MARWAY
POWER SOLUTIONS

Standard Products

# DC Programmable Power Supplies

April 2023


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Advanced Programmable Power Supply Systems
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Providing power distribution for multiple industries and applications.

# mPower™ DC Power Supplies

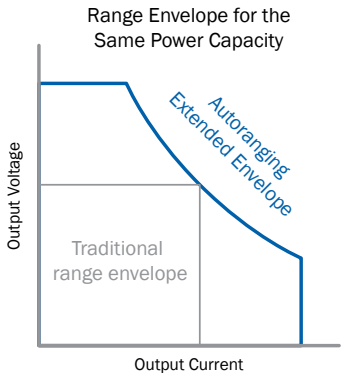
Programmable • Autoranging • Bidirectional

TAA

## Autoranging Power

Autoranging enables mPower to operate in a wider range of voltage and current while delivering 100% power. Higher voltages can be run at lower currents, and higher currents can be run at lower voltages.

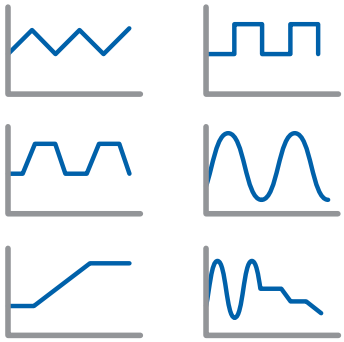
- Allows greater test range for the device under test with a single power supply—saving space and cost.
- The maximum power rating is available from approximately 33% to 100% of the rated voltage.

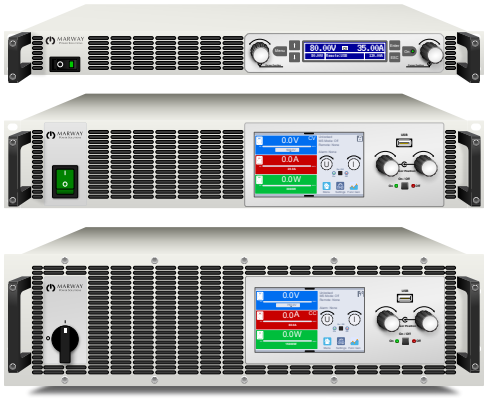



## Function Generator

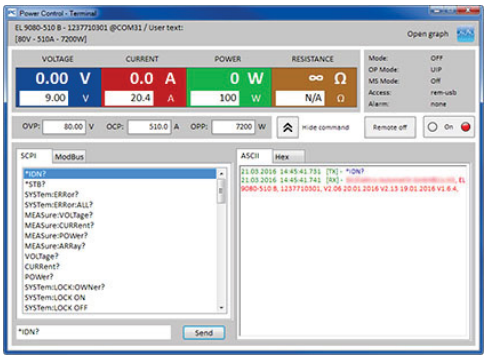
mPower 311/411 Series integrates an advanced function generators for voltage and/or current profiles.

- Create standard waveforms and arbitrary profiles. Save profiles to flash drive with onboard USB port.
- Includes photovoltaic and fuel cell power simulations. 411 Series includes battery simulations.
- Programmable via onboard control panel, remote software, and files uploaded through USB.



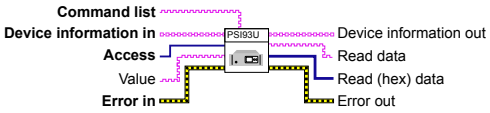


mPower autoranging power supplies provide a wider range of test conditions per kW than conventional systems. Function generators in the 311/411 Series help automate test regimens. 411 Series bidirectional models automatically adapt to source and sink modes for charge and discharge testing, and direct power back to the grid.



mPower control and configuration, including defining signal function profiles can be done through the on-board control panel, and through a Windows® application. Function definitions can be imported from and exported to the on-board USB port.

LabView drivers are available for the standard and slave unit configurations.




## Control and Configuration

- Integrated display and controls to set parameters, alerts, and in the 311/411 Series, build functions.
- Windows software for external GUI configuration and control.
- USB, Ethernet, RS232, CAN, and other available control connections.
- ModBus, SCPI, and analog control protocols.

## Other Key Features

- Active power factor correction.
- Built-in protection for over voltage, over current, over power, and over temperature.
- Galvanically isolated interfaces (analog control, USB, etc).
- High efficiency, up to 95%.
- Bidirectional units return up to 96% of load power back to the grid.

# Other Products (visit our web site at www.marway.com)

Optima Power Distribution Units
Commander EPO Panels
PowerPlus Integrated Rack Services

# mPower™ DC Series

## Programmable Power Supplies

mPower DC

300

1U

# mPower™ 300 Series 1U

## DC Programmable Power Supplies

## A Feature-Filled Compact Package

Marway's lab-quality mPower 300 Series dc power supplies include many capabilities usually found only in systems costing much more. This compact 1U package features autoranging output, multiple communications protocols, the ability to parallel up to 10 units, a graphical display, and more.

### Feature Highlights

- Available in 1.5 kW and 3.0 kW models.
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 10 units to create a total power output of up to 30 kW.
- Output Share Bus which automates the regulation of current loading among parallel-connected units.
- Output Voltage Sense Bus which monitors voltage at the load, instead of the output terminals, to compensate for minor losses in output cables.
- USB for remote control using either desktop Windows® software or your own custom scripting of Modbus and/or SCPI protocol commands.
- Ethernet for remote control using your own custom scripting of Modbus and/or SCPI protocol commands.
- Analog Interface for remote control and monitoring of key operational parameters of the system using a PLC or your own custom control circuitry.
- Graphical display user interface with multiple buttons, and two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.

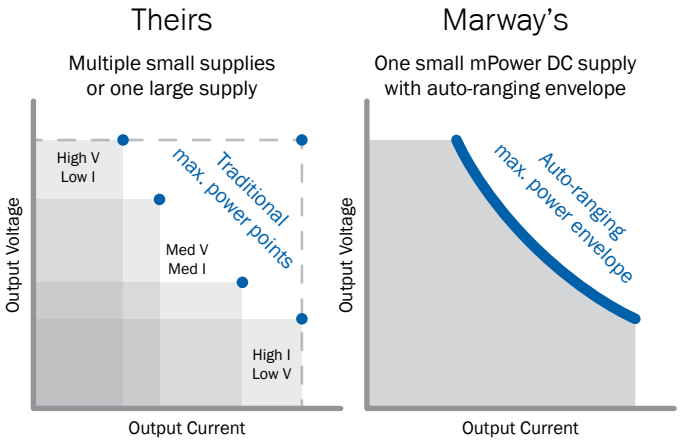
A total of 10 configurations provide 1.5 kW and 3.0 kW power capacity at various maximum DC output voltage and currents.

| 1.5 kW | | 3.0 kW | |
|---|---|---|---|
| 80 Vdc | 50 Amps | 80 Vdc | 100 Amps |
| 200 Vdc | 25 Amps | 200 Vdc | 50 Amps |
| 360 Vdc | 15 Amps | 360 Vdc | 30 Amps |
| 500 Vdc | 10 Amps | 500 Vdc | 20 Amps |
| 750 Vdc | 6 Amps | 750 Vdc | 12 Amps |

## Autoranging Power Output

Autoranging enables mPower to dynamically alter its output configuration over a wider range compared to traditional power supplies. Traditional "rectangular envelope" power supplies can provide peak power (watts) at only one specific voltage and current configuration. mPower's autoranging power envelope can deliver peak power along many voltage and current configuration points.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage




It can take multiple small power supplies to meet a set of tests. Or, one large system. For that same range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single power supply meet the demand of diverse test suites. This in turn means fewer power supplies—saving space, capital costs, and even installation costs.

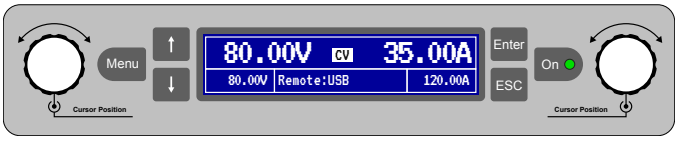
can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for output voltage, current, and power and engage a regulating mode.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show voltage on the left, and current on the right (which can be configured to show power). The actual values will be the larger numbers at the top, and the set values, the smaller numbers below. The center areas show additional various information such as operating modes and alarms.




A graphical digital display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Rotary knobs help speed up data entry. The On button toggles the DC output.

### Control Panel Lock

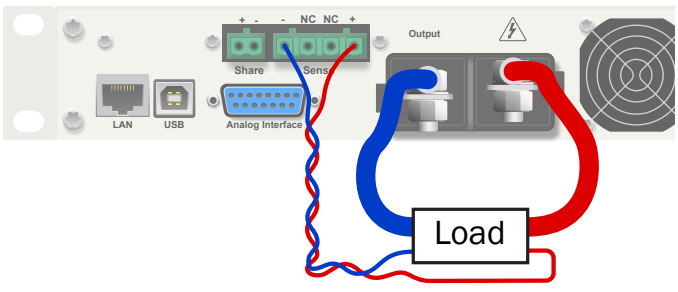
To prevent accidental changes during manual operation, the control panel can be locked—and also locking DC output off, or allowing DC output to be switched while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

### Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at its own DC output.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




### Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and

power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and collecting status from the digital interfaces.

### Discharge Circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

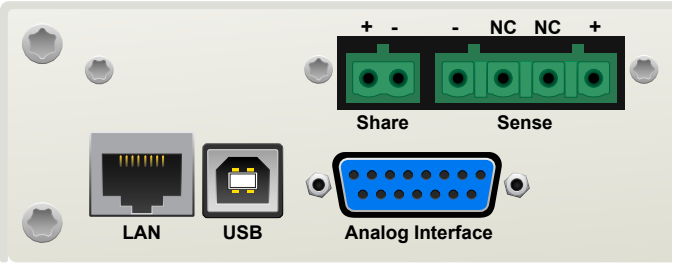
## Remote Control

The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units. This is a great choice for ease of management of stand-alone units.

LabView VIs are available to integrate the control and monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet (TCP) or USB.

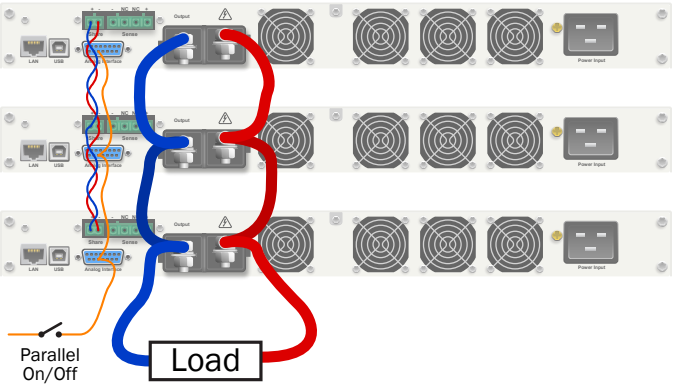
The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.




Remote control is available via analog interface, and Modbus or SCPI over TCP or USB. Manual remote control is available Windows desktop software, and remote automation is possible through scripting Modbus or SCPI commands. LabView VIs are also available.

## Parallel Operation

Multiple units of same model number can be connected in parallel in order to create a system with higher total current, and thus higher power. Up to 10 units can be connected with their DC outputs and their Share Bus in parallel. The Share Bus will balance the internal voltage regulation of each unit, and therefore the current regulation as well. This results in a balanced load distribution. One unit is selected to serve as the master source for the control limits managed over the bus, but otherwise each unit is operated separately for management of other settings, responding to alarms, and other activities. Using the analog interface, remote parallel control of some operations, such as DC output on/off, is also possible.

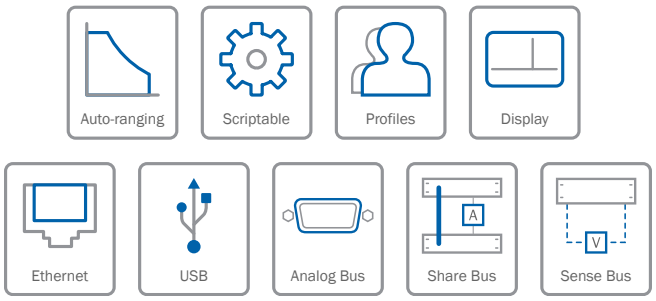



Up to 10 1U units can be connected in parallel to create larger capacity power systems up to 30 kW.

