Npaq® MR Series

Drive Racks

- 3U, 19-inch rack-mount design with integral drives
- Flexible design provides the ability to drive brush, brushless, or stepper motors with the same amplifier
- 5 A continuous, 10 amp peak output current
- PWM or linear amplifiers
- Integral power supplies
- IEEE-1394 FireWire® interface
- Digital current, velocity, and position loops for improved motion stability
- Optional Ethernet for I/O expansion
- Integrated encoder multiplier for higher throughput and reduced wiring
- CE approved and NRTL safety certification; follows the 2011/65/EU RoHS 2 Directive

Npaq MR is a 3U, 19-inch rack-mount 4- or 8-axis drive rack.

An example of an Npaq MR installed in the machine base of a gantry system.

The Npaq® MR is a cost-effective, high performance, 4- or 8-axis drive rack. All versions are 3U in size, rack-mountable, and compatible with the Automation 3200 motion platform.

Featuring high-performance double-precision DSPs, the Npaq MR family performs both current loop and servo-loop closures digitally to ensure the highest level of positioning accuracy and rate stability. It is this processing capability that allows the Npaq MR to provide loop closure rates up to 20 kHz and to handle both digital and analog I/O processing, data collection, laser firing, and encoder multiplication tasks in real time.

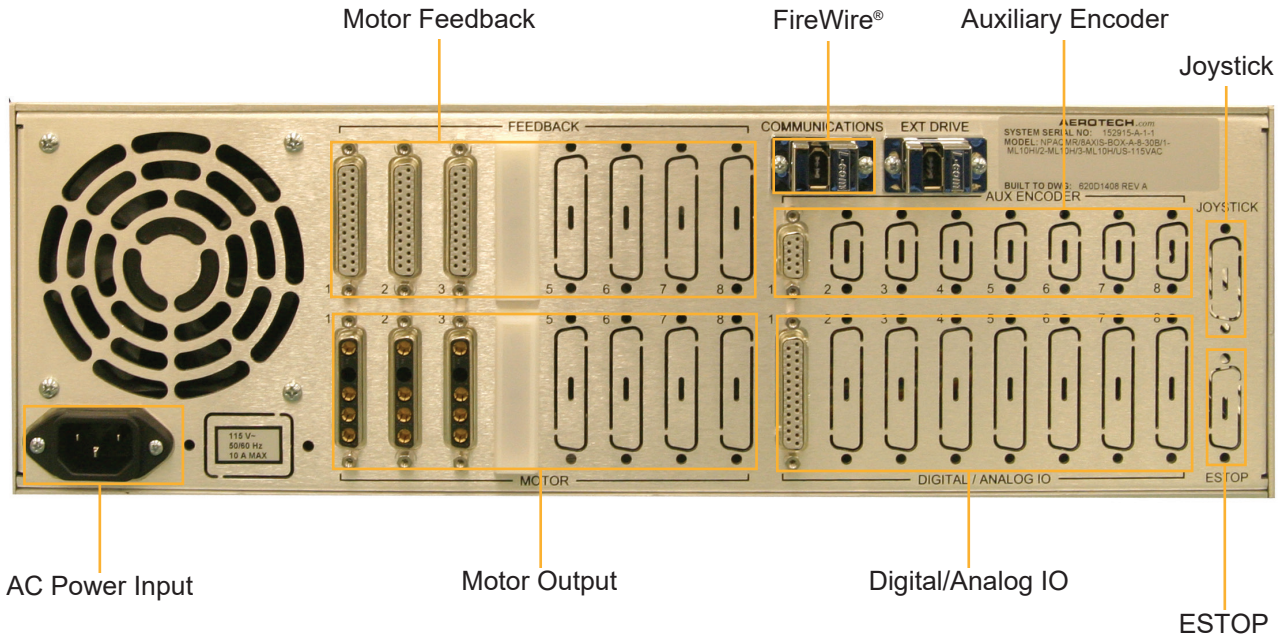
Standard options for the Npaq MR include integrated encoder multiplication, per axis brake control logic, I/O expansion, and integrated emergency stop circuitry.

The Npaq MR uses integral amplifiers supporting both linear and PWM topologies to control brushless, DC brush, or stepper motor types. The Npaq MR supports one integrated motor operation voltage with mains turn-on current limiting.

The Npaq MR supports single-axis position synchronized output (PSO) for precise synchronizing of external devices, and supports per axis I/O options with up to 64 opto-isolated inputs and outputs available to the user.

