

Stepper and Servo Motor Drives

MID Series

MID-7604, MID-7602

- Flexible configuration
- High-efficiency, bipolar chopper stepper drives
- User-selectable microstepping and peak current
- Integrated power supply

MID-7654, MID-7652

- Flexible configuration
- High-efficiency servo amplifiers
- User-selectable peak current and continuous current
- Integrated power supply

CE approved and UL recognized



Stepper and Servo Motor Drives

Overview

The National Instruments MID-760x integrated stepper motor power drives and the MID-765x integrated DC-brush servo motor power drives offer reliable, easy-to-connect drive solutions for National Instruments motion controllers. The MID-760x provides stepper motor control from the NI 7334 and 7344 controllers. The MID-765x provides DC-brush servo motor control from NI 7344 controllers. Because the MID-760x and the MID 765x have all the required motion drive and motion I/O signals, they offer all the features of a universal motion interface wiring module with the enhancements of a powered motor drive in a single product. The NI MID power drives connect to motion controller boards through a single-shielded cable that transfers all motor commands, as well as motion I/O control and feedback signals.

The MID-7604 and MID-7602 are 4-axis and 2-axis stepper motor drive units, respectively. The MID-7654 and MID-7652 are 4-axis and 2-axis DC-brush servo motor drive units, respectively.

These compact, well integrated drives incorporate per-axis amplifiers, motor-power DC bus supplies, low-voltage motion I/O supplies, and pluggable screw terminal connectivity in a single rugged metal enclosure. This optimized system wiring design simplifies motion component selection.

Compact Enclosure Size, Flexible Configuration

The MID-760x enclosure is the size of a typical laptop computer, designed to occupy a minimal amount of space. The 765x enclosure is the same length and width as the 760x, but is twice the height. Optional mounting configurations provide 19 in. rack mounting and panel mounting for flexible motion system configuration.

INFO CODES

For more information or to order products online, visit ni.com/info and enter:

mid7602
mid7604
mid7652
mid7654

BUY ONLINE!

High-Efficiency Architecture

The MID-760x power drives incorporate an efficient bipolar chopper architecture that converts step and direction control signals into winding currents for two-phase stepper motors. The MID-765x power drives incorporate an efficient servo amplifier architecture that converts analog control signals into winding currents for DC-brush motors. The PWM driver technology in the MID-765x accurately controls motor winding current, while reducing motor heating, lowering ripple current, and improving overall motor performance. Active fan cooling provides optimal motion power drive operation.

Motion

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Output Current Selection

Per-axis peak winding current is switch selectable from 0.2 A/phase to 1.4 A/phase for the MID-760x power drives. You can configure per-axis winding current from 0.8 A to a 5 A continuous and 10 A maximum peak for the MID-765x drives. Output current is carefully regulated to the selected value for efficient and proper motor performance.

Selecting Stepper and Servo Motor Drives

We recommend the National Instruments MID-760x stepper power drives for stepper motors that require less than 1.4 A of current. We also recommend the nuDrive 2SX-411 and 4SX-411 power drives for stepper motors with current rates greater than 1.4 A but less than 4 A peak. For servo power drives, we recommend the MID-765x for motors that require less than 5 A continuous current but greater than 0.8 A continuous.

Signal Conditioning for Motion I/O

The motor control and direction signals are optically isolated for signal integrity and noise immunity. All of the motion I/O limit and home switch inputs incorporate input filtering for noise immunity. Differential encoder wiring is built in to take advantage of the noise immunity inherent in this type of motion system wiring configuration.

Idle Motion Current Reduction

When the step and direction input commands are idle for more than 500 ms, you can configure the MID-760x power drive to reduce output current to a 50 percent current value. Drive current

risers to the 100 percent configured value when an active step command input occurs.

nuDrive Stepper Motor Drives

The nuDrive Series are motor drives that interface with motors, encoders, limits, and I/O. A nuDrive contains multi axis drive/amplifiers, power supplies, and motion I/O interface components in a benchtop or 19 in. rack-mount metal enclosure. The nuDrive stepper motor drives have a larger enclosure and can deliver higher current ratings than the MID Series. The next-generation MID Series includes many features that simplify development, such as front panel diagnostic and status LEDs, selectable microstepping for stepper drives, and peak current settings.

Tech Tip

User-Selectable Microstepping

Microstepping provides an electronically controlled step increment with finer resolution than the mechanical full step design of standard stepper motors. The MID-760x Series per-axis configurable microstepping gives you smooth, low-speed operation and enhanced performance.

For more information, visit ni.com/info and enter: exvzc8.

	Stepper NI 7334	Servo NI 7344	Motor Drive (V)	Current/Axis (A)	Compact Enclosure and Diagnostic LEDs	Front Panel Selectable Microstepping	Front Panel Selectable Peak Current	Axes
MID-7604	✓	–	24	0.2 to 1.4	✓	✓	✓	4
MID-7602	✓	–	24	0.2 to 1.4	✓	✓	✓	2
MID-7654	–	✓	48	0.8 to 5 cont. 10 peak	✓	–	✓	4
MID-7652	–	✓	48	0.8 to 5 cont. 10 peak	✓	–	✓	2
nuDrive 4SX-411	✓	–	40	0.36 to 4	–	–	–	4
nuDrive 2SX-411	✓	–	40	0.36 to 4	–	–	–	2

Table 1. Controller comparison.