**1.0/1.5** kW | **1U** Rackmount | **100 240** [1] 1ph Vac

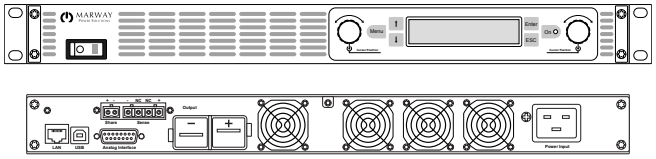
**3.0** kW | **1U** Rackmount | **220 240** [2] 1ph Vac

## Models 300-01



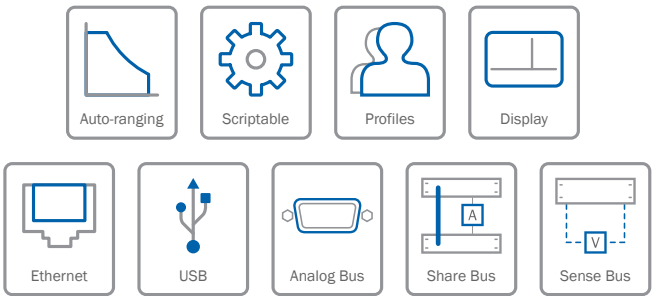

| Model Number | Volts | Amps |
|---|---|---|
| MPW 300-01-0080-050-000 | 80 | 50 |
| MPW 300-01-0200-025-000 | 200 | 25 |
| MPW 300-01-0360-015-000 | 360 | 15 |
| MPW 300-01-0500-010-000 | 500 | 10 |
| MPW 300-01-0750-006-000 | 750 | 6 |

Detailed specifications by model can be found in the Operating Guide.



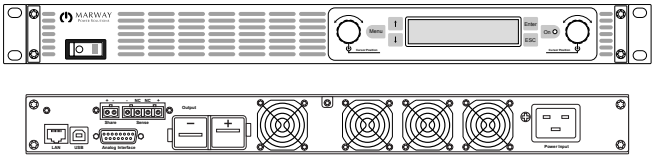
[1] Nominal input power of 220–240 Vac ±10% single phase is needed to reach output maximum. Above approximately 150 Vac, maximum output power is available. Below approximately 150 Vac, maximum power is reduced to 1000 W. Below approximately. 90 Vac, DC output is shut off.

## Models 300-11




| Model Number | Volts | Amps |
|---|---|---|
| MPW 300-11-0080-100-000 | 80 | 100 |
| MPW 300-11-0200-050-000 | 200 | 50 |
| MPW 300-11-0360-030-000 | 360 | 30 |
| MPW 300-11-0500-020-000 | 500 | 20 |
| MPW 300-11-0750-012-000 | 750 | 12 |

Detailed specifications by model can be found in the Operating Guide.



[2] Nominal input power of 220–240 Vac ±10% single phase is needed to reach output maximum. Above approximately 207 Vac, maximum output power is available. Below approximately 207 Vac, maximum power is reduced to 2500 W. Below approximately. 180 Vac, DC output is shut off. (This means running at a nominal 208 V input power is not recommended as it would likely result in fluctuating power capacity.)

# mPower™ DC Series

## Programmable Power Supplies

mPower DC

311

2U

# mPower™ 311 Series 2U

## DC Programmable Power Supplies

## Convenience, Control, and Power

Marway's lab-quality dc power supplies include many advanced capabilities usually found only in systems costing much more. An evolution of the 310 Series, the 311 features the next generation touchscreen user control offering even easier programming of the function generator. The 2U chassis includes 1.5 kW and 3 kW models. With up to 64 parallel units, even the 1.5 kW models can create a setup for up to 96 kW total, while the 3 kW units can go up to 192 kW.

### Convenience Highlights

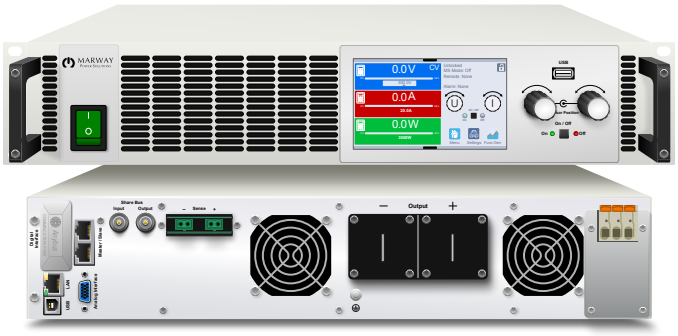
- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Function generators for standard wave patterns and custom arbitrary functions.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- Available in 1.5 kW amd 3.0 kW with voltages up to 1500.
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 192 kW.



A total of 14 configurations provide 1.5 kW or 3.0 kW power capacity at various maximum DC output voltage and currents.

### 1.5 kW

| | |
|---|---|
| 60 Vdc | 60 Amps |
| 80 Vdc | 60 Amps |
| 200 Vdc | 25 Amps |
| 360 Vdc | 15 Amps |
| 500 Vdc | 10 Amps |
| 750 Vdc | 6 Amps |

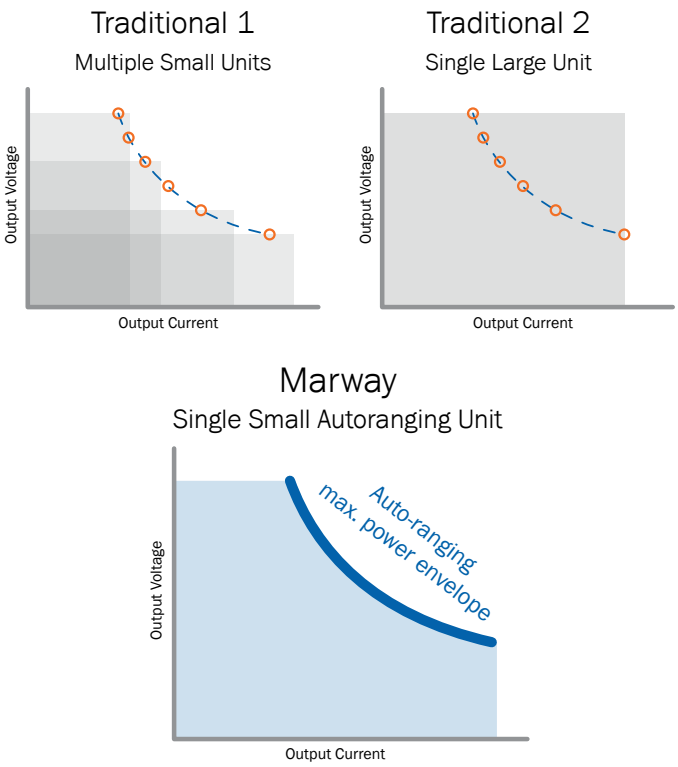
### 3.0 kW

| | |
|---|---|
| 60 Vdc | 120 Amps |
| 80 Vdc | 120 Amps |
| 200 Vdc | 50 Amps |
| 360 Vdc | 30 Amps |
| 500 Vdc | 20 Amps |
| 750 Vdc | 12 Amps |
| 1000 Vdc | 10 Amps |
| 1500 Vdc | 6 Amps |

## Autoranging Power Output

Autoranging enables mPower to dynamically alter its output configuration over a wider range compared to traditional power supplies. Traditional "rectangular envelope" power supplies can provide peak power (watts) at only one specific voltage and current setting. mPower's autoranging envelope can deliver peak power along many voltage and current setpoints.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.



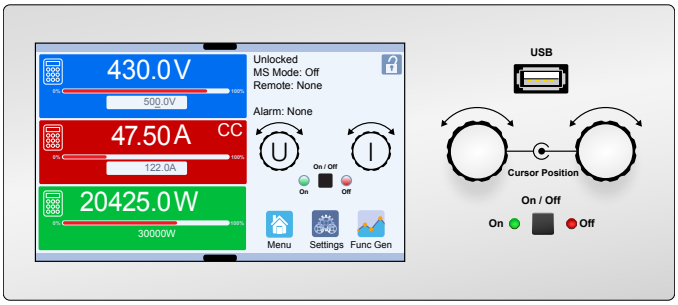

It can take multiple small power supplies to meet a set of tests. Or, one large system. For that same range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single power supply meet the demand of diverse test suites. This in turn means fewer power supplies—saving space, capital costs, and even installation costs.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and system alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for output voltage, current, and power, and configure the function generator.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show actual measure output values (large numbers), and the target set values (the smaller number fields below). The upper right area shows status information such as operating modes and alarms. The rotary knobs can be assigned different functionality, and are used to speed up data entry and menu navigation.




A graphical touch display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Rotary knobs help speed up data entry. The On/Off button toggles DC output.

### Control Panel Lock

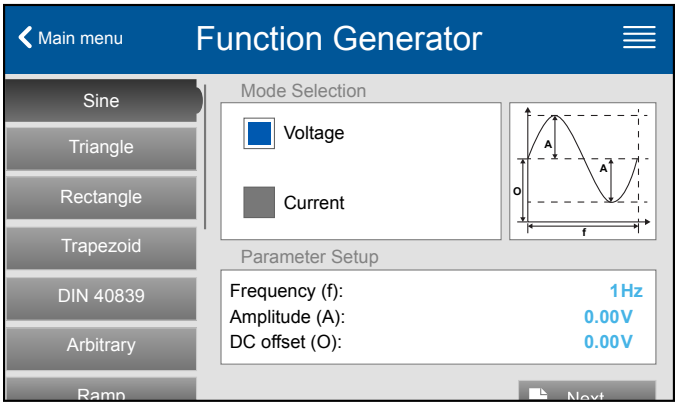
To prevent accidental changes during manual operation, the control panel can be locked. The DC output can be locked off, or allowed to switch while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Essentially, you get an "Are you sure?" prompt. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

## Function Generators

mPower has two foundational function generators to define signal forms and apply them to either voltage or current. An arbitrary generator allows up to 99 sequences, and a table-based generator accepts up to 4,096 UI/IU mapped values. Both generator types are fully customizable with remote control programming, and table data can even be loaded and saved to USB thumb drives. There are multiple higher level patterns pre-defined with touchscreen editing to simplify setup of common waveforms. Additionally, there are some built-in aids for commonly used simulations.

- sine wave
- triangle wave
- rectangular wave
- trapezoidal wave
- ramp step
- arbitrary forms
- DIN 40839
- XY generator (UI, IU)
- photovoltaic simulation (PV)
- fuel cell simulation (FC)

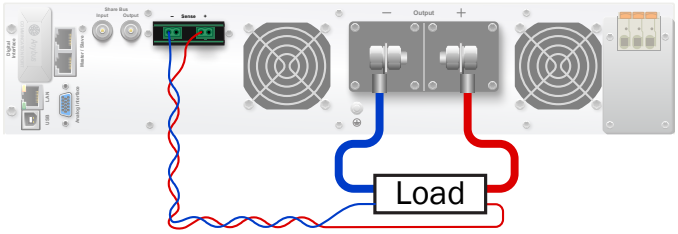



The function generator can be configured by touch panel where common types of wave forms are simplified with a few input variables.

## Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at the DC output connectors.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




## Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and the ability to collect status from the digital interfaces.

## Discharge Circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

# Remote Control

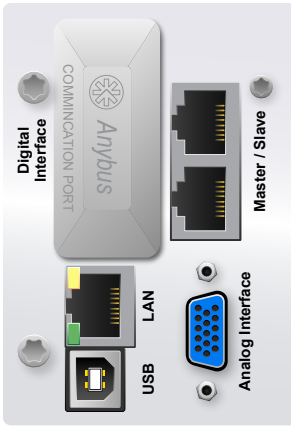
The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units—a great choice for managing stand-alone units.

LabView VIs are available to integrate the control and monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet or USB.

The flexible Anybus port accepts a number of interface modules to facilitate a variety of protocols. (See "mPower™ DC Anybus Modules" on page MPW-49.) Most will use Modbus register command data as a payload wrapped in the host communication protocol.

The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.




Basic remote control is available via analog interface using 5V or 10V signals. More extensive software-driven remote control is possible using SCPI or Modbus commands over USB or Ethernet. Additional hardware interfaces are available through the flexible Anybus slot which accepts field-exchangeable modules designed for RS232, Ethernet, Modbus TCP, Profinet, CAN, CANopen, and EtherCAT. LabView VIs are also available, and can work on a variety of hardware interfaces. Manual remote configuration and control is available with Windows® desktop software.

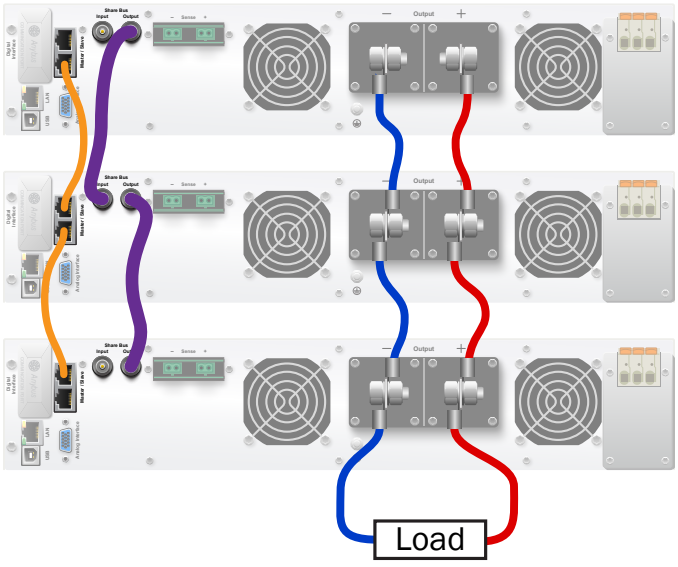
## Parallel Operation

Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (960 kW with 15kW units). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.