Npaq® MR Series COMPONENTS

Npaq MR Rear View



Integrated Amplifier Electrical Specifications		MP	ML
Output Voltage	VDC	10, 20, 30, 40, 80	10, 20, 30, 40
Peak Output Current	A	10	10(1)
Continuous Output Current	A	5	5(1)
PWM Switching Frequency	kHz	20	N/A
Power Amplifier Bandwidth	kHz	Software Selectable	Software Selectable
Minimum Load Inductance	mH	0.1	0
Operating Temperature	°C	0 to 50	0 to 50
Storage Temperature	°C	-20 to 85	-20 to 85
Weight	kg	0.5	0.5

Notes:
1. Actual current ratings dependent on motor resistance.

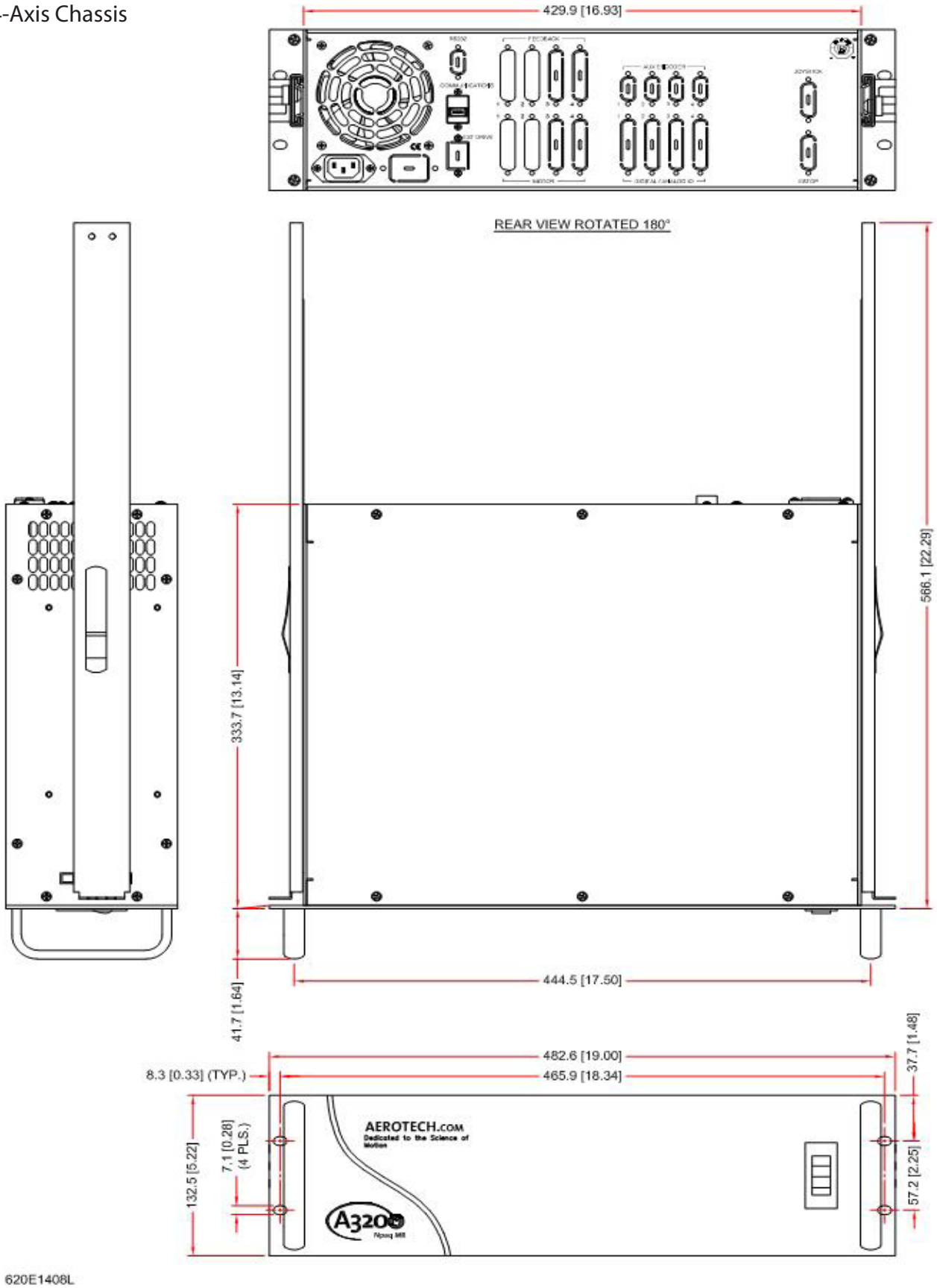
Npaq® MR Series SPECIFICATIONS

	Units	Npaq
Number of Axes		1 to 6
Encoder Inputs		1 Primary and 1 Auxiliary Per Axis
Motor Style		Brush, Brushless, Stepper
Power Supply	VAC	Single-Phase 100-240 VAC; 50/60 Hz (Factory Configured)
Bus Voltage	VDC	10-80
Peak Output Current (1 sec)(1)	A_{pk}	10
Continuous Output Current(1)	A_{pk}	5
Digital Inputs		Optional(2)
Digital Outputs		Optional(2)
Analog Inputs		One 12-bit Differential Per Axis
Analog Outputs		Optional(2)
Dedicated Axis I/O on Feedback Connector		Three Limit Inputs (CW, CCW, Home); Three Hall Effect Inputs (A, B, C); Three High-Speed Differential Inputs (sin, cos, mkr for encoder); Motor Over-Temperature Input
Dedicated I/O on Auxiliary Feedback Connector		sin, cos, mkr for Aux Enc; mkr can be used for PSO Output
I/O Expansion Board(2)		One 12-bit Differential Analog Input; One 16-bit Analog Output; Eight Digital Inputs, Optically Isolated, Sinking or Sourcing; Eight Optically-Isolated Digital Outputs per Axis
