



MDRIVE 42™ MOTOR+DRIVER AC Plus MICROSTEPPING

FEATURES

- Highly Integrated Microstepping Driver and NEMA 42 High Torque 1.8° Brushless Step Motor
- Advanced 2nd Generation Current Control for Exceptional Performance and Smoothness
- Single Supply: 120 or 240 VAC
- Cost Effective
- Extremely Compact
- High Positioning Accuracy
- No Tuning Required
- Stable at Low Speeds
- No Dithering at Zero Speed
- High Starting Torque
- Allows for Greater Inertia Mismatch
- Built-in Regeneration Circuitry
- 20 Microstep Resolutions up to 51,200 Steps Per Rev Including: Degrees, Metric, Arc Minutes
- Optically Isolated Logic Inputs will Accept +5 to +24 VDC Signals, Sourcing or Sinking
- Automatic Current Reduction
- Configurable:
 - Motor Run/Hold Current
 - Motor Direction vs. Direction Input
 - Microstep Resolution
 - Clock Type: Step and Direction, Quadrature, Step Up and Step Down
 - Programmable Digital Filtering for Clock and Direction Inputs
- Available Options:
 - Internal Differential Optical Encoder
 - Integrated Planetary Gearbox
 - Control Knob for Manual Positioning
 - IP65 Sealed Configuration**
- 2 Rotary Motor Lengths Available
- Setup Parameters May Be Switched On-The-Fly
- Standard Industrial Connectors:
 - Circular 19-Pin M23
 - Circular 3-Pin Euro AC
- Graphical User Interface (GUI) for Quick and Easy Parameter Setup

DESCRIPTION

The **MDrive42AC Plus Microstepping** high torque integrated motor and step and direction driver is ideal for designers who want the simplicity of a motor with on-board electronics. The integrated electronics of the MDrive42AC Plus eliminate the need to run motor cabling through the machine, reducing the potential for problems due to electrical noise.

The unsurpassed smoothness and performance delivered by the MDrive42AC Plus Microstepping 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 MDrive42AC Plus accepts a broad input voltage range from 95 to 264 VAC, 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 +75°C provides long life, trouble free service in demanding environments.

The MDrive42AC Plus uses a NEMA 42 frame size high torque brushless step motor combined with a microstepping driver, and accepts up to 20 resolution settings from full to 256 microsteps per full step, including: degrees, metric and arc minutes. These settings may be changed on-the-fly or downloaded and stored in nonvolatile memory with the use of a simple GUI which is provided. This eliminates the need for external switches or resistors. Parameters are changed via an SPI port.

For use in environments where exposure to chemical, dust and liquids may occur,

a sealed MDrive42AC Plus Microstepping unit with circular connectors meets IP65 specifications.**

The versatile MDrive42AC Plus Microstepping is available in multiple configurations to fit various system needs. Two rotary motor lengths are available and may include an internal optical encoder, a control knob for manual positioning or an integrated planetary gearbox.

Interface connections are accomplished using standard industrial circular connectors. And connectivity has never been easier with options ranging from **all-inclusive QuickStart Kits to individual interfacing cables**. *See pg 5.*

The MDrive42AC Plus is a compact, powerful and cost effective solution that will reduce system cost, design and assembly time for a large range of brushless step motor applications.

CONFIGURING

The IMS Motor Interface software is an easy to install and use GUI for configuring the MDrive42AC Plus from a computer's USB port. GUI access is via the IMS SPI Motor Interface available at www.imshome.com.

The IMS SPI Motor Interface features:

- Easy installation.
- Automatic detection of MDrive version and communication configuration.
- Will not set out-of-range values.
- Tool-tips display valid range setting for each option.
- Simple screen interfaces.