## Series Operation

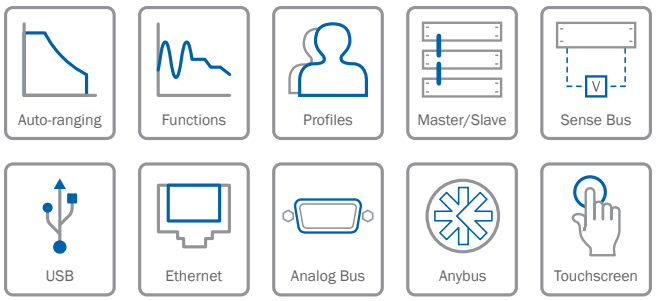
Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.

# mPower 311 Series 2U

**1.5** kW | **2U** Rackmount | **208 240** [1] 1ph Vac

**3.0** kW | **2U** Rackmount | **208 240** [1] 1ph Vac

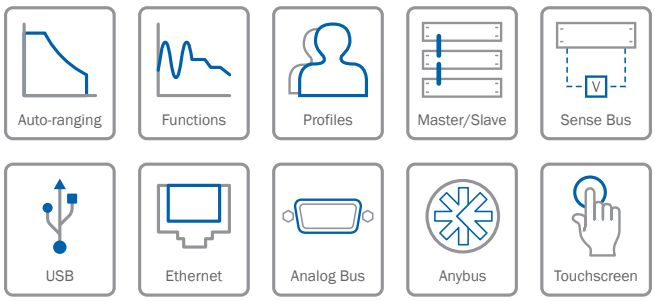
## Models 311-62




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-62-0060-060-004 | 60 | 60 |
| MPW 311-62-0080-060-004 | 80 | 60 |
| MPW 311-62-0200-025-004 | 200 | 25 |
| MPW 311-62-0360-015-004 | 360 | 15 |
| MPW 311-62-0500-010-004 | 500 | 10 |
| MPW 311-62-0750-006-004 | 750 | 6 |

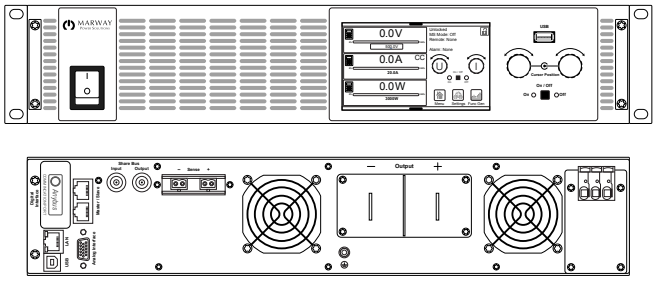
Detailed specifications by model can be found in the Operating Guide.

## Models 311-62




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-62-0060-120-004 | 60 | 120 |
| MPW 311-62-0080-120-004 | 80 | 120 |
| MPW 311-62-0200-050-004 | 200 | 50 |
| MPW 311-62-0360-030-004 | 360 | 30 |
| MPW 311-62-0500-020-004 | 500 | 20 |
| MPW 311-62-0750-012-004 | 750 | 12 |
| MPW 311-62-1000-010-004 | 1000 | 10 |
| MPW 311-62-1500-006-004 | 1500 | 6 |

Detailed specifications by model can be found in the Operating Guide.



[1] Nominal input power of 208/220/230/240 Vac ±10% single phase is needed to reach output maximum.
110/120 Vac single phase can be used, but the 1.5 kW unit derates to 1.2 kW, and the 3 kW unit derates to 1.5 kW.
We generally do not promote use of 120 Vac, but it can be used reliably if a need arises.

# mPower™ DC Series

## Programmable Power Supplies

mPower DC

311

3U

# mPower™ 311 Series 3U

## Programmable Power Supplies

## Convenience, Control, and Power

Marway's lab-quality dc power supplies include many advanced capabilities usually found only in systems costing much more. An evolution of the 310 Series, the 311 features the next generation touchscreen user control offering even easier programming of the function generator. The 3U chassis includes 5 kW, 10 kW, and 15 kW models. With up to 64 parallel units, even the 5 kW models can create up to a 320 kW system, while the 15 kW units can go up to 960 kW.

### Convenience Highlights

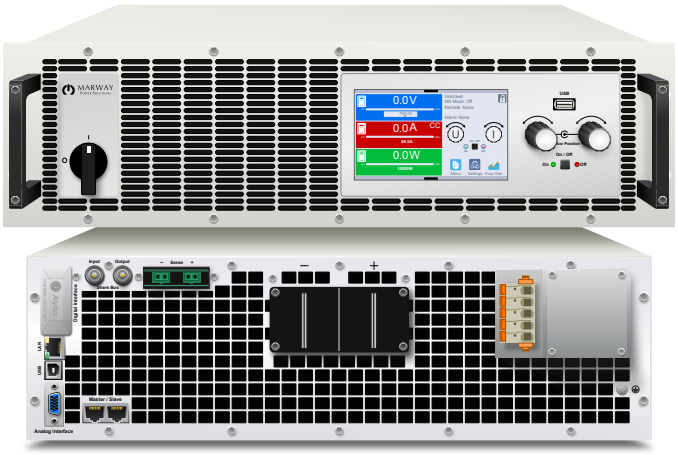
- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Function generators for standard wave patterns and custom arbitrary functions.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- Available in 5 kW, 10 kW, and 15 kW models.
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 960 kW.




A total of 23 configurations provide 5 kW, 10 kW, or 15 kW power capacity at various maximum DC output voltage and current.

### 5kW

| | |
|---|---|
| 60 Vdc | 170 Amps |
| 80 Vdc | 170 Amps |
| 200 Vdc | 70 Amps |
| 360 Vdc | 40 Amps |
| 500 Vdc | 30 Amps |
| 750 Vdc | 20 Amps |

### 10kW

| | |
|---|---|
| 60 Vdc | 340 Amps |
| 80 Vdc | 340 Amps |
| 200 Vdc | 140 Amps |
| 360 Vdc | 80 Amps |
| 500 Vdc | 60 Amps |
| 750 Vdc | 40 Amps |
| 1000 Vdc | 30 amps |
| 1500 Vdc | 20 amps |

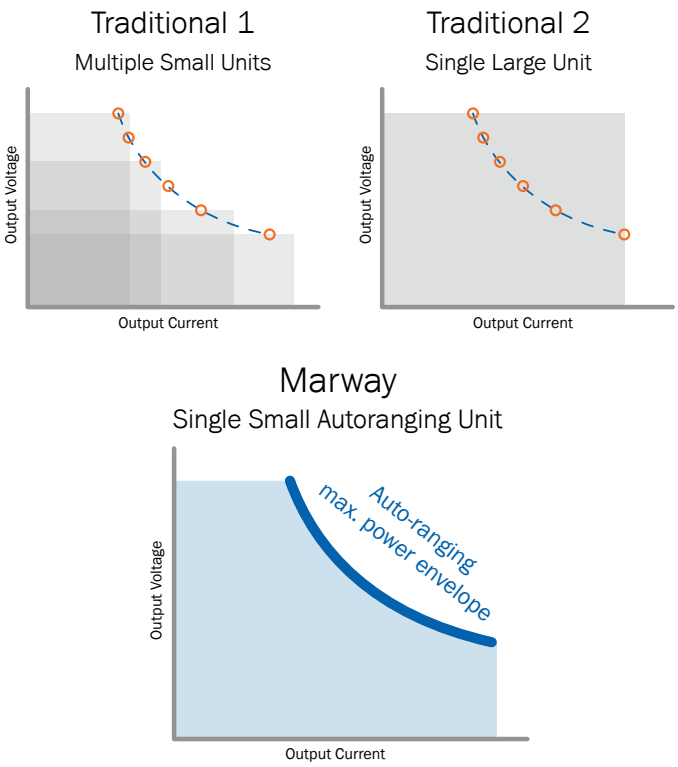
### 15kW

| | |
|---|---|
| 60 Vdc | 510 Amps |
| 80 Vdc | 510 Amps |
| 200 Vdc | 210 Amps |
| 360 Vdc | 120 Amps |
| 500 Vdc | 90 Amps |
| 750 Vdc | 60 Amps |
| 1000 Vdc | 40 Amps |
| 1500 Vdc | 30 Amps |
| 2000 Vdc | 20 amps |

## Autoranging Power Output

Autoranging enables mPower to dynamically alter its output configuration over a wider range compared to traditional power supplies. Traditional "rectangular envelope" power supplies can provide peak power (watts) at only one specific voltage and current setting. mPower's autoranging envelope can deliver peak power along many voltage and current setpoints.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.



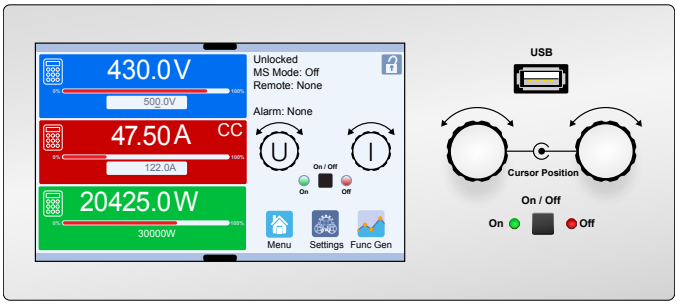

It can take multiple small power supplies to meet a set of tests. Or, one large system. For that same range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single power supply meet the demand of diverse test suites. This in turn means fewer power supplies—saving space, capital costs, and even installation costs.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and system alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for output voltage, current, and power, and configure the function generator.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show actual measure output values (large numbers), and the target set values (the smaller number fields below). The upper right area shows status information such as operating modes and alarms. The rotary knobs can be assigned different functionality, and are used to speed up data entry and menu navigation.




A graphical touch display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Rotary knobs help speed up data entry. The On/Off button toggles DC output.

### Control Panel Lock

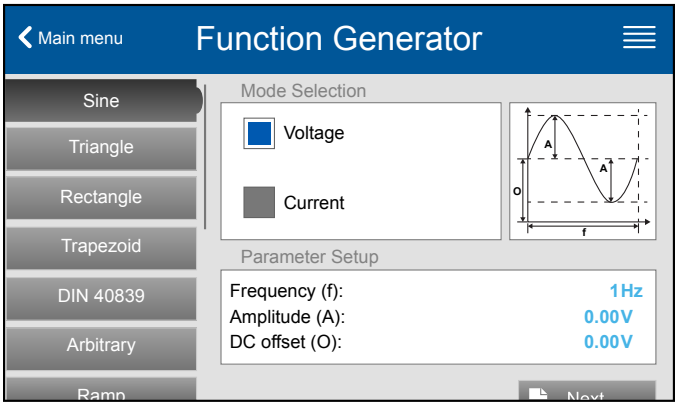
To prevent accidental changes during manual operation, the control panel can be locked. The DC output can be locked off, or allowed to switch while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Essentially, you get an "Are you sure?" prompt. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

## Function Generators

mPower has two foundational function generators to define signal forms and apply them to either voltage or current. An arbitrary generator allows up to 99 sequences, and a table-based generator accepts up to 4,096 UI/IU mapped values. Both generator types are fully customizable with remote control programming, and table data can even be loaded and saved to USB thumb drives. There are multiple higher level patterns pre-defined with touchscreen editing to simplify setup of common waveforms. Additionally, there are some built-in aids for commonly used simulations.

- sine wave
- triangle wave
- rectangular wave
- trapezoidal wave
- ramp step
- arbitrary forms
- DIN 40839
- XY generator (UI, IU)
- photovoltaic simulation (PV)
- fuel cell simulation (FC)

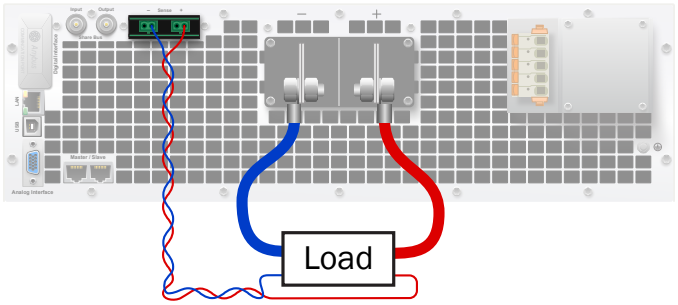



The function generator can be configured by touch panel where common types of wave forms are simplified with a few input variables.

## Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at the DC output connectors.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




## Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and the ability to collect status from the digital interfaces.

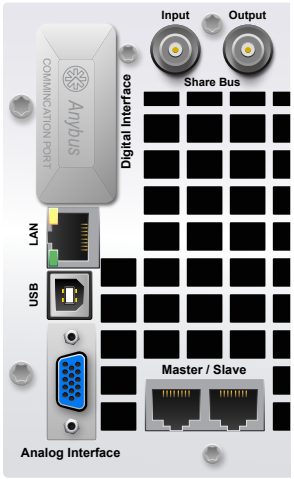
## Discharge Circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

# Remote Control

The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units—a great choice for managing stand-alone units.