High Speed Data Capture		Yes
High Speed Digital Outputs		No
Bi-Directional Lines		No
Automatic Brake Control		Optional
Emergency Stop (ESTOP)		Optional
Position Synchronized Output (PSO)		Single Axis Standard
Can Output Multiplied Encoder		Only With MXH Option
Can Output Square Wave Encoder		Yes
Primary Encoder Input Frequency with Multiplication		200 kHz sine wave (MXU); 450 kHz sine wave (MXH)
Primary Encoder Input Frequency – Square Wave		10 MHz square wave frequency/40 MHz count rate
Secondary Encoder Input Frequency		10 MHz square wave frequency/40 MHz count rate
Laser Feedback Support		No
Encoder Multiplication(3)		x4096 (MXU); x65536 (MXH)
Resolver/Inductosyn Interface		No
Internal Shunt Resistor		No
External Shunt		No
Ethernet		No
USB		No
RS-232 No		No
FireWire		Yes
Fieldbus		Modbus TCP on PC
Joystick Support		Yes
Current Loop Update Rate	kHz	20
Servo Loop Update Rate	kHz	8
Power Amplifier Bandwidth	kHz	Selectable Through Software
Minimum Load Inductance	mH	0.1 mH with PWM; 0 With Linear
Operating Temperature	°C	0 to 50
Storage Temperature	°C	-30 to 85
Weight	kg (lb)	16 (35)
Package		Amplifiers Installed at Factory
Standards		CE approved, NRTL safety certification, EU 2015/863 RoHS 3 directive

Notes:
1. Peak value of the sine wave; rms current for AC motors is 0.707 * A_{pk}.
2. Requires I/O option.
3. Effective resolution after quadrature decoding if applicable.