**Consult Factory for Availability.

MDrive42AC Plus MICROSTEPPING

STANDARD SPECIFICATIONS

INPUT VOLTAGE	Range	120 V MDrive – 95 to 132 VAC @ 50/60 Hz 240 V MDrive – 95 to 264 VAC @ 50/60 Hz	
ISOLATED INPUT	Step Clock, Direction and Enable		
	Voltage Range	+5 to +24 VDC Sourcing or Sinking	
MOTION	Digital Filter Range	50 nS to 12.9 µS (10 MHz to 38.8 kHz)	
	Clock Types	Step/Direction, Quadrature, Step Up/Step Down	
	Step Frequency (Max)	2 MHz	
	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)	
TEMP OUTPUT WARNING	Open-Drain Type	+5 to +24 VDC	50 mA Current
THERMAL	Operating Temperature	Heat Sink	-40° to +75°C (non-condensing)
		Motor	-40° to +90°C (non-condensing)
PROTECTION	Type	Thermal, Internal Fuse †	

† Designed for line-neutral systems.

SETUP PARAMETERS

	Function	Range	Units	Default
MHC	Motor Hold Current	0 to 100	percent	5
MRC	Motor Run Current	1 to 100	percent	25
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
DIR	Motor Direction Override	0/1	—	CW
HCDT	Hold Current Delay Time	0 or 2–65535	mSec	500
CLK TYPE	Clock Type	Step/Dir, Quadrature, Up/Down	—	Step/Dir
CLK IOF	Clock and Direction Filter	50 nS to 12.9 µS (10 MHz to 38.8 kHz)	nS (MHz)	200 nS (2.5 MHz)
USER ID	User ID	Customizable	1–3 characters	IMS
EN ACT	Enable Active	High/Low	—	High
WARN TEMP	Over Temperature Warning	0 to 125°C	°C	80°C

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.

MOTOR SPECIFICATIONS

	Holding Torque	Detent Torque	Rotor Inertia	Weight (Motor+Driver)
SINGLE LENGTH	1147 oz-in / 810 N-cm	35 oz-in / 25 N-cm	0.0917 oz-in-sec ² / 6.5 kg-cm ²	14.07 lb / 6.38 kg
DOUBLE LENGTH	2294 oz-in / 1620 N-cm	84 oz-in / 59 N-cm	0.1833 oz-in-sec ² / 13.0 kg-cm ²	21.25 lb / 9.64 kg

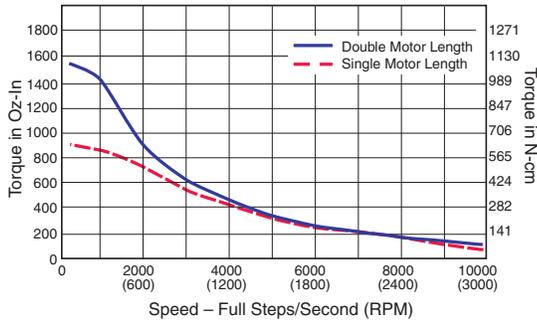
ENCODER SPECIFICATIONS

INTERNAL DIFFERENTIAL OPTICAL ENCODER	Pin Assignments		Line Count	Part Number
	19-Pin M23 Connector	Function		
	Pin 3	Index +	100	EA
	Pin 4	Channel B +	200	EB
	Pin 5	Channel B –	400	ED
	Pin 7	Channel A +	500	EH
	Pin 14	Index –	512	EX
	Pin 15	Channel A –	1000	EJ
			1024	EY

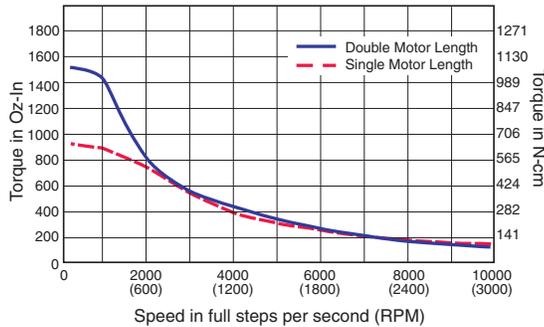
Note: All encoders come with an index mark, except the 400 line count.