LabView VIs are available to integrate the control and



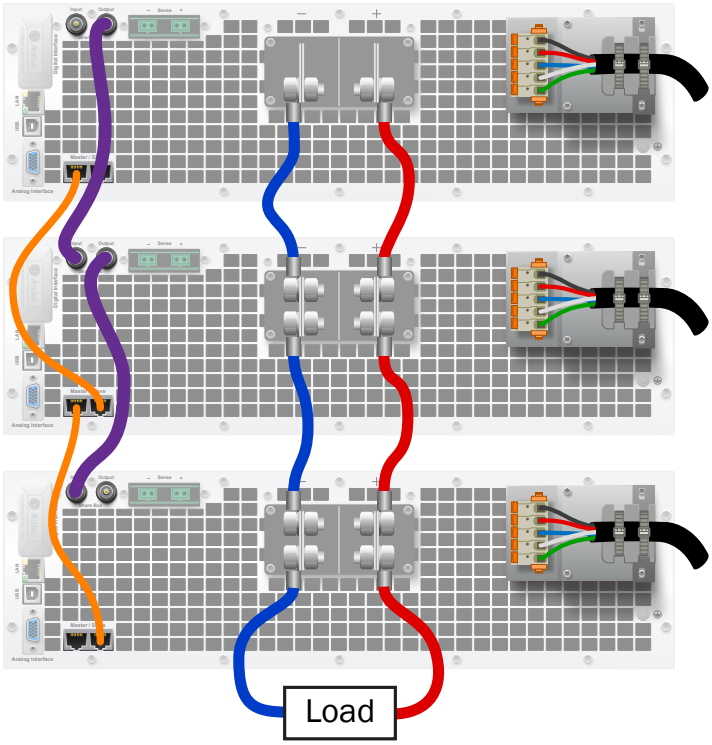

Basic remote control is available via analog interface using 5V or 10V signals. More extensive software-driven remote control is possible using SCPI or Modbus commands over USB or Ethernet. Additional hardware interfaces are available through the flexible Anybus slot which accepts field-exchangeable modules designed for RS232, Ethernet, Modbus TCP, Profinet, CAN, CANopen, and EtherCAT. LabView VIs are also available, and can work on a variety of hardware interfaces. Manual remote configuration and control is available with Windows® desktop software.

monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet or USB.

The flexible Anybus port accepts a number of interface modules to facilitate a variety of protocols. (See "mPower™ DC Anybus Modules" on page MPW-49.) Most will use Modbus register command data as a payload wrapped in the host communication protocol.

The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.




## Parallel Operation

Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (960 kW with 15kW units). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.

## Series Operation

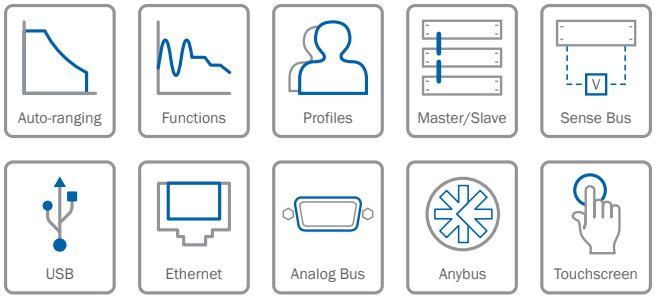
Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.

**5.0** kW

**3U** Rackmount

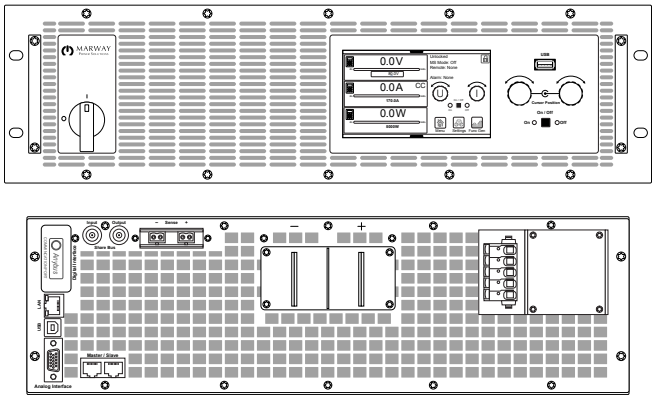
**380**[1]
**480**
1ph Vac

## Models 311-33




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-33-0060-170-004 | 60 | 170 |
| MPW 311-33-0080-170-004 | 80 | 170 |
| MPW 311-33-0200-070-004 | 200 | 70 |
| MPW 311-33-0360-040-004 | 360 | 40 |
| MPW 311-33-0500-030-004 | 500 | 30 |
| MPW 311-33-0750-020-004 | 750 | 20 |

Detailed specifications by model can be found in the Operating Guide.

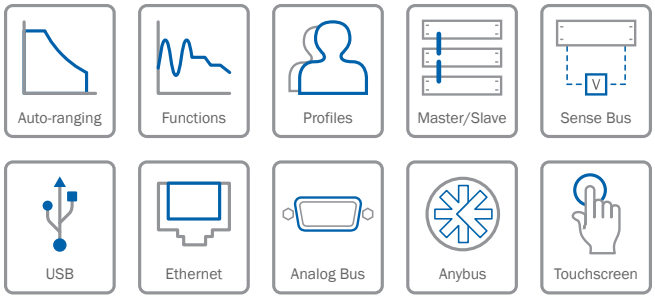


[1] 208 Vac 3-phase input is possible with power derating to 3 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

# mPower 311 Series 3U

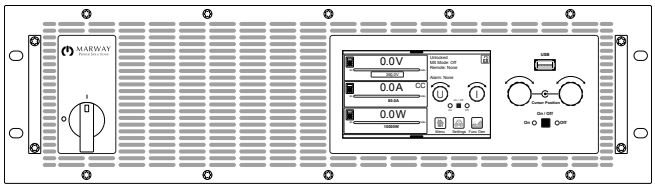
| 10 | 3U | 380[1]<br>480 |
|---|---|---|
| kW | Rackmount | 3ph Vac |

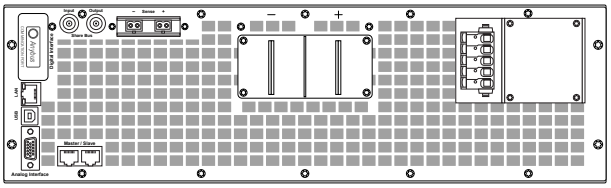
## Models 311-53




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-53-0060-340-004 | 60 | 340 |
| MPW 311-53-0080-340-004 | 80 | 340 |
| MPW 311-53-0200-140-004 | 200 | 140 |
| MPW 311-53-0360-080-004 | 360 | 80 |
| MPW 311-53-0500-060-004 | 500 | 60 |
| MPW 311-53-0750-040-004 | 750 | 40 |
| MPW 311-53-1000-030-004 | 1000 | 30 |
| MPW 311-53-1500-020-004 | 1500 | 20 |

Detailed specifications by model can be found in the Operating Guide.



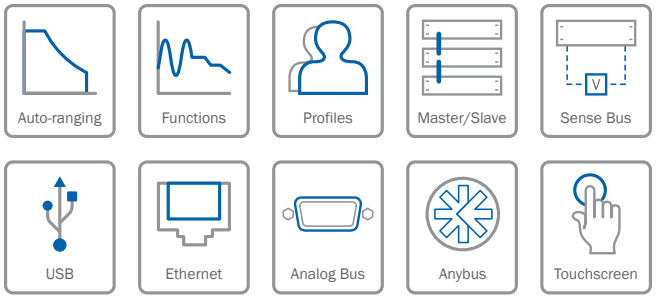
[1] 208 Vac 3-phase input is possible with power derating to 6 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

**15** kW

**3U** Rackmount

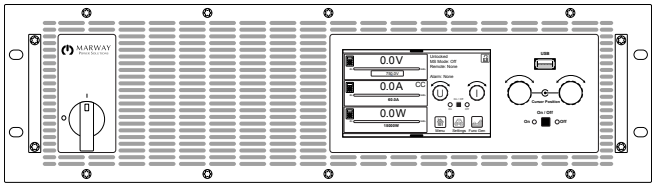
**380**[1]
**480** 3ph Vac

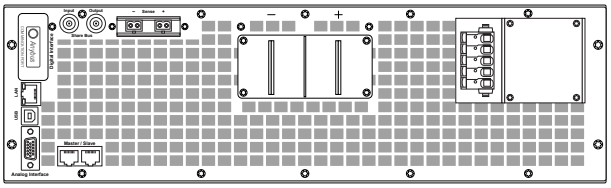
## Models 311-53




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-53-0060-510-004 | 60 | 510 |
| MPW 311-53-0080-510-004 | 80 | 510 |
| MPW 311-53-0200-210-004 | 200 | 210 |
| MPW 311-53-0360-120-004 | 360 | 120 |
| MPW 311-53-0500-090-004 | 500 | 90 |
| MPW 311-53-0750-060-004 | 750 | 60 |
| MPW 311-53-1000-040-004 | 1000 | 40 |
| MPW 311-53-1500-030-004 | 1500 | 30 |
| MPW 311-53-2000-020-004 | 2000 | 20 |

Detailed specifications by model can be found in the Operating Guide.





[1] 208 Vac 3-phase input is possible with power derating to 9 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

# mPower™ DC Series

## Programmable Power Supplies

mPower DC

311

4U

# mPower™ 311 Series 4U

## Programmable Power Supplies

## Convenience, Control, and Power

Marway's lab-quality dc power supplies include many advanced capabilities usually found only in systems costing much more. An evolution of the 310 Series, the 311 features the next generation touchscreen user control offering even easier programming of the function generator. The 4U chassis expands the power range to 30 kW. With up to 64 parallel units, this is the highest powered series of the mPower lineup.

### Convenience Highlights

- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Function generators for standard wave patterns and custom arbitrary functions.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- 30 kW models, up to 1,000 amps, or 2,000 Vdc
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 1,920 kW. (Pre-designed rack infrastructure for parallel setups available as an option.)

Ten models provide a range of 30 kW configurations from 1000 amps to 2000 volts dc output. The updated, larger touchscreen interface makes it even easier to navigate settings, and program the function generator compared to the previous 300 series.

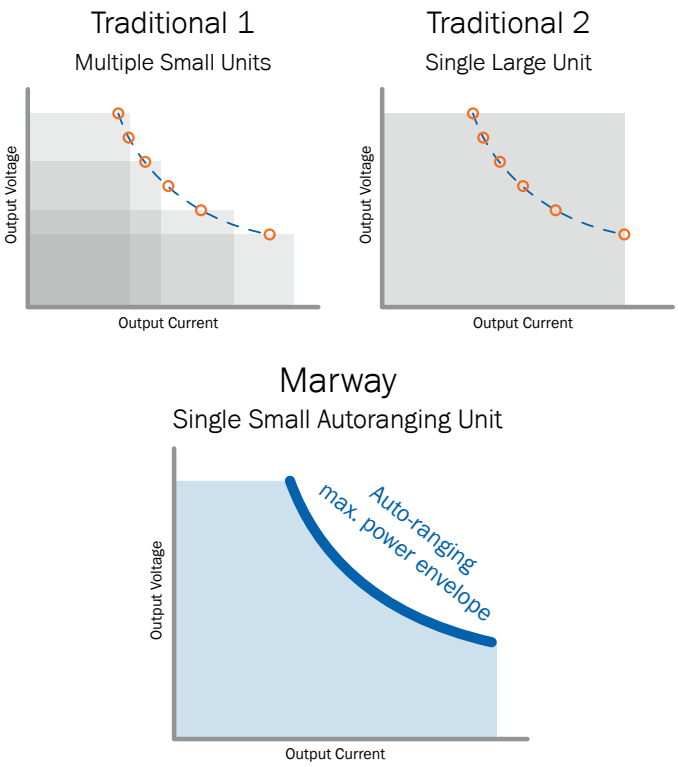
**30 kW**

| | |
|---|---|
| 60 Vdc | 1000 Amps |
| 80 Vdc | 1000 Amps |
| 200 Vdc | 420 Amps |
| 360 Vdc | 240 Amps |
| 500 Vdc | 180 Amps |
| 750 Vdc | 120 Amps |
| 920 Vdc | 125 Amps |
| 1000 Vdc | 80 amps |
| 1500 Vdc | 60 amps |
| 2000 Vdc | 40 amps |

## Autoranging Power Output

Autoranging enables mPower to dynamically alter its output configuration over a wider range compared to traditional power supplies. Traditional "rectangular envelope" power supplies can provide peak power (watts) at only one specific voltage and current setting. mPower's autoranging envelope can deliver peak power along many voltage and current setpoints.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.



