

# M DRIVE 34™ MOTOR+DRIVER



## FEATURES

- Integrated Microstepping Drive/ NEMA 34 High Torque Motor
- +24 to +75 VDC Input Voltage
- Low Cost
- Extremely Compact
- Optically Isolated Logic Inputs will Accept 5 to 24 Volt DC Signals, Sourcing or Sinking
- Automatic Current Reduction
- Configurable:
  - Motor Run/Hold Current
  - Motor Rotation vs. Direction Input
  - Microstep Resolution to 256 Microsteps/Full Step
- Available Configurations:
  - Factory-Mounted Internal Optical Encoder
  - Rear Knob for Manual Positioning
- Available in Three Motor Lengths
- Current and Resolution May Be Switched On-The-Fly
- Single Supply
- Interface Uses 12" (30.5 cm) Flying Leads
- Graphical User Interface (GUI) for Quick and Easy Parameter Setup

## DESCRIPTION

The MDrive NEMA 34 high torque Integrated Motor and Driver is ideal for designers who want the simplicity of a motor with on-board electronics, but without the expense of an indexer on each axis. The low cost

MDrive34 puts the system designer in the driver's seat to decide the best method of control. The MDrive34's integrated electronics eliminates the need to run the motor cabling through the machine, reducing the potential for problems due to electrical noise.

The MDrive34 uses a NEMA 34 frame size 1.8° high torque motor combined with a microstepping drive, and accepts up to 14 resolution settings from 1/2 to 256 microsteps per full step. Setup parameters include Microstep Resolution, Motor Rotation versus Direction Input and Run/Hold currents. These settings may be changed on-the-fly or downloaded and stored in non-volatile 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 located on connector P2. Operating voltage for the MDrive34 ranges from +24 to +75 VDC.

The MDrive34 is available in three motor lengths: 24, 31 & 47. Interface connections are accomplished using 12" (30.5 cm) flying leads. Configurations include an optical encoder version and a control knob on the back for manual positioning.

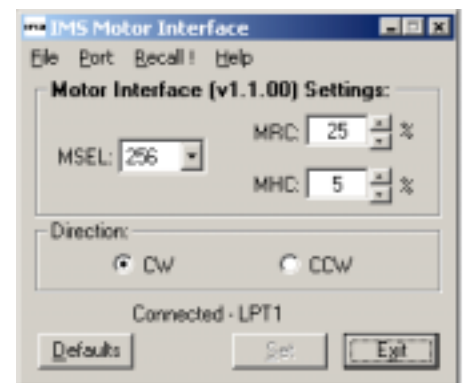
The MDrive34 is a compact, powerful and inexpensive solution that will reduce system cost, design and assembly time for a large range of stepping motor applications.

## CONFIGURATION UTILITY

The IMS MDrive Configuration Utility is an easy to install and use graphical user interface (GUI) for configuring the MDrive34 from the parallel port on your computer. This utility is included on a CD that ships with the product, or it may be downloaded at [www.imshome.com](http://www.imshome.com). An optional parameter setup cable is also available for ease of connecting and configuring this MDrive product.

Configuration Utility features include:

- Easy installation.
- Automatic communication configuration.
- Will not set out-of-range values.
- Tool-tips display valid range setting for each option.
- Ease of use via single screen interface (shown below).



The IMS Motor Interface GUI (Graphical User Interface) simplifies use with single screen interface for configuring the MDrive.

# M DRIVE 34<sup>TM</sup>

MOTOR+DRIVER

## SPEED CONTROL

### FEATURES

- Integrated Speed Control, Driver and NEMA 34 High Torque Motor
- +24 to +75 VDC Input Voltage
- Digital Oscillator for Accurate Speed Control
- Optically Isolated Inputs will Accept 5 to 24 Volt DC Signals, Sourcing or Sinking
- Step Clock and Direction Outputs
- Low Cost
- Extremely Compact
- Available in Three Motor Lengths
- Electronically Configurable:
  - Motor Run/Hold Current
  - Acceleration/Deceleration
  - Initial and Max Velocity
  - Speed Control Input Source
  - Microstep Resolution to 256 Microsteps/Full Step
  - Motor Rotation vs. Direction Input
- Available Configurations:
  - Factory-Mounted Internal Optical Encoder
  - Rear Knob for Manual Positioning
- Selectable Speed Control from One of Two 0 to 5VDC Inputs (One Configurable as 4 to 20mA) or 15 to 25kHz PWM Input, all with Programmable Center Point
- Single Supply
- Interface Uses 12" (30.5 cm) Flying Leads
- Graphical User Interface (GUI) for Quick and Easy Parameter Setup

### DESCRIPTION

The MDrive34 Variable Speed Control offers the system designer low cost, intelligent velocity control integrated with a NEMA 34 high torque stepping motor and a +24 to +75 volt microstepping drive.