SPEED-TORQUE

MDrive42AC - 120VAC



MDrive42AC - 240VAC



PIN ASSIGNMENTS

P1: I/O & COMM (SPI) CONNECTOR

M23 Circular (Male)	Function	Function with Encoder
Pin 1	Optocoupler Reference	Optocoupler Reference
Pin 2	Enable Input	Enable Input
Pin 3	No Connect	Index +
Pin 4	No Connect	Channel B +
Pin 5	No Connect	Channel B -
Pin 6	No Connect	No Connect
Pin 7	No Connect	Channel A +
Pin 8	SPI Master Out - Slave In	SPI Master Out - Slave In
Pin 9	SPI Chip Select	SPI Chip Select
Pin 10	+5 VDC Output	+5 VDC Output
Pin 11	Communications Ground	Communications Ground
Pin 12	Shell Connect	Shell Connect
Pin 13	CW/CCW Direction Input	CW/CCW Direction Input
Pin 14	No Connect	Index -
Pin 15	No Connect	Channel A -
Pin 16	SPI Clock	SPI Clock
Pin 17	SPI Master In - Slave Out	SPI Master In - Slave Out
Pin 18	Step Clock Input	Step Clock Input
Pin 19	Temp Output Warning	Temp Output Warning

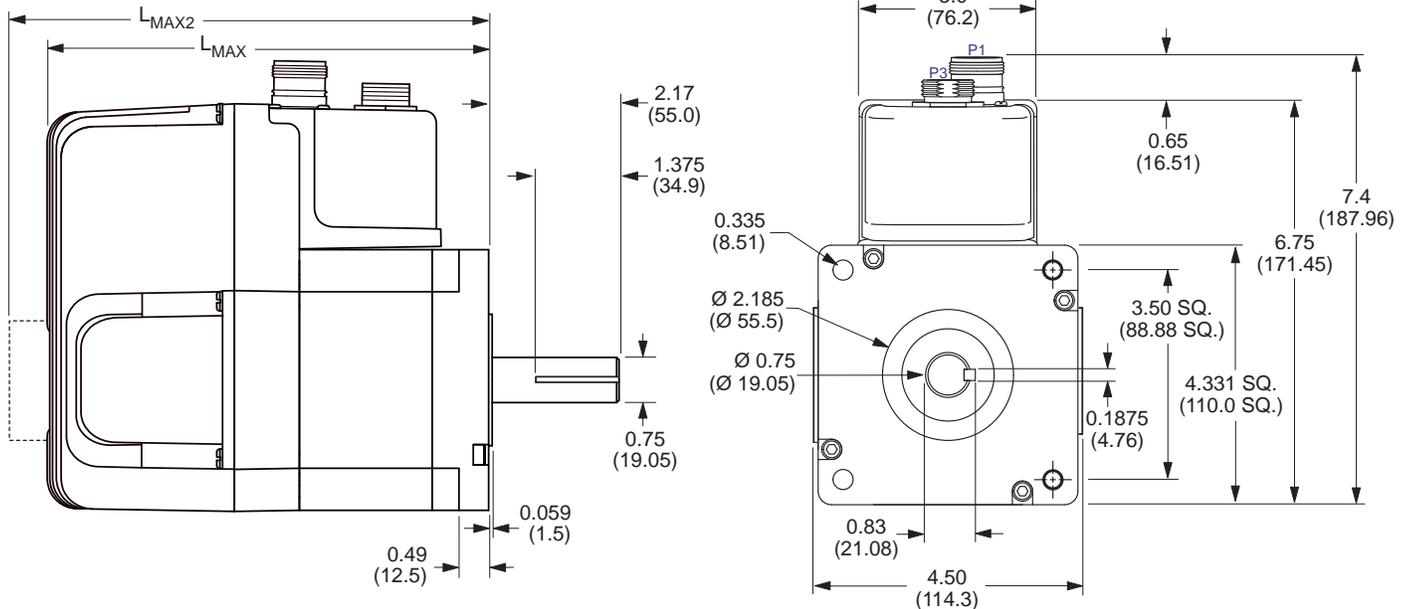
P3: POWER CONNECTOR

Euro AC (Male)	Function
Pin 1	Chassis Ground
Pin 2	AC Power Line
Pin 3	AC Power Neutral

MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

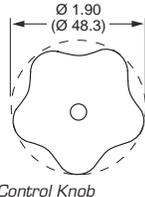
MDrive42AC Plus



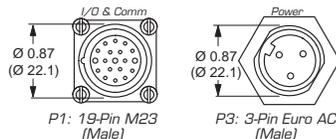
MDrive Lengths Inches (mm)

	LMAX	LMAX2
Motor Length	SINGLE SHAFT or ENCODER VERSION	CONTROL KNOB VERSION
Single	7.4 (187.96)	9.4 (238.76)
Double	9.4 (238.76)	11.4 (289.56)