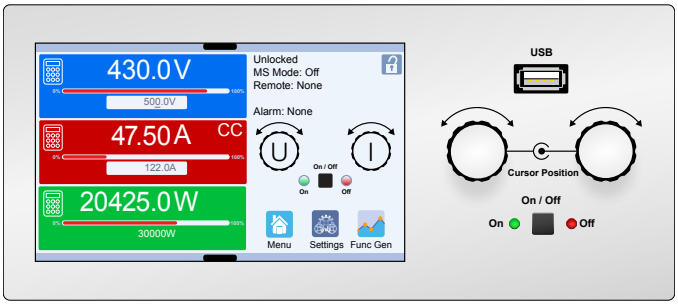

It can take multiple small power supplies to meet a set of tests. Or, one large system. For that same range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single power supply meet the demand of diverse test suites. This in turn means fewer power supplies—saving space, capital costs, and even installation costs.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and system alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for output voltage, current, and power, and configure the function generator.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show actual measure output values (large numbers), and the target set values (the smaller number fields below). The upper right area shows status information such as operating modes and alarms. The rotary knobs can be assigned different functionality, and are used to speed up data entry and menu navigation.




A graphical touch display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Rotary knobs help speed up data entry. The On/Off button toggles DC output.

### Control Panel Lock

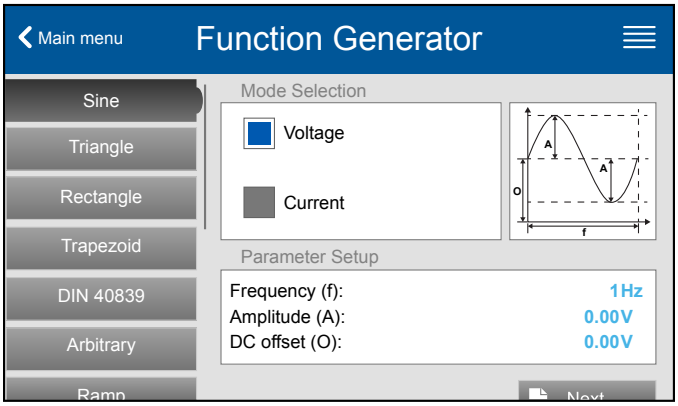
To prevent accidental changes during manual operation, the control panel can be locked. The DC output can be locked off, or allowed to switch while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Essentially, you get an "Are you sure?" prompt. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

## Function Generators

mPower has two foundational function generators to define signal forms and apply them to either voltage or current. An arbitrary generator allows up to 99 sequences, and a table-based generator accepts up to 4,096 UI/IU mapped values. Both generator types are fully customizable with remote control programming, and table data can even be loaded and saved to USB thumb drives. There are multiple higher level patterns pre-defined with touchscreen editing to simplify setup of common waveforms. Additionally, there are some built-in aids for commonly used simulations.

- sine wave
- triangle wave
- rectangular wave
- trapezoidal wave
- ramp step
- arbitrary forms
- DIN 40839
- XY generator (UI, IU)
- photovoltaic simulation (PV)
- fuel cell simulation (FC)

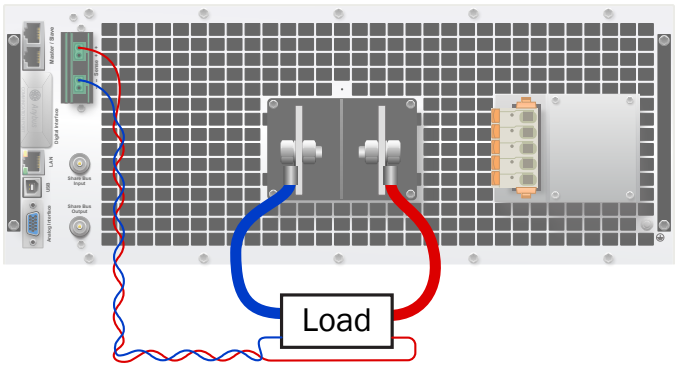



The function generator can be configured by touch panel where common types of wave forms are simplified with a few input variables.

## Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at the DC output connectors.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




## Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and the ability to collect status from the digital interfaces.

## Discharge Circuit

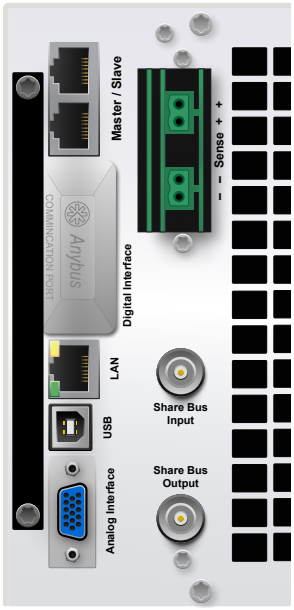
Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

# Remote Control

The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units—a great choice for managing stand-alone units.

LabView VIs are available to integrate the control and

Basic remote control is available via analog interface using 5V or 10V signals. More extensive software-driven remote control is possible using SCPI or Modbus commands over USB or Ethernet. Additional hardware interfaces are available through the flexible Anybus slot which accepts field-exchangeable modules designed for RS232, Ethernet, Modbus TCP, Profinet, CAN, CANopen, and EtherCAT. LabView VIs are also available, and can work on a variety of hardware interfaces. Manual remote configuration and control is available with Windows® desktop software.



monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet or USB.

The flexible Anybus port accepts a number of interface modules to facilitate a variety of protocols. (See "mPower™ DC Anybus Modules" on page MPW-49.) Most will use Modbus register command data as a payload wrapped in the host communication protocol.

The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.

## Parallel Operation

Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (1920 kW). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

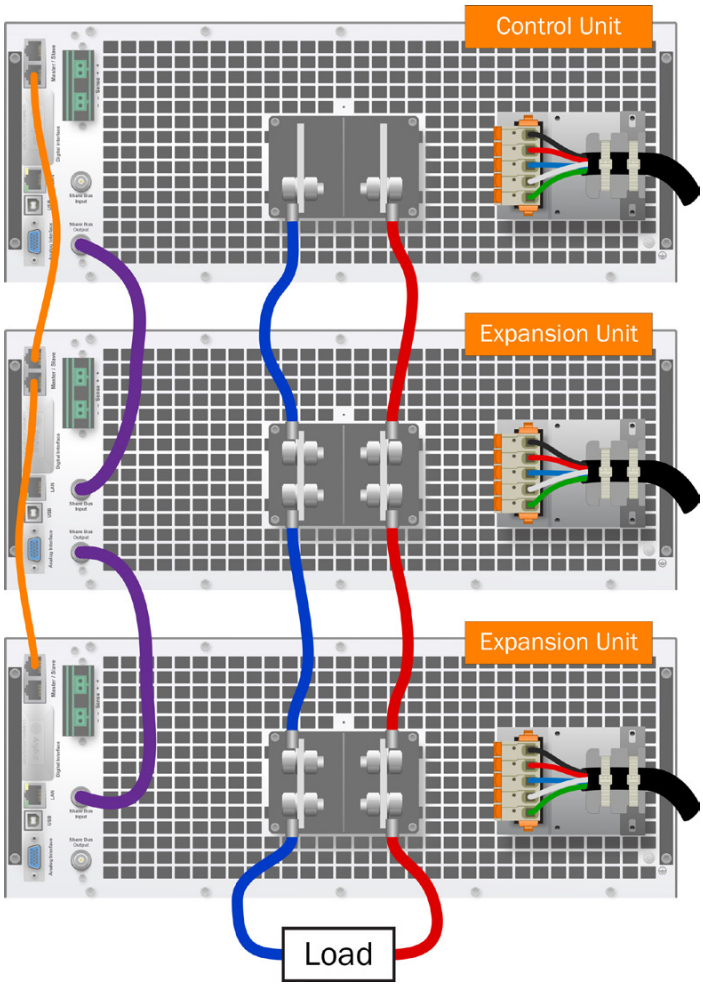
There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.

## Series Operation

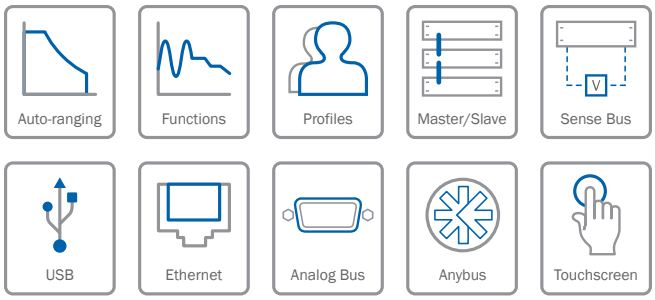
Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.



# mPower 311 Series 4U

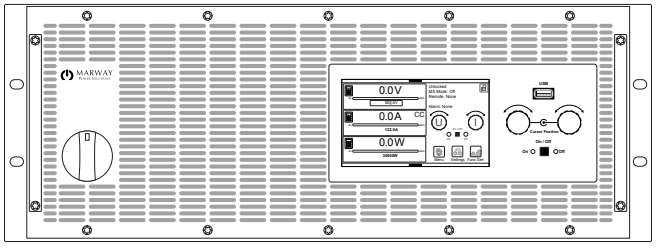
| 30 | 4U | 380[1] 480 |
|---|---|---|
| kW | Rackmount | 3ph Vac |

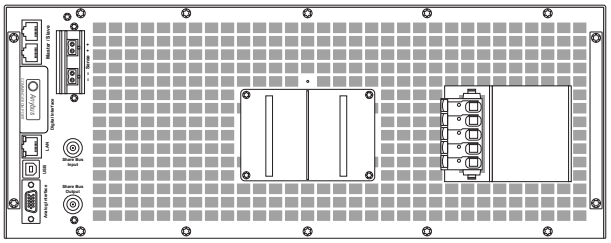
## Models 311-54




| Model Number | Volts | Amps |
|---|---|---|
| MPW 311-54-0060-1000-004 | 60 | 1000 |
| MPW 311-54-0080-1000-004 | 80 | 1000 |
| MPW 311-54-0200-420-004 | 200 | 420 |
| MPW 311-54-0360-240-004 | 360 | 240 |
| MPW 311-54-0500-180-004 | 500 | 180 |
| MPW 311-54-0750-120-004 | 750 | 120 |
| MPW 311-54-0920-125-004 | 920 | 125 |
| MPW 311-54-1000-080-004 | 1000 | 80 |
| MPW 311-54-1500-060-004 | 1500 | 60 |
| MPW 311-54-2000-040-004 | 1500 | 40 |

Detailed specifications by model can be found in the Operating Guide.



[1] 208 Vac 3-phase input is possible with power derating to 18 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

# mPower™ DC Series

## Bidirectional Power Supplies

mPower DC

411

2U

# mPower™ 411 Series 2U

## DC Bidirectional Power Supplies

## Convenience, Control, and Power

Marway's lab quality mPower DC bi-directional power supplies provide both source and sink functionality. When acting as a load, energy can be transferred back to the power grid with up to 96% efficiency. The 2U chassis includes 1.5 kW and 3 kW models. With up to 64 parallel units, even the 1.5 kW models can create a setup with up to 96 kW total, while the 3 kW units can create up to 192 kW.

### Convenience Highlights

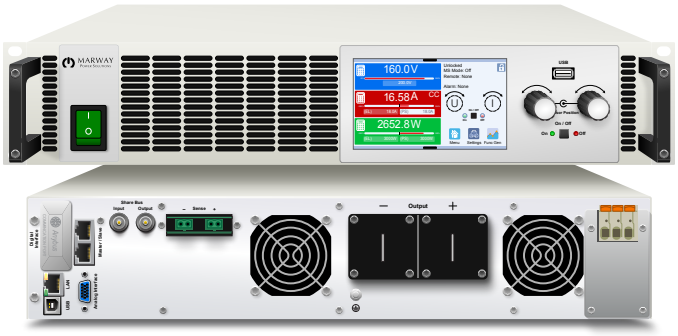
- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Automated management of source and sink operation with independant setpoints.
- Function generators for standard wave patterns and custom arbitrary functions in source and sink quadrants.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the source load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- Available in 1.5 kW amd 3.0 kW with voltages up to 1500.
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 192 kW.



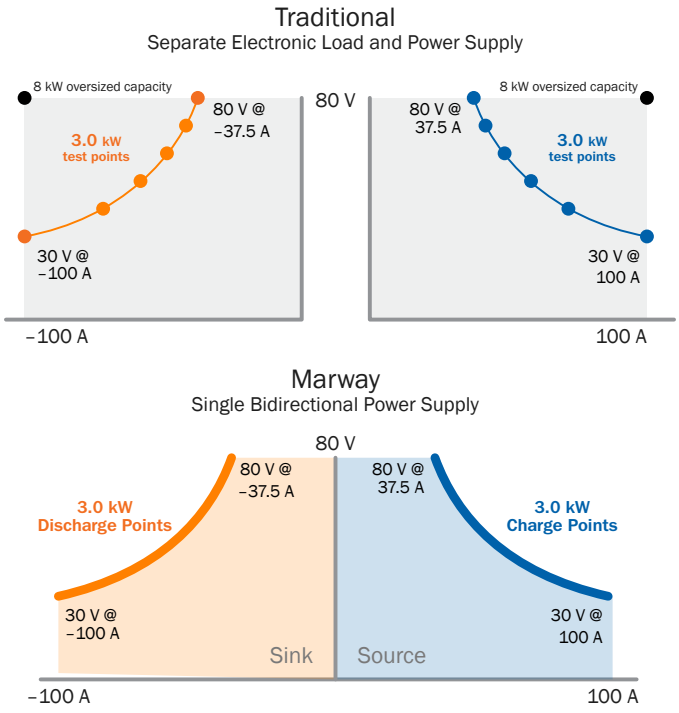

| 1.5kW | | 3.0kW | |
|---|---|---|---|
| 10 Vdc | 60 Amps | 10 Vdc | 120 Amps |
| 60 Vdc | 60 Amps | 60 Vdc | 120 Amps |
| 80 Vdc | 60 Amps | 80 Vdc | 120 Amps |
| 200 Vdc | 25 Amps | 200 Vdc | 50 Amps |
| 360 Vdc | 15 Amps | 360 Vdc | 30 Amps |
| 500 Vdc | 10 Amps | 500 Vdc | 20 Amps |
| 750 Vdc | 6 Amps | 750 Vdc | 12 Amps |
| | | 1000 Vdc | 10 Amps |
| | | 1500 Vdc | 6 Amps |

The 10 Vdc models are rated 600 watts and 1200 watts.