The MDrive34 Variable Speed Control features a digital oscillator for accurate velocity control with an output frequency of up to 100 kilohertz. Output frequency will vary with the signal applied to the speed control inputs. The speed can be adjusted by a 15 - 25kHz PWM, 4 - 20mA or 0 to 5 volts input signal.

Step clock and direction output signals are available with the MDrive34 Variable Speed Control. These outputs can be used to control a second non-speed control MDrive to follow the speed of the Variable Speed Control unit. By using this feature, wiring and controlling machines with large tables or wide conveyors can be simplified and there is no drift between motor speeds.

One of the two speed inputs available with the MDrive34 Variable Speed Control can be selected using the SPEED1/SPEED2 input. This allows the user to have two preset speeds that can be selected digitally. The MDrive34 will then accelerate/decelerate to the new value.

There are two basic modes of operation: bidirectional and unidirectional. By moving the center point, both speed and direction are controlled by the analog speed control input. By setting the center point to zero or the lower end of the potentiometer, only velocity is controlled by the speed control input; direction is controlled by a separate digital input.

The MDrive34 Variable Speed Control has 12 setup parameters which are configured using the included Configuration Utility. These enable the user to configure all of the

operational parameters of the MDrive34 which are stored in non-volatile memory.

The MDrive34 configurations include an optical encoder version and a control knob on the back for manual positioning. Three motor lengths are available: 24, 31 & 47. Interface connections are accomplished using 12" (30.5 cm) flying leads.

### CONFIGURATION UTILITY

The IMS Variable Speed Control Configuration Utility is an easy to install and use graphical user interface (GUI) for configuring the MDrive34 from the parallel port on your computer. It is required for configuring your MDrive34 Variable Speed Control and is included on a CD with the product, or it may be downloaded at [www.imshome.com](http://www.imshome.com).

Configuration Utility features include:

- Easy installation.
- Automatic communication configuration.
- Will not set out-of-range values.
- Tool-tips display valid range setting for each option.
- Ease of use via single screen interface (shown below).



# MICROSTEPPING MDRIVE34 SPECIFICATIONS

## ELECTRICAL SPECIFICATIONS

Input Voltage (+V) Range ..... +24 to +75 VDC  
 Isolated Inputs ..... Step Clock, Direction & Enable  
 Isolated Input Voltage Range\* ..... +5 to +24VDC  
 Step Frequency (Max) ..... 2 MHz  
 Steps per Revolution ..... 400, 800, 1000, 1600, 2000, 3200, 5000,  
 6400, 10000, 12800, 25000, 25600, 50000, 51200  
 Protection ..... Over Voltage

\*Sourcing or Sinking

## PARAMETERS

See PARAMETERS NOTE below.

SETUP PARAMETERS				
NAME	FUNCTION	RANGE	UNITS	DEFAULT
MHC	Hold Current	0 to 100	percent	5
MRC	Run Current	1 to 100	percent	25
MSEL	Microstep Resolution	2, 4, 5, 8, 10, 16, 25, 32, 50, 64, 125, 128, 250, 256	μsteps per step	256

## WIRE/PIN ASSIGNMENTS

FLYING LEADS / FUNCTION	
White	OPTOCOUPLER REFERENCE
Orange	STEP CLOCK INPUT
Blue	CW/CCW DIRECTION INPUT
Brown	ENABLE INPUT
Black	POWER GROUND
Red	+V (+24 TO +75 VDC)
CONNECTOR P2 (SPI) / FUNCTION	
4	CHIP SELECT
5	GROUND
6	+5 VDC OUTPUT
7	MASTER OUT -- SLAVE IN
8	CLOCK
10	MASTER IN -- SLAVE OUT