L_MAX2 Option



Connectors



MDrive42AC PLUS WITH PLANETARY GEARBOX

The MDrive42AC Plus 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 MDrive42AC Plus 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 (lb/kg)	
					Radial	Axial	Gearbox	w/Flange
PM105	1-STAGE	4956/35.0	0.80	1.0°	135/600	27/120	9.7/4.4	10.0/4.5
	2-STAGE	14869/105.0	0.75	1.5°	202/900	40/180	13.2/6.0	13.6/6.2
	3-STAGE	27614/195.0	0.70	2.0°	337/1500	67/300	16.8/7.6	17.3/7.8
PM120	1-STAGE	7080/50.0	0.80	0.55°	135/600	27/120	12.3/5.6	12.7/5.8
	2-STAGE	21242/150.0	0.75	0.60°	202/900	40/180	17.6/8.0	18.1/8.2
	3-STAGE	42484/300.0	0.70	0.65°	337/1500	67/300	22.9/10.4	23.5/10.7

Ratios and Part Numbers

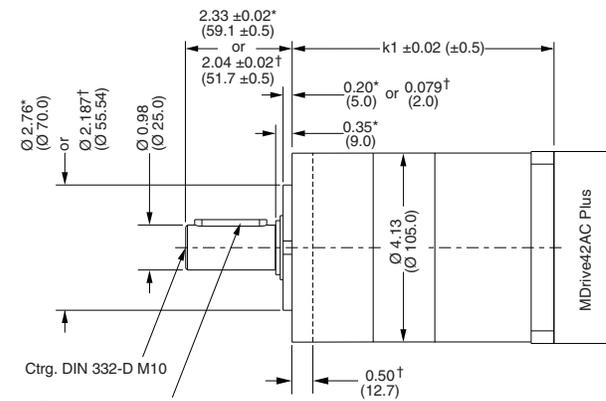
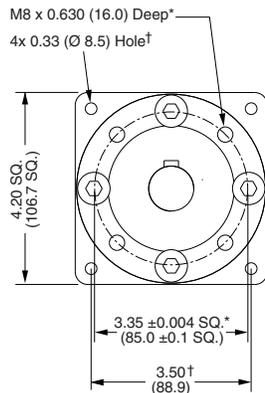
Planetary Gearbox	Ratio (Rounded)	Part Number†	
		PM105 Model	PM120 Model
1-Stage	3.71:1 **	G1A1	G2A1
1-Stage	5.18:1	G1A2	—
1-Stage	6.75:1 **	G1A3	G2A3
2-Stage	13.73:1 **	G1A4	G2A4
2-Stage	15.88:1	G1A5	—
2-Stage	18.37:1	G1A6	—
2-Stage	19.20:1	G1A7	—
2-Stage	22.21:1	G1A8	—
2-Stage	25.01:1 **	G1A9	G2A9
2-Stage	26.85:1	G1B1	—
2-Stage	28.93:1	G1B2	—
2-Stage	34.98:1	G1B3	—
2-Stage	45.56:1 **	G1B4	G2B4
3-Stage	50.89:1 **	G1B5	G2B5
3-Stage	58.86:1	G1B6	—
3-Stage	68.07:1	G1B7	—
3-Stage	71.16:1	G1B8	—
3-Stage	78.72:1	G1B9	—
3-Stage	92.70:1 **	G1C1	G2C1
3-Stage	95.18:1	G1C2	—
3-Stage	99.51:1	G1C3	—
3-Stage	107.21:1	G1C4	—
3-Stage	115.08:1	G1C5	—
3-Stage	123.98:1	G1C6	—
3-Stage	129.62:1	G1C7	—
3-Stage	139.14:1	G1C8	—
3-Stage	149.90:1	G1C9	—
3-Stage	168.85:1 **	G1D1	G2D1
3-Stage	181.25:1	G1D2	—
3-Stage	195.27:1	G1D3	—
3-Stage	236.10:1	G1D4	—
3-Stage	307.55:1 **	G1D5	G2D5

Planetary Gearbox for MDrive42Plus

Dimensions in Inches (mm)

