ALx Series
DC Electronic Load • Air cooled, linear MOSFET topology, wide operating range

Overview
The ALx Series MagnaLOAD utilizes conventional linear MOSFET-based dissipative elements, allowing the series to achieve a very wide voltage-current operating range within the model’s maximum power rating. Using the same heat management innovations developed for Magna-Power’s high density programmable DC power supplies, the ALx Series’ conservative cooling ensures long product life with continuous full power operation in environments up to 50°C ambient operating temperature.

Technology
The ALx Series uses MOSFETs for power dissipation, delivering among the industry’s widest full-power operating for its product class. The ALx Series uses MOSFETs operated in the linear region to allow full power and full control over the entire VA rating of the product.

MOSFETs are specifically selected based on their ability to operate in the linear region and have safe operating curves well below the maximum power rating when used as an electronic switch. Control circuitry for ALx Series MagnaLOADs are operated in a closed loop to linearize the response. Each MOSFET device produces a load current defined by VC/Rn. Closed loop amplifiers enable multiple MOSFETs to share load current equally.

Key Features
• MagnaLINK™ Distributed DSP Architecture
• 16-bit digital programming and monitoring resolution
• SCPI Remote Programming API
• Many control modes, including: voltage, current, power, resistance, and shunt regulator
• Wide voltage-current-power operating profile
• Integrated front and rear full control USB ports, RS485, and dual MagnaLINK™ ports, with LXI TCP/IP Ethernet and IEEE-488 GPIB available.
• Digital plug-and-play master-slaving
• Programmable protection limits
• Configurable external analog-digital user I/O
• Designed and manufactured in the USA

Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum Power</th>
<th>Maximum Voltage</th>
<th>Maximum Current</th>
<th>Package Type</th>
<th>Minimum Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALx1.25-200-300</td>
<td>1.25 kW</td>
<td>200 Vdc</td>
<td>300 Adc</td>
<td>Rack-mount</td>
<td>2.5 Vdc</td>
</tr>
<tr>
<td>ALx1.25-500-125</td>
<td>1.25 kW</td>
<td>500 Vdc</td>
<td>125 Adc</td>
<td>Rack-mount</td>
<td>6.0 Vdc</td>
</tr>
<tr>
<td>ALx1.25-1000-37.5</td>
<td>1.25 kW</td>
<td>1000 Vdc</td>
<td>37.5 Adc</td>
<td>Rack-mount</td>
<td>7.5 Vdc</td>
</tr>
<tr>
<td>ALx2.5-200-600</td>
<td>2.5 kW</td>
<td>200 Vdc</td>
<td>600 Adc</td>
<td>Rack-mount</td>
<td>2.5 Vdc</td>
</tr>
<tr>
<td>ALx2.5-500-250</td>
<td>2.5 kW</td>
<td>500 Vdc</td>
<td>250 Adc</td>
<td>Rack-mount</td>
<td>6.0 Vdc</td>
</tr>
<tr>
<td>ALx2.5-1000-75</td>
<td>2.5 kW</td>
<td>1000 Vdc</td>
<td>75 Adc</td>
<td>Rack-mount</td>
<td>7.5 Vdc</td>
</tr>
</tbody>
</table>
Specifications

AC Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input Voltage</td>
<td>85-265 Vac, 1Φ, 2-wire + ground</td>
</tr>
<tr>
<td>AC Input Current</td>
<td>2.2-0.55 Aac</td>
</tr>
<tr>
<td>AC Input Frequency</td>
<td>45-66 Hz</td>
</tr>
<tr>
<td>AC Input Isolation</td>
<td>±1500 Vac, maximum input voltage to ground</td>
</tr>
</tbody>
</table>

Programming Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution (All Modes)</td>
<td>16-bit, 0.0015%</td>
</tr>
</tbody>
</table>
| Accuracy                    | Voltage: ±0.1% of full scale voltage rating  
|                             | Current: ±0.2% of full scale current rating  
|                             | Power: ±0.3% of full scale power rating  
|                             | Resistance: ±0.3% of full scale resistance rating  |

Connectivity Specifications

<table>
<thead>
<tr>
<th>Communication Interfaces (Standard)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Host (Front): Type B</td>
<td></td>
</tr>
<tr>
<td>USB Host (Rear): Type B</td>
<td>RS485 (Rear): RJ-45</td>
</tr>
<tr>
<td>MagnaLINK™: RJ-25 x 2</td>
<td>External User I/O: Standard-pin-sub Female</td>
</tr>
<tr>
<td>Communication Interfaces (Optional)</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>LXI TCP/IP Ethernet (Rear): RJ-45</td>
<td>GPIB (Rear): IEEE-488</td>
</tr>
</tbody>
</table>