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Host PC Power Monitoring/Shutdown

Designed to enhance PC-based motion system operation, a unique circuit constantly monitors the +5 VDC power from the host PC. Because an unexpected shutdown of the host PC may

signal the loss of system control, the MID power drives immediately react to the +5 VDC power loss by disabling motor drive power for instant motor shutdown.

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MID-7604 Rear Panel View

Ordering Information

MID-7604 (4-axis stepper)	
U.S. 120 VAC	777936-01
Swiss 220 VAC.....	777936-02
Australian 240 VAC	777936-03
Universal Euro 240 VAC.....	777936-04
North American 240 VAC.....	777936-05
United Kingdom 240 VAC	777936-06
Japan 100 VAC.....	777936-07

MID-7602 (2-axis stepper)	
U.S. 120 VAC	778003-01
Swiss 220 VAC.....	778003-02
Australian 240 VAC	778003-03
Universal Euro 240 VAC.....	778003-04
North American 240 VAC.....	778003-05
United Kingdom 240 VAC	778003-06
Japan 100 VAC.....	778003-07

MID-7654 (4-axis servo)	
U.S. 120 VAC	778005-01
Swiss 220 VAC.....	778005-02
Australian 240 VAC	778005-03
Universal Euro 240 VAC.....	778005-04
North American 240 VAC.....	778005-05
United Kingdom 240 VAC	778005-06
Japan 100 VAC.....	778005-07

MID-7652 (2-axis servo)	
U.S. 120 VAC	778004-01
Swiss 220 VAC.....	778004-02
Australian 240 VAC	778004-03
Universal Euro 240 VAC.....	778004-04
North American 240 VAC.....	778004-05
United Kingdom 240 VAC	778004-06
Japan 100 VAC.....	778004-07

Cables

Refer to the cable guide on page 594.

Previous-Generation Products

High-Power Stepper Drives	
nuDrive 2SX-411	777668-01
nuDrive 4SX-411	777669-01

Accessories

Rack-Mount Kit	
MID-765x	187374-01
MID-760x	777665-01
Strain-Relief Bar for MID-76xx	187407-01
Panel-Mount Kit	187243-01

For more information on extended warranty and value-added services, see page 22.

Motion

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Motor Drives

Specifications

The specifications below apply only to the MID-7604/7602/7654/7652. Please refer to your controller specifications to determine overall system specifications.

Some signals have compatibility defined as pass-through. This means the MID 76xx may have passive filtering on these signals, but the signals do not affect the voltage range. Consult your motion controller specifications to determine allowable voltage range and logic level compatibility of the signal.

MID-7604, MID-7602 Stepper Motor Drives

Driver type	IM481H modular hybrid, bipolar chopper
Chopping operating frequency.....	20 kHz
Motor bus voltage.....	24 VDC nominal
Current per phase	0.2 to 1.4 A_{peak} (0.14 to 1 A_{rms}) (factory setting is 0.2 A_{peak})
Microstepping selections.....	x2, 4, 8, 16, 32, 64, 128, 256, x5, 10, 25, 50, 125, 250

Power Supply

Input voltage	90-138 VAC/204-264 VAC, 47-63 Hz
Input fuse	1.5 A, 240 VAC
	3 A, 120 VAC
Input fuse dimensions	5 x 20 mm

Host Bus Voltage Interlock

PC bus host voltage monitoring range	5 ($\pm 5\%$) VDC
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Physical

Dimensions	30.7 by 25.4 by 4.3 cm (12.1 by 10.0 by 1.7 in.)
Weight	4.5 kg (10 lb)

MID-7654, MID-7652 Servo Motor Drives

Driver type.....	Elmo Motion Control VIO 10/100
Peak current limit.....	1.7 to 10 A (default 1.7 A)
Continuous current limit.....	0.8 to 5 A (default 0.5 A)
DC-bus motor voltage.....	48 VDC nominal
Continuous power (all axes combined).....	320 W

Power Supply

Input voltage	90-138 VAC/204-264 VAC, 47-63 Hz
Input fuse	6 A, 240 VAC
	8 A, 120 VAC
Input fuse type.....	3 AG

Host Bus Voltage Interlock

PC bus host voltage monitoring range	5 VDC $\pm 5\%$
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Physical

Dimensions	30.7 by 25.4 by 8.9 cm (12.1 by 10.0 by 3.5 in.)
Weight	10.2 kg (22.5 lb)

Encoder Interface (Each Axis)

Inputs – Quadrature, incremental	
Differential input threshold	± 0.3 V (typical)
Single-ended input threshold	TTL/CMOS
Voltage range	0 to 5 VDC
Noise filter (RC time constant)	100 ns
Maximum quadrature frequency	1 MHz

Inhibit, Limit, and Home Switch Inputs (Each axis)

Voltage range	0 to 12 VDC
Compatibility	Signal pass-through

Trigger Input

Noise filter (RC time constant)	100 ns
Max frequency.....	100 kHz
Compatibility	Signal pass-through

Breakpoint Output

Compatibility	Signal pass-through
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Analog Input

Noise filter (RC time constant)	10 μ s
Max frequency.....	100 kHz
Compatibility	Signal pass-through

Analog Output

Compatibility	Signal pass-through
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Safety

Installation category II, pollution degree 2	
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Environment

Operating temperature	0 to 40 °C
Storage temperature.....	-20 to 70 °C
Humidity	10% to 90% (noncondensing)

Motion