PM105 Model

*Gearbox without Flange
†Gearbox with Flange

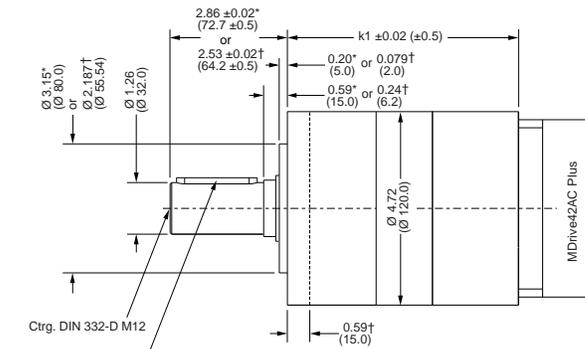
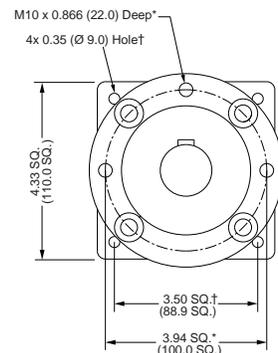


Gearbox Lengths Inches (mm)

	k1	
	GEARBOX*	with FLANGE†
1-Stage	5.73 (145.5)	5.9 (149.9)
2-Stage	7.07 (179.6)	7.13 (181.0)
3-Stage	8.41 (213.7)	8.35 (212.0)

PM120 Model

*Gearbox without Flange
†Gearbox with Flange



Gearbox Lengths Inches (mm)

	k1	
	GEARBOX*	with FLANGE†
1-Stage	6.23 (158.2)	6.58 (167.2)
2-Stage	7.57 (192.4)	7.93 (201.4)
3-Stage	8.92 (226.6)	9.28 (235.6)

**Indicates limited ratios available for PM120 gearbox.

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

ORDER INFORMATION — MDrive42AC Plus Microstepping

CONNECTIVITY

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.

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. Length 12.0' (3.6m).
Mates to connector:
5-Pin M12MD-CC301-001

Prototype Development Cables
Speed test/development with pre-wired mating connectors that have flying leads other end. Single-ended cordsets are PVC jacketed with foil shield and unconnected drain wire. Length 13.0' (4.0m).

Mates to connector:
19-Pin M23
Straight TerminationMD-CC100-000
Right Angle TerminationMD-CC101-000
3-Pin Euro AC
Straight TerminationMD-CC200-000
Right Angle TerminationMD-CC201-000

OPTIONS

Internal Encoder
An internal 512-line (2048 count) differential optical encoder with index mark is available factory-mounted.

Control Knob ‡
For manual shaft positioning, a factory-mounted rear control knob is available.

Planetary Gearbox
Efficient, low maintenance planetary gearboxes are offered factory-mounted. Refer to details and part numbers on the back cover.

‡ Not Available with Sealed -65 Versions.

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

PART NUMBERING



Plus
base version

Plus²-65
IP65 sealed

K MDM **MSZ42** **OPTION**

QuickStart Kit
details above

MDrive Version
1 = Plus
2 = Plus-65 (sealed)**

Input Voltage
1 = 120 Volt
2 = 240 Volt

Motor
A = Single Length
B = Double Length

P1: I/O & Communications,
19-Pin M23 Circular Connector

P3: Power, 3-Pin Euro AC Connector

Example #1: Part Number **MDM1MSZ42B2** is an MDrive42AC Plus Microstepping with 19-pin M23 circular I/O & SPI communications interface, NEMA 42 double length motor and 240 input voltage.

**Consult Factory for Availability.

OPTIONS

Internal Encoder **-E**

Refer to encoder specifications section for line counts and part numbers.

Example: **MDM1MSZ42B2-EX** adds an internal 512-line differential optical encoder with index mark to example #1.

Control Knob **-N**

Example: **MDM1MSZ42B2-N** adds a rear control knob to example #1. *Not available with sealed -65 versions.*

Planetary Gearbox **-G** **-F**

Refer to gearbox page for complete table of ratios and part numbers.

Optional NEMA Flange

Example: **MDM1MSZ42B2-G1A2** adds a PM105 1-stage planetary gearbox with 5.18:1 ratio to example #1. Add -F for optional NEMA flange.

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