Outdoor User I/O Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Inputs</td>
<td>5 V, 10 kΩ impedance</td>
</tr>
<tr>
<td>Digital Monitoring Signals</td>
<td>5 V, 32 mA capacity</td>
</tr>
<tr>
<td>Digital Reference Signal</td>
<td>5 V output, 20 mA capacity</td>
</tr>
<tr>
<td>Analog Sampling Rate</td>
<td>2 kHz</td>
</tr>
<tr>
<td>Analog Programming Input</td>
<td>0-10 V</td>
</tr>
<tr>
<td>Analog Programming Impedance</td>
<td>10 kΩ</td>
</tr>
<tr>
<td>Analog Programming Resolution</td>
<td>12-bit, 0.025%</td>
</tr>
<tr>
<td>Analog Monitoring Signals</td>
<td>0-10 V, 3 mA capacity</td>
</tr>
<tr>
<td>Analog Monitoring Impedance</td>
<td>0.005 Ω</td>
</tr>
<tr>
<td>Analog Monitoring Accuracy</td>
<td>0.05% of max rating</td>
</tr>
<tr>
<td>Analog Reference Signal</td>
<td>10 V, 20 mA capacity</td>
</tr>
</tbody>
</table>

Physical Specifications

<table>
<thead>
<tr>
<th>Power Level</th>
<th>Rack Units</th>
<th>Size</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25 kW</td>
<td>3U</td>
<td>5.25&quot; H x 19&quot; W x 24&quot; D</td>
<td>40 lbs (18.1 kg)</td>
</tr>
<tr>
<td>2.5 kW</td>
<td>3U</td>
<td>5.25&quot; H x 19&quot; W x 24&quot; D</td>
<td>65 lbs (29.5 kg)</td>
</tr>
</tbody>
</table>

Environmental Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Operating Temperature</td>
<td>0°C to 50°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-25°C to +85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Relative humidity up to 95% non-condensing</td>
</tr>
<tr>
<td>Air Flow</td>
<td>Front air inlet, rear exhaust</td>
</tr>
</tbody>
</table>

Regulatory Compliance

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC</td>
<td>Complies with European EMC Directive for test and measurement products, 2014/30/EU</td>
</tr>
<tr>
<td>Safety</td>
<td>Complies with EN61010-1:2010</td>
</tr>
<tr>
<td>CE Mark</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Product Diagrams

Front Panel

Side Panel

Rear Panel
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Operating Profiles
With its sole use of linear elements for heat dissipation, the ALx Series has the widest operating profile of the MagnaLOAD products. This operating profile figure applies to all ALx Series models, normalized about the model’s maximum voltage, current, and power ratings.

200 Vdc ALx Series Models

500 Vdc ALx Series Models
MagnaPower Electronics
magna-power.com

MagnaLOAD Overview

MagnaLINK™ Distributed Digital Control

Magna-Power’s MagnaLINK™ technology provides distributed Texas Instrument DSP control across power processing stages inside the MagnaLOAD DC electronic load. This technology follows a significant internal development cycle from Magna-Power to provide a unified digital control platform across its electronic loads and power supplies, featuring fully digital control loops, adjustable control gains, programmable slew rates, digital master-slaving, and many new advanced control technologies.

All MagnaLOADs come with the following interfaces:
- Front panel knob, keypad, and menu system
- 25-pin configurable external user I/O, including a high-speed analog input
- Front and rear USB and rear RS-485 or optional Ethernet

When in standby or diagnostic fault, the DC input bus is disconnected via a switching device.

Finally, with a dedicated +5V interlock input pin and included +5V reference on all models, external emergency stop systems can be easily integrated using an external contact.

Flexible Operating Modes

To accommodate a variety of DC sources, all MagnaLOADs come with many configurable control modes, including:
- Voltage Mode
- Current Mode
- Power Mode
- Resistance Mode
- Shunt Regulator Mode
- Rheostat Mode (ARx Series and WRx Series only)

Preference for DC regulation is given to the parameter in the selected mode within the programmed set-points. Using the MagnaLOAD’s set-points and trip settings, the product can configured to either trip with a fault when a limit is exceeded or to cross-over into a different regulation state.

Shunt Regulator Mode turns the MagnaLOAD into a high-speed smart braking resistor, engaging the DC input only when a specified voltage and exceeded by a user-defined percentage, while limiting the shunt current to a programmed set-point.