## Bidirectional Autoranging

Autoranging enables mPower to dynamically alter its source and sink configuration over a wider range compared to traditional power supplies and loads. Traditional "rectangular envelope" systems provide peak power (watts) at only one specific voltage and current setting. mPower's autoranging envelope delivers peak power along many voltage and current setpoints.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.



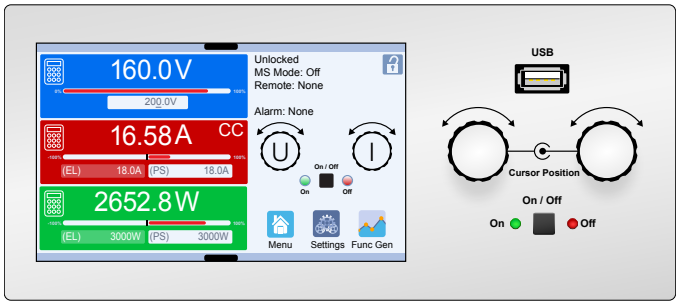

Traditionally, it takes multiple small power supplies and loads to meet a range of test points. Or, one oversized system each for the supply and load. For that same test range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single rackmount enclosure to meet the demand of diverse test suites. With the mPower 411 Series, the power supply and load are combined for even further space, capital, and installation cost savings.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and system alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for source and sink voltage, current, and power, and configure the function generator.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show actual measure output values (large numbers), and the target set values (the smaller number fields below). The upper right area shows status information such as operating modes and alarms. The rotary knobs can be assigned different functionality, and are used to speed up data entry and menu navigation.




A graphical touch display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Current and power limits have independent source and sink settings. Rotary knobs help speed up data entry. The On/Off button toggles DC output.

### Control Panel Lock

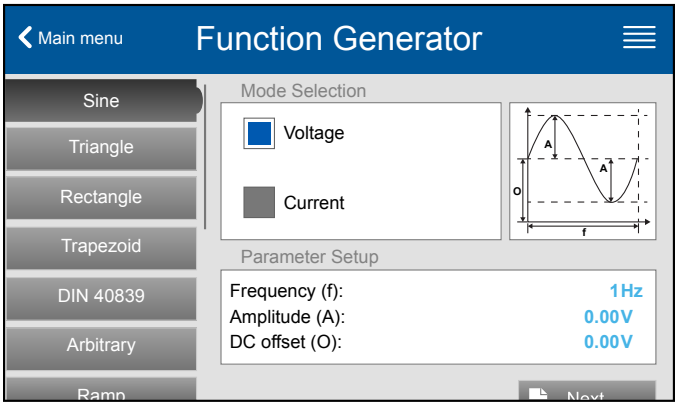
To prevent accidental changes during manual operation, the control panel can be locked. The DC output can be locked off, or allowed to switch while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Essentially, you get an "Are you sure?" prompt. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

## Function Generators

mPower has two foundational function generators to define signal forms and apply them to either voltage or current. An arbitrary generator allows up to 99 sequences, and a table-based generator accepts up to 4,096 UI/IU mapped values. Both generator types are fully customizable with remote control programming, and table data can even be loaded and saved to USB thumb drives. There are multiple higher level patterns pre-defined with touchscreen editing to simplify setup of common waveforms. Additionally, there are some built-in aids for commonly used simulations.

- sine wave
- triangle wave
- rectangular wave
- trapezoidal wave
- ramp step
- arbitrary forms
- XY generator (UI, IU)
- photovoltaic simulation (PV)
- fuel cell simulation (FC)
- battery testing

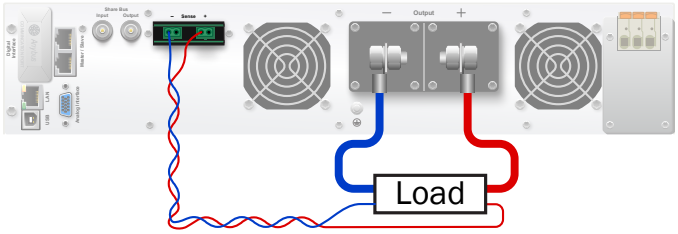



The function generator can be configured by touch panel where common types of wave forms are simplified with a few input variables.

## Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at the DC output connectors.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




## Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and the ability to collect status from the digital interfaces.

## Discharge Circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

# Remote Control

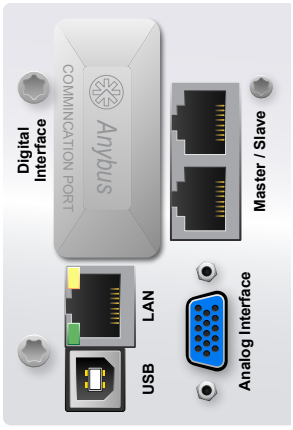
The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units—a great choice for managing stand-alone units.

LabView VIs are available to integrate the control and monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet or USB.

The flexible Anybus port accepts a number of interface modules to facilitate a variety of protocols. (See s.) Most will use Modbus register command data as a payload wrapped in the host communication protocol.

The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.




Basic remote control is available via analog interface using 5V or 10V signals. More extensive software-driven remote control is possible using SCPI or Modbus commands over USB or Ethernet. Additional hardware interfaces are available through the flexible Anybus slot which accepts field-exchangeable modules designed for RS232, Ethernet, Modbus TCP, Profinet, CAN, CANopen, and EtherCAT. LabView VIs are also available, and can work on a variety of hardware interfaces. Manual remote configuration and control is available with Windows® desktop software.

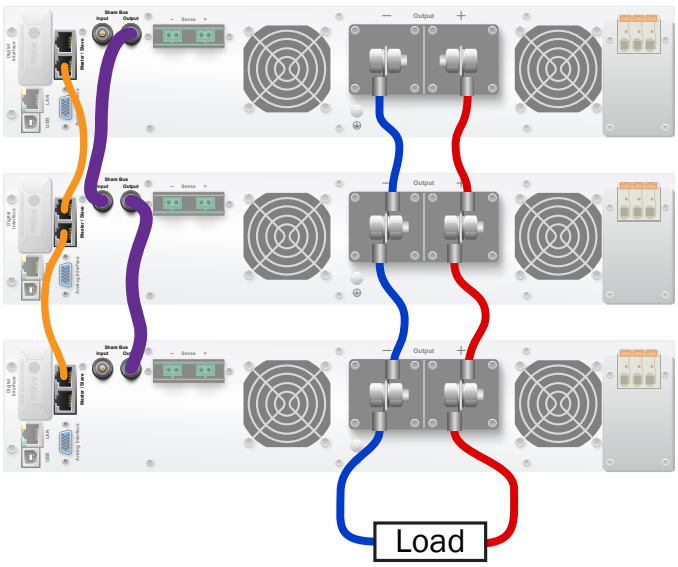
## Parallel Operation

Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (960 kW with 15kW units). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.




## Series Operation

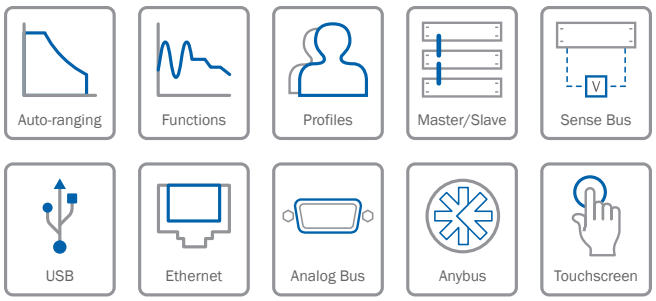
Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.

# mPower 411 Series 2U

**1.5** kW | **2U** Rackmount | **208 240** [1] 1ph Vac

**3.0** kW | **2U** Rackmount | **208 240** [1] 1ph Vac

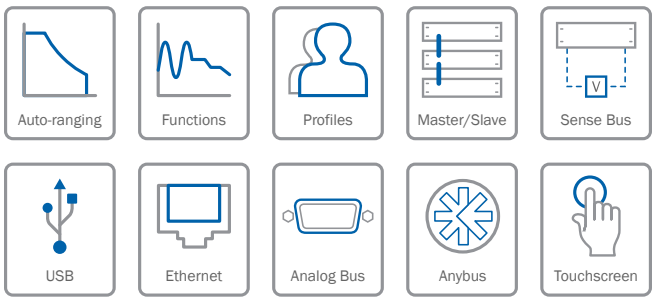
## Models 411-62




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-62-0010-060-004 [2] | 10 | 60 |
| MPW 411-62-0060-060-004 | 60 | 60 |
| MPW 411-62-0080-060-004 | 80 | 60 |
| MPW 411-62-0200-025-004 | 200 | 25 |
| MPW 411-62-0360-015-004 | 360 | 15 |
| MPW 411-62-0500-010-004 | 500 | 10 |
| MPW 411-62-0750-006-004 | 750 | 6 |

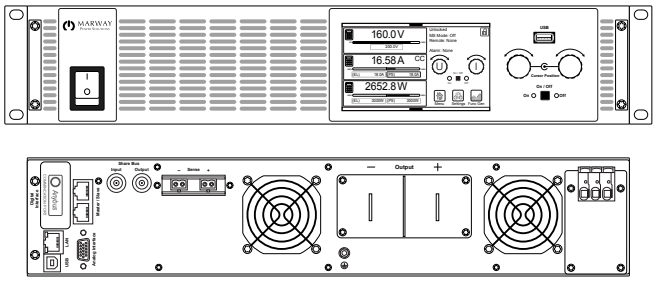
Detailed specifications by model can be found in the Operating Guide.

## Models 411-62




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-62-0010-120-004 [2] | 10 | 120 |
| MPW 411-62-0060-120-004 | 60 | 120 |
| MPW 411-62-0080-120-004 | 80 | 120 |
| MPW 411-62-0200-050-004 | 200 | 50 |
| MPW 411-62-0360-030-004 | 360 | 30 |
| MPW 411-62-0500-020-004 | 500 | 20 |
| MPW 411-62-0750-012-004 | 750 | 12 |
| MPW 411-62-1000-010-004 | 1000 | 10 |
| MPW 411-62-1500-006-004 | 1500 | 6 |

Detailed specifications by model can be found in the Operating Guide.




[1] Nominal input power of 208/220/230/240 Vac ±10% single phase is needed to reach output maximum.
110/120 Vac single phase can be used, but the 1.5 kW unit derates to 1.2 kW, and the 3 kW unit derates to 1.5 kW.
We generally do not promote use of 120 Vac, but it can be used reliably if a need arises.

[2] The 10 Vdc models provide high accuracy for low voltage applications, but yield 600 and 1200 watts respectively, and not 1.5 kW and 3 kW.

# mPower™ DC Series

## Bidirectional Power Supplies

mPower DC

411

3U

# mPower™ 411 Series 3U

## DC Bidirectional Power Supplies

## Convenience, Control, and Power

Marway's lab quality mPower DC bi-directional power supplies provide both source and sink functionality. When acting as a load, energy can be transferred back to the power grid with up to 96% efficiency. The 3U chassis includes 5 kW, 10 kW, and 15 kW models. With up to 64 parallel units, even the 5 kW models can create up to a 320 kW system, while the 15 kW units can go up to 960 kW.

### Convenience Highlights

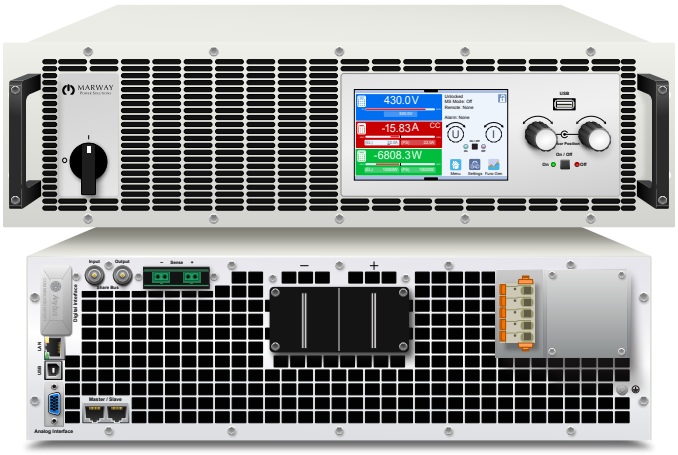
- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Automated management of source and sink operation with independant setpoints.
- Function generators for standard wave patterns and custom arbitrary functions in source and sink quadrants.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the source load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- Available in 5 kW, 10 kW, and 15 kW models.
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 960 kW.