# MDRIVE34 SPEED CONTROL SPECIFICATIONS

## ELECTRICAL SPECIFICATIONS

Speed Control Input 1 ..... 0 to +5 VDC or 4 to 20 mA  
 Speed Control Input 2 ..... 0 to +5 VDC  
 A/D Resolution ..... 10 bit  
 Speed Control Potentiometer Resistance ..... 10 kΩ  
 Input Voltage (+V) Range ..... +24 to +75 VDC  
 Step Clock, Direction Out (Drain Source Voltage Max) ..... 100 VDC  
 Step Clock, Direction Out (Continuous Drain Current) ..... 100 mA  
 Isolated Inputs ..... Speed1/Speed2/PWM, Start/Stop, Direction  
 Isolated Input Voltage Range\* ..... 5 to 24 Volts  
 PWM Input Frequency ..... 15 to 25 kHz

\*Sourcing or Sinking

## PARAMETERS

See PARAMETERS NOTE below.

SETUP PARAMETERS				
NAME	FUNCTION	RANGE	UNITS	DEFAULT
ACCL	Accel/Decel	2000 to 100000	steps/sec <sup>2</sup>	2000
C	Joystick Center	0 to 1022	counts	0
DB	Deadband	0 to 255	counts	1
DCLT	Decel Type	Decel at ACCL Rate/No Decel	--	Decel
IMODE	Source	A1 and A2, or PWM	--	0
	Analog Input	Voltage/4-20mA	--	0
	Clockwise/Counter Clockwise	0 or 1	--	0
FS	Full Scale	1 to 1023	counts	1023
MHC	Hold Current	0 to 100	percent	5
MRC	Run Current	1 to 100	percent	25
MSEL	Microstep Resolution	2, 4, 5, 8, 10, 16, 25, 32, 50, 64, 125, 128, 250, 256	μsteps per step	256
RANGE	VI/VM Range	1 to 8	--	3
VI	Initial Velocity	1 to 100000	steps/sec	400
VM	Maximum Velocity	1 to 100000	steps/sec	20000

## WIRE/PIN ASSIGNMENTS

FLYING LEADS / FUNCTION	
Violet	STOP/START INPUT
Blue	DIRECTION INPUT
White/Brown	SPEED1/SPEED2/PWM INPUT
White	OPTOCOUPLER REFERENCE
White/Orange	STEP CLOCK OUTPUT
White/Blue	DIRECTION OUTPUT
Yellow	+5 VDC OUTPUT (10K POT)*
Gray	LOGIC GROUND (10K POT)*
Green	SPEED CONTROL INPUT 1: 0-5V (10K POT)* / 4-20mA
White/Green	SPEED CONTROL INPUT 2: 0-5V (10K POT)*
Black	POWER GROUND
Red	+V (+24 TO +75 VDC)
CONNECTOR P2 (SPI) / FUNCTION	
4	CHIP SELECT
5	GROUND
6	+5 VDC OUTPUT
7	MASTER OUT - SLAVE IN
8	CLOCK
10	MASTER IN - SLAVE OUT

\* Example Part: 10k ohm, 1/2 W potentiometer such as the Bourns 53AAA-B28-B15 is available from  
 - Digi-Key (No. 53AAA-B28-B15-ND)  
 - Newark Electronics (No. 90F6563)

PARAMETERS NOTE: All parameters are set using the included Configuration Utility GUI and may be changed on-the-fly.  
 The optional parameter setup cable No. MD-CC100-000 is recommended with the first order.

# MDRIVE34 SHARED SPECIFICATIONS

## MOTOR SPECIFICATIONS

### MD3424

Holding Torque oz-in (N-cm) ..... 381 (269)  
 Detent Torque oz-in (N-cm) ..... 10.9 (7.7)  
 Rotor Inertia oz-in-sec<sup>2</sup> (kg-cm<sup>2</sup>) ..... 0.01416 (1.0)  
 Weight (Motor+Driver) oz (gm) ..... 51.1 (1450)

### MD3431

Holding Torque oz-in (N-cm) ..... 575 (406)  
 Detent Torque oz-in (N-cm) ..... 14.16 (10.0)  
 Rotor Inertia oz-in-sec<sup>2</sup> (kg-cm<sup>2</sup>) ..... 0.02266 (1.6)  
 Weight (Motor+Driver) oz (gm) ..... 72.3 (2050)