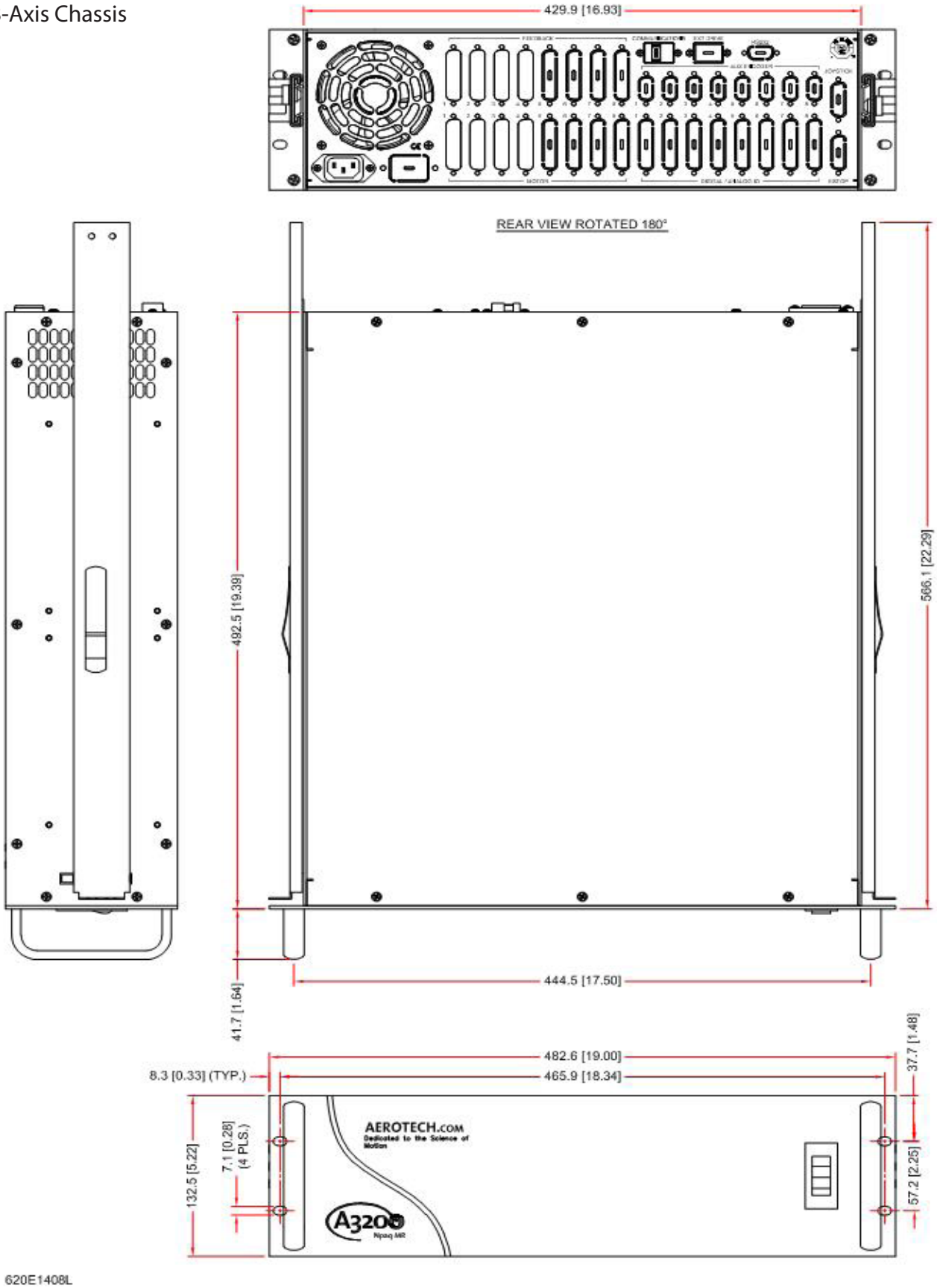
Npaq® MR Series DIMENSIONS

4-Axis Chassis



Npaq® MR Series DIMENSIONS

8-Axis Chassis



Npaq® MR Series ORDERING INFORMATION

Ordering Example

Npaq MR	/4AXIS-BOX	-A	-4-40LP	/1-MP10I	/2-MP10	/3-MP10
Base	Package	Line Voltage	Bus Power Supply	Axis 1 Amp	Axis 2 Amp	Axis 3 Amp
	/4AXIS-BOX	-A	-4-40LP	/1-MP10	/2-MP10	/3-MP10
	/8AXIS-BOX	-B	-4-80LP	/1-MP10I	/2-MP10I	/3-MP10I
		-C	-4-40	/1-MP10M	/2-MP10M	/3-MP10M
		-D	-4-80	/1-MP10MI	/2-MP10MI	/3-MP10MI
			-4-10B	/1-MP10-HB	/2-MP10-HB	/3-MP10-HB
			-4-20B	/1-MP10I-HB	/2-MP10I-HB	/3-MP10I-HB
			-4-30B	/1-MP10M-HB	/2-MP10M-HB	/3-MP10M-HB
			-4-40B	/1-MP10MI-HB	/2-MP10MI-HB	/3-MP10MI-HB
			-8-40LP	/1-ML10	/2-ML10	/3-ML10
			-8-80LP	/1-ML10I	/2-ML10I	/3-ML10I
			-8-40	/1-ML10M	/2-ML10M	/3-ML10M
			-8-80	/1-ML10MI	/2-ML10MI	/3-ML10MI
			-8-10B	/1-ML10H	/2-ML10H	/3-ML10H
			-8-20B	/1-ML10HI	/2-ML10HI	/3-ML10HI
			-8-30B			
			-8-40B			