### 5kW

| | |
|---|---|
| 10 Vdc | 170 Amps |
| 60 Vdc | 170 Amps |
| 80 Vdc | 170 Amps |
| 200 Vdc | 70 Amps |
| 360 Vdc | 40 Amps |
| 500 Vdc | 30 Amps |
| 750 Vdc | 20 Amps |

### 10kW

| | |
|---|---|
| 10 Vdc | 340 Amps |
| 60 Vdc | 340 Amps |
| 80 Vdc | 340 Amps |
| 200 Vdc | 140 Amps |
| 360 Vdc | 80 Amps |
| 500 Vdc | 60 Amps |
| 750 Vdc | 40 Amps |
| 1000 Vdc | 30 amps |
| 1500 Vdc | 20 amps |

### 15kW

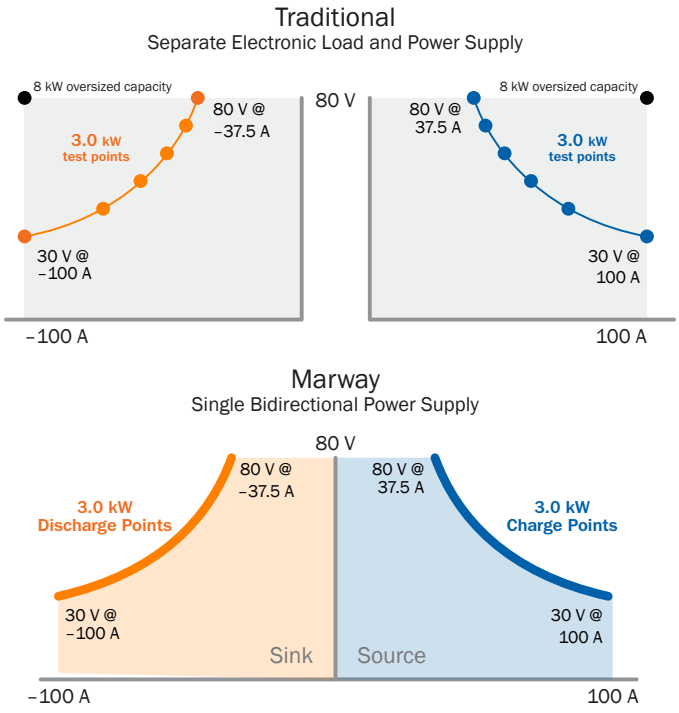
| | |
|---|---|
| 10 Vdc | 510 Amps |
| 60 Vdc | 510 Amps |
| 80 Vdc | 510 Amps |
| 200 Vdc | 210 Amps |
| 360 Vdc | 120 Amps |
| 500 Vdc | 90 Amps |
| 750 Vdc | 60 Amps |
| 1000 Vdc | 40 Amps |
| 1500 Vdc | 30 Amps |
| 2000 Vdc | 20 amps |

The 10 Vdc models are rated 1700, 3400, and 5100 watts.

## Bidirectional Autoranging

Autoranging enables mPower to dynamically alter its source and sink configuration over a wider range compared to traditional power supplies and loads. Traditional "rectangular envelope" systems provide peak power (watts) at only one specific voltage and current setting. mPower's autoranging envelope delivers peak power along many voltage and current setpoints.

You'll notice that any given mPower model's maximum DC output voltage multiplied by it's maximum current is much higher than the power rating of the system. When a system is able to run at a lower than maximum current, the voltage can be adjusted as high as it's maximum rating in order to still yield the maximum power of the system. Likewise, when running the system at a lower voltage, the current can be increased up to the maximum rating—again, up to the limit of the full power rating. The autoranging envelope maintains a high quality output signal with voltages down to about 30% of the rating, but can be operated as low as 10%.



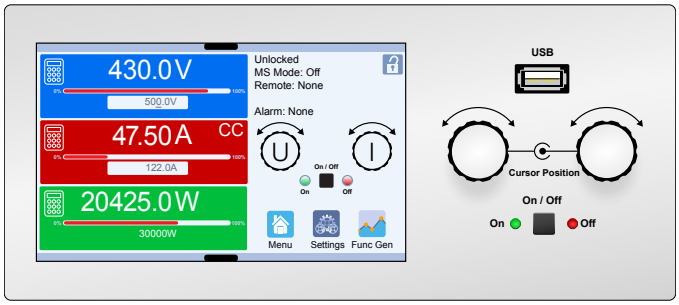

Traditionally, it takes multiple small power supplies and loads to meet a range of test points. Or, one oversized system each for the supply and load. For that same test range, a single small mPower DC with autoranging can be used to serve all tests. Autoranging enables a greater range of applied voltage and current while delivering 100% of its power capacity. This helps a single rackmount enclosure to meet the demand of diverse test suites. With the mPower 411 Series, the power supply and load are combined for even further space, capital, and installation cost savings.

## Control System

The local control panel can be used to adjust all configurable settings, set operation limits, and monitor the status of the output power and system alarms. Aside from configuring a number of behavior preferences, the control system is primarily used to set limits for source and sink voltage, current, and power, and configure the function generator.

Up to 5 profiles of settings and application limits can be stored for later recall—making it easier to switch between test cases and projects.

The default display of the system will show actual measure output values (large numbers), and the target set values (the smaller number fields below). The upper right area shows status information such as operating modes and alarms. The rotary knobs can be assigned different functionality, and are used to speed up data entry and menu navigation.




A graphical touch display is used to view and update all configuration settings, as well as set control limits, and monitor system status. Rotary knobs help speed up data entry. The On/Off button toggles DC output.

### Control Panel Lock

To prevent accidental changes during manual operation, the control panel can be locked. The DC output can be locked off, or allowed to switch while the rest of the controls are locked. Before responding to touchscreen or rotary knob input, the screen displays a dialog to confirm that the control panel should be unlocked. Essentially, you get an "Are you sure?" prompt. Even further, a PIN can be required to unlock the controls.

The control panel is automatically locked whenever the unit is being operated in remote mode.

## Function Generators

mPower has two foundational function generators to define signal forms and apply them to either voltage or current. An arbitrary generator allows up to 99 sequences, and a table-based generator accepts up to 4,096 UI/IU mapped values. Both generator types are fully customizable with remote control programming, and table data can even be loaded and saved to USB thumb drives. There are multiple higher level patterns pre-defined with touchscreen editing to simplify setup of common waveforms. Additionally, there are some built-in aids for commonly used simulations.

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- triangle wave
- rectangular wave
- trapezoidal wave
- ramp step
- arbitrary forms
- XY generator (UI, IU)
- photovoltaic simulation (PV)
- fuel cell simulation (FC)
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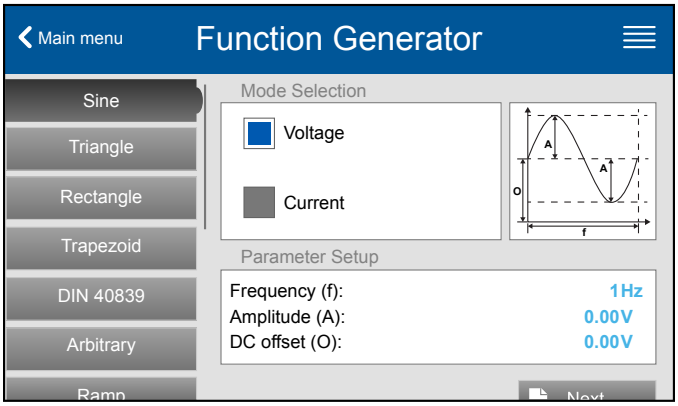
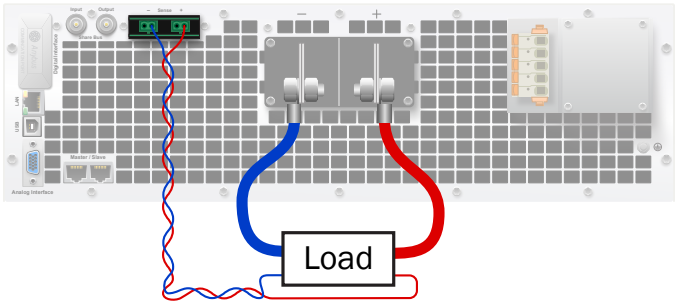



The function generator can be configured by touch panel where common types of wave forms are simplified with a few input variables.

## Voltage Sense Bus

For more accurate constant-voltage operation at the load, the system can, to a certain degree, compensate for voltage loss in the DC cables. mPower includes a voltage "Sense" bus which connects remote voltage sensing to the load. The system recognizes the remote sensing mode automatically, and regulates the output voltage at the load rather than at the DC output connectors.

The voltage sense bus can be used to detect and compensate for voltage loss at the load. This enables the unit to deliver more accurate voltage for critical constant-voltage testing.




## Built-in Hardware Protection

The system includes built-in protections including over temperature, over voltage, over current, over power, and power fail (loss of ac power). Alarm annunciation includes the graphical display, an optional buzzer, some signals on the analog bus, and the ability to collect status from the digital interfaces.

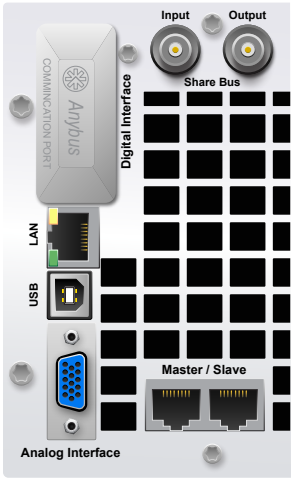
## Discharge Circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output. For no-load or low-load applications, this helps to ensure that a dangerous output voltage can sink to under 60 Vdc in just a few seconds after the DC output has been switched off.

# Remote Control

The mPower DC systems can be remotely controlled several ways. Windows® software called EA Power Control connects over USB to remotely adjust configurations, set application control limits, and monitor the operation of one or more units—a great choice for managing stand-alone units.

LabView VIs are available to integrate the control and



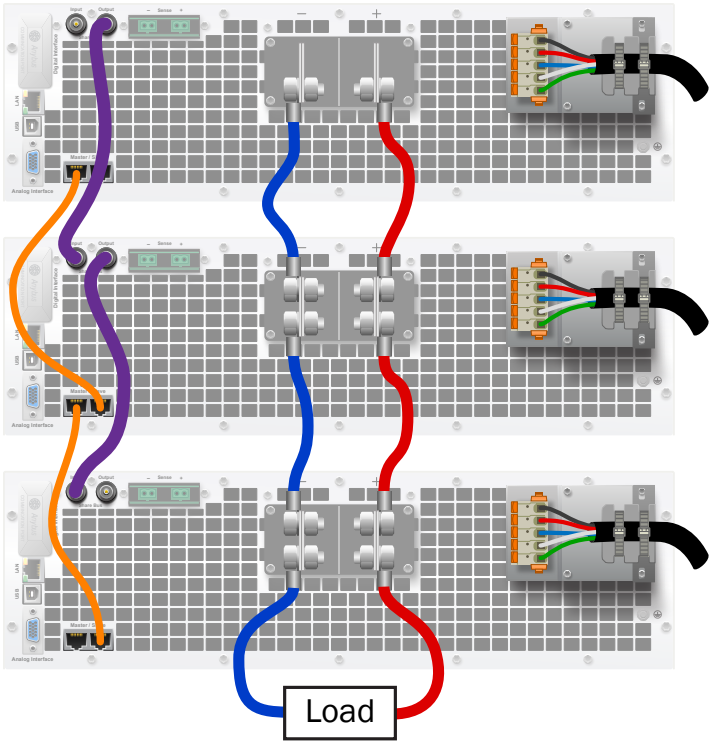

Basic remote control is available via analog interface using 5V or 10V signals. More extensive software-driven remote control is possible using SCPI or Modbus commands over USB or Ethernet. Additional hardware interfaces are available through the flexible Anybus slot which accepts field-exchangeable modules designed for RS232, Ethernet, Modbus TCP, Profinet, CAN, CANopen, and EtherCAT. LabView VIs are also available, and can work on a variety of hardware interfaces. Manual remote configuration and control is available with Windows® desktop software.

monitoring operations of the power supply into a larger LabView environment.

Custom scripts can be created to send Modbus or SCPI commands. Modbus offers control and monitoring capabilities. SCPI offers these and several configuration commands as well. Both Modbus and SCPI can be scripted to operate over Ethernet or USB.

The flexible Anybus port accepts a number of interface modules to facilitate a variety of protocols. (See "mPower™ DC Anybus Modules" on page MPW-49.) Most will use Modbus register command data as a payload wrapped in the host communication protocol.

The analog interface provides 0–5V or 0–10V signals to acquire actual data values. Plus, a number of discrete signals can be used to monitor some alarms, and control some behaviors such as mode selection and DC on/off.