### MD3447

Holding Torque oz-in (N-cm) ..... 1061 (749)  
 Detent Torque oz-in (N-cm) ..... 19.83 (14.0)  
 Rotor Inertia oz-in-sec<sup>2</sup> (kg-cm<sup>2</sup>) ..... 0.04815 (3.4)  
 Weight (Motor+Driver) oz (gm) ..... 128.7 (3650)

## POWER SUPPLY CURRENT

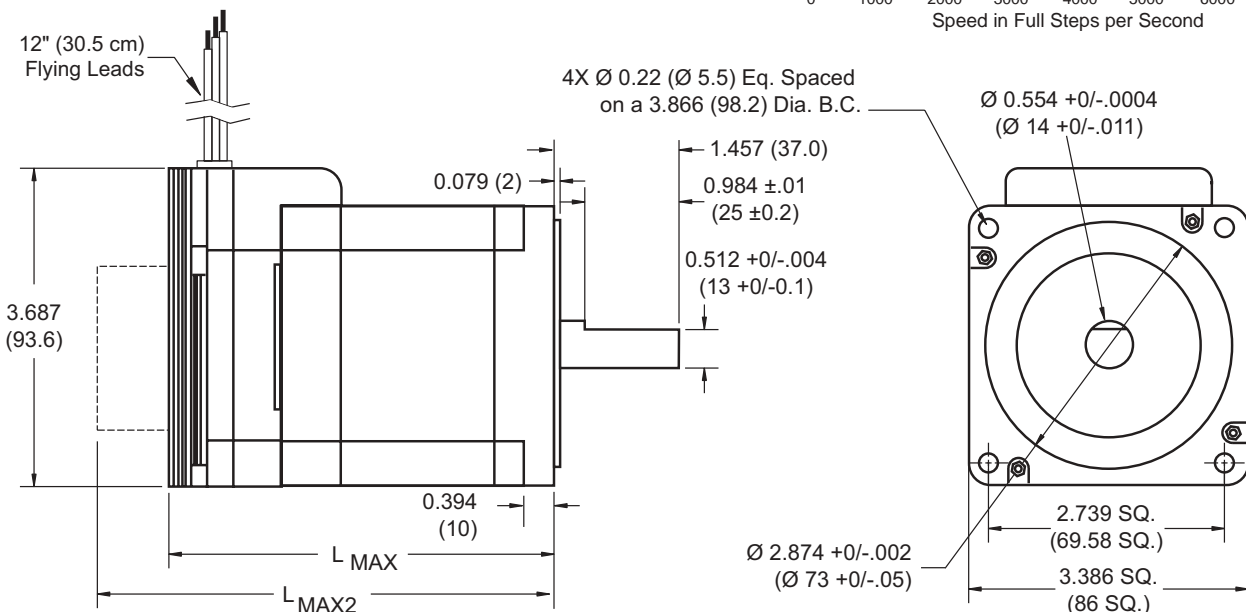
Power supply current requirements are 3.5A (MAX) per MDrive34. Actual power supply current will depend on load and duty cycle.

## MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

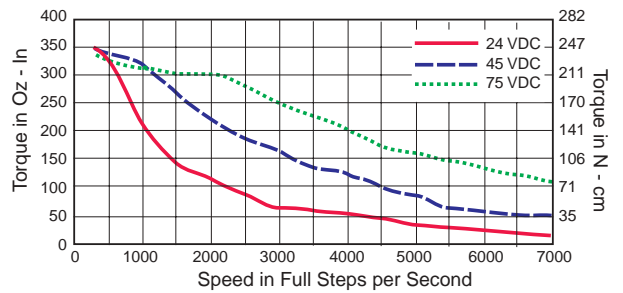
L <sub>MAX</sub> TABLE	
Size	Length
3424	3.973 (100.91)
3431	4.551 (115.60)
3447	6.073 (154.25)

CONTROL KNOB L <sub>MAX2</sub> TABLE	
Size	Length
3424	5.083 (129.10)
3431	5.661 (143.79)
3447	7.183 (182.44)