Ordering Example (continued)

/4-MP10	/5-MP10	/6-MP10	/7-MP10	/8-MP10	/US-115VAC	/Brake-2
Axis 4 Amp	Axis 5 Amp	Axis 6 Amp	Axis 7 Amp	Axis 8 Amp	Line Cord	Brake Options
/4-MP10	/5-MP10	/6-MP10	/7-MP10	/8-MP10	/ENGLAND	/BRAKE-1
/4-MP10I	/5-MP10I	/6-MP10I	/7-MP10I	/8-MP10I	/GERMANY	/BRAKE-2
/4-MP10M	/5-MP10M	/6-MP10M	/7-MP10M	/8-MP10M	/ISRAEL	/BRAKE-3
/4-MP10MI	/5-MP10MI	/6-MP10MI	/7-MP10MI	/8-MP10MI	/INDIA	/BRAKE-4
/4-MP10-HB	/5-MP10-HB	/6-MP10-HB	/7-MP10-HB	/8-MP10-HB	/AUSTRALIA	/BRAKE-5
/4-MP10I-HB	/5-MP10I-HB	/6-MP10I-HB	/7-MP10I-HB	/8-MP10I-HB	/US-115VAC	/BRAKE-6
/4-MP10M-HB	/5-MP10M-HB	/6-MP10M-HB	/7-MP10M-HB	/8-MP10M-HB	/US-230VAC	/BRAKE-7
/4-MP10MI-HB	/5-MP10MI-HB	/6-MP10MI-HB	/7-MP10MI-HB	/8-MP10MI-HB	/NO-LINECORD	/BRAKE-8
/4-ML10						
/4-ML10I						
/4-ML10M						
/4-ML10MI						
/4-ML10H						
/4-ML10HI						

Npaq MR

Npaq MR — Rack-mount digital amplifier chassis with integral DC power supply and FireWire® interface. Supports 4 or 8 axes of brush, brushless, or stepper motor amplifiers.

-Dedicated I/O per axis includes: CW, CCW, and home limits, sin, cos, mkr, Hall effect sensors, motor over-temperature, ext fault

-User defined I/O included on I/O option board: 8 opto-isolated inputs (sinking or sourcing), 8 outputs (sinking or sourcing), one 12-bit analog input, one 16-bit analog output and brake relay

Package

/4AXIS-BOX	Supports up to 4 axes of motion
/8AXIS-BOX	Supports up to 8 axes of motion

Line Voltage

-A	115 VAC line
-B	230 VAC line
-C	100 VAC line
-D	200 VAC line

Bus Power Supply

Npaq® MR Series ORDERING INFORMATION

-4-40LP	Four-axis rack with 40 VDC bus; up to 300 watts
-4-80LP	Four-axis rack with 80 VDC bus; up to 300 watts
-4-40	Four-axis rack with 40 VDC bus; up to 600 watts
-4-80	Four-axis rack with 80 VDC bus; up to 600 watts
-4-10B	Four-axis rack with ±10 VDC bus; up to 400 watts
-4-20B	Four-axis rack with ±20 VDC bus; up to 400 watts
-4-30B	Four-axis rack with ±30 VDC bus; up to 400 watts
-4-40B	Four-axis rack with ±40 VDC bus; up to 800 watts
-8-40LP	Eight-axis rack with 40 VDC bus; up to 500 watts
-8-80LP	Eight-axis rack with 80 VDC bus; up to 500 watts
-8-40	Eight-axis rack with 40 VDC bus; up to 500 watts
-8-80	Eight-axis rack with 80 VDC bus; up to 1000 watts
-8-10B	Eight-axis rack with ±10 VDC bus; up to 400 watts
-8-20B	Eight-axis rack with ±20 VDC bus; up to 400 watts
-8-30B	Eight-axis rack with ±30 VDC bus; up to 400 watts
-8-40B	Eight-axis rack with ±40 VDC bus; up to 600 watts