Configurable External User I/O

Beyond the front panel and computer controls, all MagnaLOADs come standard with a 25-pin D-Sub connector designated as the External User I/O. This connector provides:
- 8 Digital Outputs
- 4 Digital Inputs
- 4 Analog Outputs
- 4 Analog Inputs

All the analog-digital I/O ports are configurable, allowing the user to select which parameters they want to control and monitor. This configurable I/O scheme reduces complexity, eases PLC integration and allows control parameters from various interfaces simultaneously.

The MagnaLOAD’s configurable analog inputs provide 0-10V programming from PLCs and external D/A converters.

Digital Master-Slaving: Expandibility Without Compromise

All MagnaLOADs come standard with a MagnaLINK™ Input and a MagnaLINK™ Output port, which provides plug and play digital master-slaving. Simply connect the master’s MagnaLINK™ Output to the slave’s MagnaLINK™ Input and, using the MagnaWEB software, the products will automatically configure themselves for master-slave operation as a higher-power unit based on the populated ports. Buffered digital MagnaLINK™ connections means many MagnaLOADs can be daisy-chained in master-slave operation. Master-slave MagnaLOAD units will aggregate measurements to one display panel.

The internal MagnaLINK™ protocol was developed with expandability at the forefront. When configured for master-slave operation, the master controller takes control of all the slave’s digital "targets." With this digital master-slaving strategy, it is completely transparent whether the unit is operating as a stand-alone product or in master-slave.
MagnaWEB Software Interface

Magna-Power’s next generation software interface, MagnaWEB, provides intuitive and user-friendly web-browser based controls for programming and measurement read-back of the MagnaLOAD’s activity. Virtually all of the MagnaLOAD’s available functions can be controlled and monitored from the MagnaWEB software over any of product’s installed communication interfaces.

MagnaWEB uses a server-client software model to provide access to the MagnaLOAD from nearly any device and operating system. Install and run the MagnaWEB software locally on Windows then, using a web browser, access the server connected to the MagnaLOAD from a variety of devices including other desktops, tablets or smart-phones.

Extensive Programming Support

All MagnaLOAD DC electronic loads come with a dedicated National Instruments LabVIEW™ driver, Interchangeable Virtual Instrument (IVI) driver, and support for a wide range of Standard Commands for Programmable Instrumentation (SCPI). These programming interfaces support full control, measurement, and monitoring of the MagnaLOAD. All of the MagnaLOAD’s available communication interfaces are supported by these drivers and command sets, including: USB, RS-485, LXI TCP/IP Ethernet, and IEEE-488 GPIB.

Showcased in the following basic code examples, SCPI commands provide the simplest form of communication by using plain ASCII text and parameters sent over a basic socket connection. Over 50 commands are provided, with detailed documentation in the respective product series user manual.

Python programming example using SCPI commands

```python
import serial
conn = serial.Serial(port='COM8', baudrate=115200)
conn.write('*IDN?
')
print conn.readline()
conn.write('VOLT 1000
')
conn.write('CURR 2.5
')
conn.write('INP:START
')
conn.write('MEAS:ALL?
')
print conn.readline()
```

MagnaLOAD Front Panel - Standard

1. START: Enables the DC input bus
2. STOP: Disable the DC input bus
3. Voltage measurement display
4. Current measurement display
5. 4-line character display featuring a menu system, operating status and modes, product messages with diagnostic codes, resistance measurement display, and power measurement display
6. Control power switch, energizes the control circuits without engaging DC bus
7. LED indicator that the DC input is enabled
8. Full control (host) front panel USB port
9. Clean air intake, with integrated fans
10. Aluminium digital encoder knob for programming set-points
11. LED indicator of the MagnaLOAD’s present regulation state, which can include: constant voltage (CV), constant current (CC), constant power (CP), or constant resistance (CR)
12. Illuminated selector buttons to choose which set-point the digital encoder knob and digital keypad buttons will modify.
13. MENU: Enters the menu system on the 4-line display
14. BACK: Moves back one level in the menu
15. ENTER: Selects the highlighted menu item
16. CLEAR: Removes the product from a faulted state
17. LOCK: Locks the front panel

MagnaLOAD Front Panel - Blank Panel (+BP) Option
Where to Buy

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To find the nearest sales partner, please visit:
magna-power.com/contact

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INFORMATION
For further information on technology, terms and conditions, and product prices, contact the nearest Magna-Power Electronics sales partner (magna-power.com/contact).