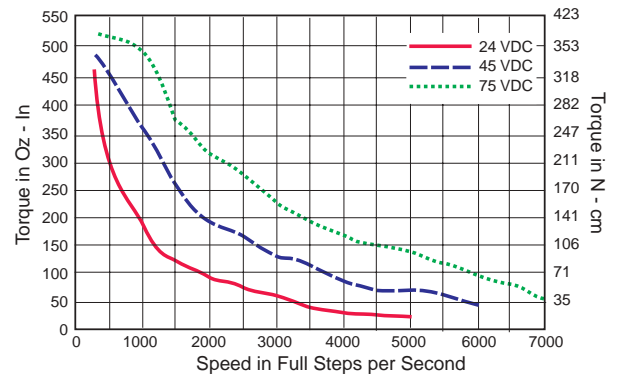


## TORQUE-SPEED CURVES

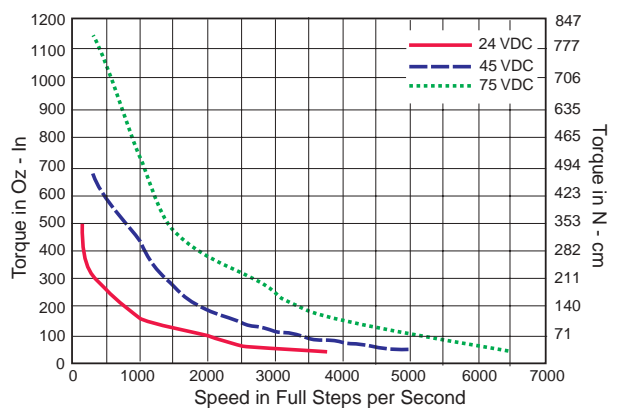
### MD3424



### MD3431



### MD3447



## OPTIONS

### PARAMETER SETUP CABLE

A low cost accessory which eliminates the need for the user to wire communications. Included in this cable is built-in logic level shifting circuitry to accommodate the 3.3v ports on some PCs. This cable plugs in easily to connect a standard DB-25 PC parallel port to the 10 pin header (P2) on the MDrive34. Order Part Number **MD-CC100-000**.

### CONTROL KNOB VERSION

The MDrive34 is available with a factory-mounted knob for manual shaft positioning.

### FACTORY-MOUNTED ENCODER VERSION

The MDrive34 is available with a factory-mounted internal optical encoder. Available line counts: 100, **200**, 250, 400, **500**, 1000. All encoders have an index mark except the 1000.

Encoders are available in both single-end and differential configurations. Wire assignments for both configurations are shown below.

DIFFERENTIAL ENCODER	
Flying Leads	Function
Yellow/Black	GROUND
Yellow/Violet	INDEX +
Yellow/Blue	CHANNEL A+
Yellow/Red	5 VDC INPUT
Yellow/Brown	CHANNEL B+
Yellow/Gray	INDEX -
Yellow/Green	CHANNEL A-
Yellow/Orange	CHANNEL B-

SINGLE-END ENCODER	
Flying Leads	Function
Yellow/Black	GROUND
Yellow/Violet	INDEX
Yellow/Blue	CHANNEL A
Yellow/Red	5 VDC INPUT
Yellow/Brown	CHANNEL B

## ORDERING INFORMATION

Basic MDrive34	
<p>M = Microstepping O = Speed Control</p> <p>Stack Size 381 oz-in = 24 575 oz-in = 31 1061 oz-in = 47</p> <p><b>MD</b> <input type="checkbox"/> <b>F 34</b> <input type="checkbox"/> <b>OPTION</b></p>	
<p><b>Example #1:</b> Part Number <b>MDOF3431</b> is an MDrive34 Speed Control with 31 stack size motor.</p>	

OPTIONS	
<p>Add <b>ONE</b> of the options below to the Basic MDrive part number</p> <p>Stock items shown in <b>bold italics</b>. Lead times may apply to other versions.</p>	
<p>Control Knob</p> <p><b>N</b></p>	<p><b>Example #2: MDOF3431N</b> Adds a Control Knob to the part shown in example #1.</p>
<p>Optical Encoder</p> <p><b>E</b> <input type="checkbox"/> <input type="checkbox"/></p> <p>S = Single End D = Differential</p> <p>Line Count 100, <b>200</b>, 250, 400, <b>500</b>, 1000</p>	<p><b>Example #3: MDOF3431ES200</b> Adds a 200 line, single end optical encoder to the part shown in example #1.</p>

Rev. 07.19.2002