Axis 1 Amplifier Options

/1-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/1-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/1-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/1-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and I/O option
/1-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/1-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/1-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/1-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option
/1-ML10	Linear amplifier, 10 A peak, 5 A continuous
/1-ML10I	Linear amplifier, 10 A peak, 5 A continuous with I/O option
/1-ML10M	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/1-ML10MI	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O option
/1-ML10H	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1]
/1-ML10HI	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1] with I/O option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 2 Amplifier Options

/2-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/2-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/2-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/2-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and I/O option
/2-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/2-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/2-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/2-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option
/2-ML10	Linear amplifier, 10 A peak, 5 A continuous
/2-ML10I	Linear amplifier, 10 A peak, 5 A continuous with I/O option
/2-ML10M	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/2-ML10MI	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O option
/2-ML10H	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1]
/2-ML10HI	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1] with I/O option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 3 Amplifier Options

/3-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/3-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/3-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]

Npaq® MR Series ORDERING INFORMATION

/3-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and I/O option
/3-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/3-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/3-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/3-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option
/3-ML10	Linear amplifier, 10 A peak, 5 A continuous
/3-ML10I	Linear amplifier, 10 A peak, 5 A continuous with I/O option
/3-ML10M	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/3-ML10MI	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O option
/3-ML10H	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1]
/3-ML10HI	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1] with I/O option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 4 Amplifier Options

/4-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/4-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/4-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/4-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and I/O option
/4-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/4-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/4-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/4-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option
/4-ML10	Linear amplifier, 10 A peak, 5 A continuous
/4-ML10I	Linear amplifier, 10 A peak, 5 A continuous with I/O option
/4-ML10M	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/4-ML10MI	Linear amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O option
/4-ML10H	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1]
/4-ML10HI	Digital linear amplifier, 10 A peak, 5 A continuous; x65536 MXH[1] with I/O option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 5 Amplifier Options

/5-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/5-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/5-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/5-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and I/O option
/5-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/5-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/5-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/5-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 6 Amplifier Options

/6-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/6-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/6-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1]
/6-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O option
/6-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/6-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/6-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] and half bus option
/6-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU[1] with I/O and half bus option

Note:

1. Effective multiplication factor specified after quadrature decoding (if applicable).

Npaq® MR Series ORDERING INFORMATION

Axis 7 Amplifier Options

/7-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/7-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/7-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1)
/7-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) and I/O option
/7-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/7-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/7-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) and half bus option
/7-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) with I/O and half bus option

Note: 1. Effective multiplication factor specified after quadrature decoding (if applicable).

Axis 8 Amplifier Options

/8-MP10	Digital PWM amplifier, 10 A peak, 5 A continuous
/8-MP10I	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O option
/8-MP10M	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1)
/8-MP10MI	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) and I/O option
/8-MP10-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with half bus option
/8-MP10I-HB	Digital PWM amplifier, 10 A peak, 5 A continuous with I/O and half bus option
/8-MP10M-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) and half bus option
/8-MP10MI-HB	Digital PWM amplifier, 10 A peak, 5 A continuous; x4096 MXU(1) with I/O and half bus option

Note: 1. Effective multiplication factor specified after quadrature decoding (if applicable).

Line Cord (must select one)

/ENGLAND	UK compatible line cord
/GERMANY	German compatible line cord
/ISRAEL	Israel compatible line cord
/INDIA	India compatible line cord
/AUSTRALIA	Australia compatible line cord
/US-115VAC	US 115 VAC line cord
/US-230VAC	US 230 VAC line cord
/NO-LINECORD	No line cord

Brake Options (up to 4 selections allowable)

/BRAKE-1	Axis 1 wired for 24 V, 1 A brake
/BRAKE-2	Axis 2 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-3	Axis 3 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-4	Axis 4 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-5	Axis 5 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-6	Axis 6 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-7	Axis 7 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)
/BRAKE-8	Axis 8 wired for 24 V, 1 A brake (amp must have “I” or “MI” option)

Options (multiple selections allowable)

-ESTOP1	Controller stops motion, then disables servo control. Internal positive guided relay with monitor contact disconnects AC power source from motor. Operator risk assessment is the responsibility of the end user or integrator.
-ESTOP2	Same as ESTOP1 but uses two relays
-ESTOP3	Same as ESTOP2 but contains 1 second bus discharge resistors
-SLIDE	Rack-mount slides

Npaq® MR Series ORDERING INFORMATION

Integration (Required)

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

-TAS	Integration - Test as system Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.
-TAC	Integration - Test as components Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.