## Parallel Operation

Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (960 kW with 15kW units). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.

## Series Operation

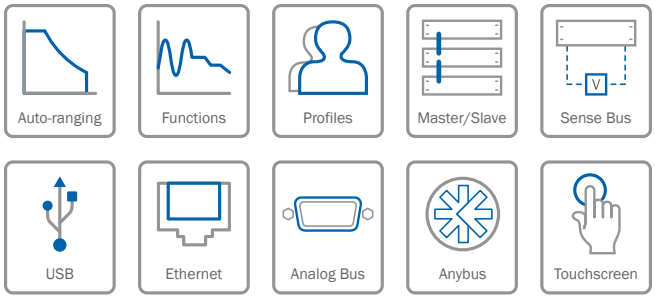
Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.

**5.0** kW

**3U** Rackmount

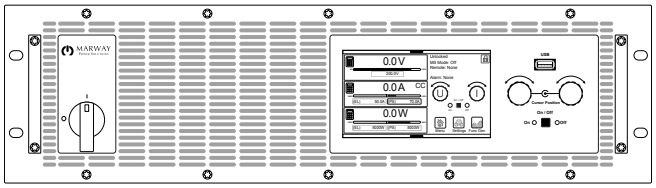
**380** [1]
**480**
1ph Vac

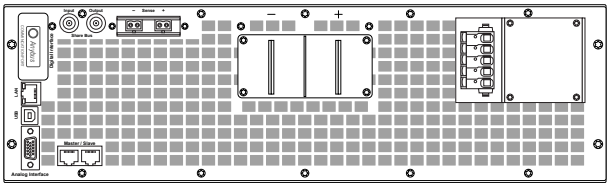
## Models 411-33




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-33-0010-170-004 [2] | 10 | 170 |
| MPW 411-33-0060-170-004 | 60 | 170 |
| MPW 411-33-0080-170-004 | 80 | 170 |
| MPW 411-33-0200-070-004 | 200 | 70 |
| MPW 411-33-0360-040-004 | 360 | 40 |
| MPW 411-33-0500-030-004 | 500 | 30 |
| MPW 411-33-0750-020-004 | 750 | 20 |

Detailed specifications by model can be found in the Operating Guide.





[1] 208 Vac 3-phase input is possible with power derating to 3 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

[2] The 10 Vdc model provides high accuracy for low voltage applications, but yields 1.7 kW, and not 5 kW.

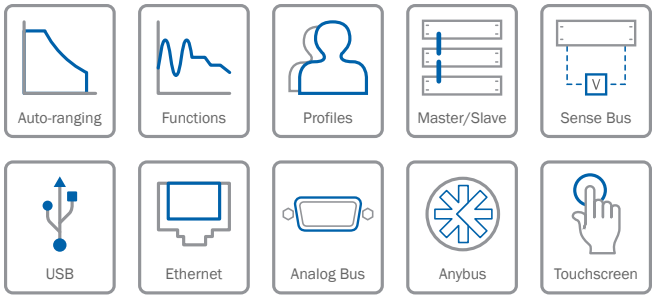
# mPower 411 Series 3U

**10** kW

**3U** Rackmount

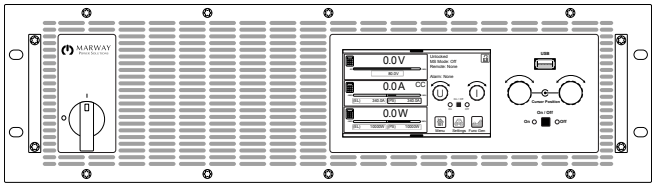
**380** [1]
**480**
3ph Vac

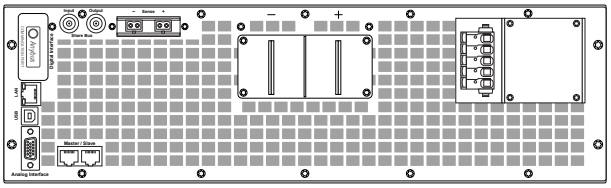
## Models 411-53




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-53-0010-340-004 [2] | 10 | 340 |
| MPW 411-53-0060-340-004 | 60 | 340 |
| MPW 411-53-0080-340-004 | 80 | 340 |
| MPW 411-53-0200-140-004 | 200 | 140 |
| MPW 411-53-0360-080-004 | 360 | 80 |
| MPW 411-53-0500-060-004 | 500 | 60 |
| MPW 411-53-0750-040-004 | 750 | 40 |
| MPW 411-53-1000-030-004 | 1000 | 30 |
| MPW 411-53-1500-020-004 | 1500 | 20 |

Detailed specifications by model can be found in the Operating Guide.





[1] 208 Vac 3-phase input is possible with power derating to 6 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

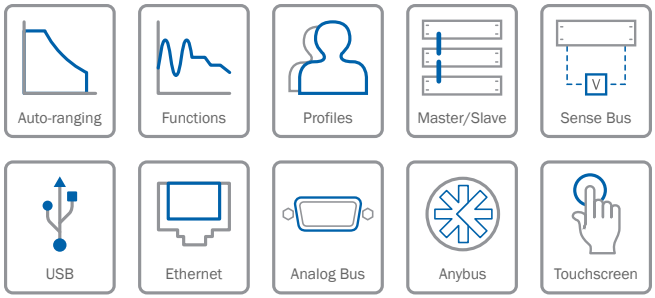
[2] The 10 Vdc model provides high accuracy for low voltage applications, but yields 3.4 kW, and not 10 kW.

**15** kW

**3U** Rackmount

**380 480** [1] 3ph Vac

## Models 411-53




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-53-0010-510-004 [2] | 10 | 510 |
| MPW 411-53-0060-510-004 | 60 | 510 |
| MPW 411-53-0080-510-004 | 80 | 510 |
| MPW 411-53-0200-210-004 | 200 | 210 |
| MPW 411-53-0360-120-004 | 360 | 120 |
| MPW 411-53-0500-090-004 | 500 | 90 |
| MPW 411-53-0750-060-004 | 750 | 60 |
| MPW 411-53-1000-040-004 | 1000 | 40 |
| MPW 411-53-1500-030-004 | 1500 | 30 |
| MPW 411-53-2000-020-004 | 2000 | 20 |

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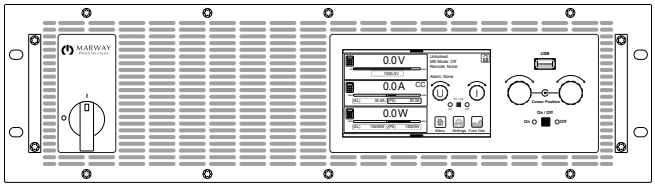
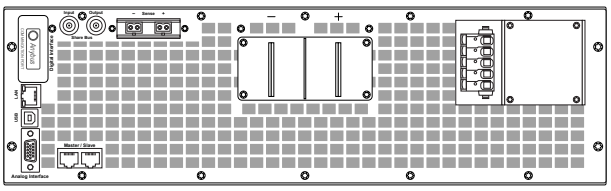




[1] 208 Vac 3-phase input is possible with power derating to 9 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

[2] The 10 Vdc model provides high accuracy for low voltage applications, but yields 5.1 kW, and not 15 kW.

# mPower™ DC Series

## Bidirectional Power Supplies

mPower DC

411

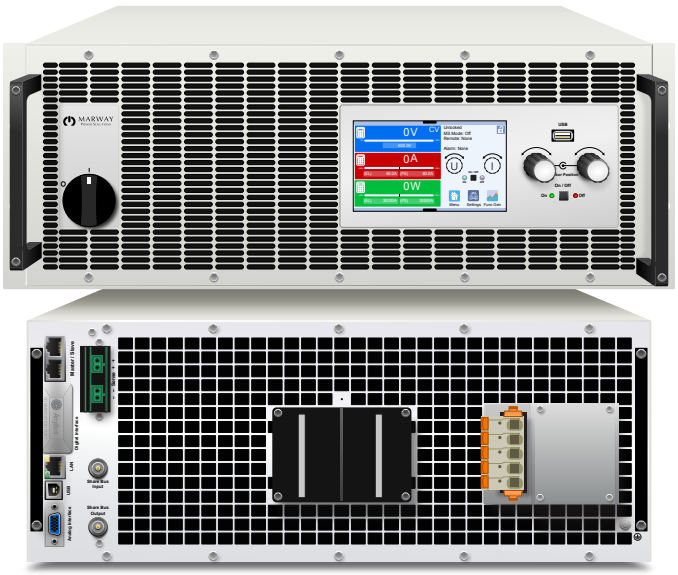
4U

# mPower™ 411 Series 4U

DC Bidirectional Power Supplies

## Convenience, Control, and Power

Marway's lab quality mPower DC bi-directional power supplies provide both source and sink functionality. When acting as a load, energy can be transferred back to the power grid with up to 96% efficiency. The 4U chassis expands the power range to 30 kW. With up to 64 parallel units, this is the highest powered series of the mPower lineup.



### Convenience Highlights

- Touchscreen graphical user interface with two rotary controls (which speed up data entry) allows for complete configuration, control, and monitoring.
- Configure a single control unit to manage and monitor parallel setups with up to 63 additional expansion units.

### Control Highlights

- Automated management of source and sink operation with independant setpoints.
- Function generators for standard wave patterns and custom arbitrary functions in source and sink quadrants.
- Constant voltage, constant current, constant power, and constant resistance modes.
- Output voltage Sense Bus monitors voltage at the source load instead of the output terminals to compensate for minor losses in output cables.
- Daisy chain Sense bus regulates current load sharing among parallel-connected units.
- USB for remote control using either desktop Windows® software, LabView®, or your own custom scripting of Modbus and/or SCPI commands.
- Analog Interface for remote control and monitoring of key parameters using a PLC, or your own control circuitry.
- Anybus digital interface accepts modules for RS232, Ethernet, CAN, CANopen, Profibus, Profinet, ModbusTCP, and EtherCAT.

### Power Highlights

- 30 kW models, up to 1,000 amps, or 2,000 Vdc
- Active power factor correction of input power.
- Autoranging power output enables the system to deliver 100% power over a wide range of voltage and current.
- Parallel output connectivity of up to 64 units creates a total power output of up to 1,920 kW. (Pre-designed rack infrastructure for parallel setups available as an option.)

## 30 kW

| | |
|---|---|
| 10 Vdc | 1000 Amps |
| 60 Vdc | 1000 Amps |
| 80 Vdc | 1000 Amps |
| 200 Vdc | 420 Amps |
| 360 Vdc | 240 Amps |
| 500 Vdc | 180 Amps |
| 750 Vdc | 120 Amps |
| 920 Vdc | 125 Amps |
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| 1500 Vdc | 60 amps |
| 2000 Vdc | 40 amps |

The 10 Vdc models is rated 10 kW.

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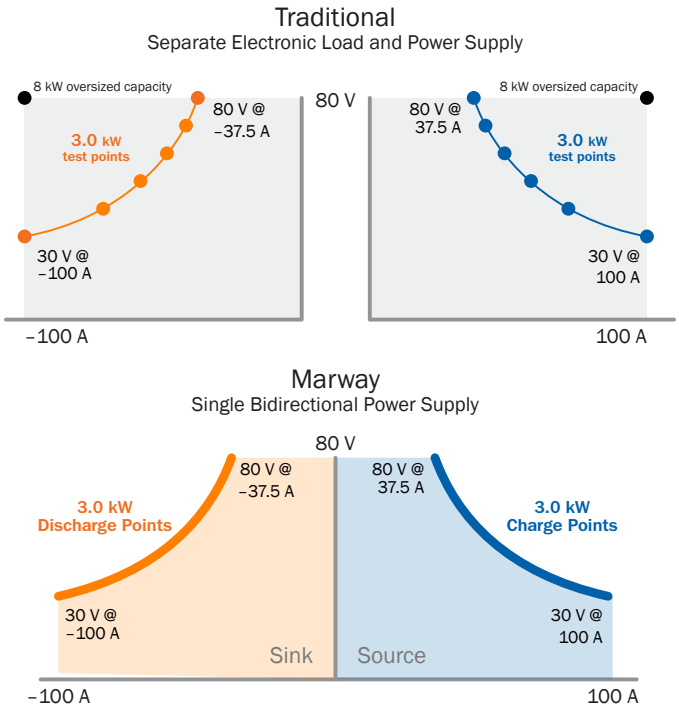


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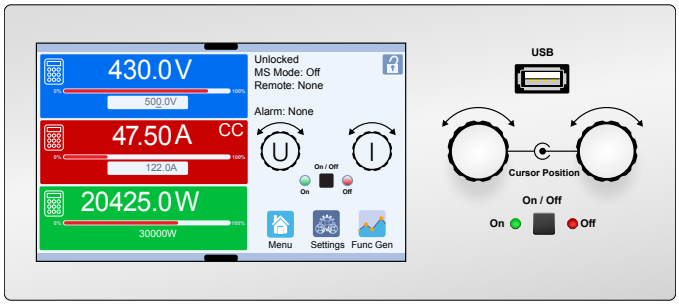


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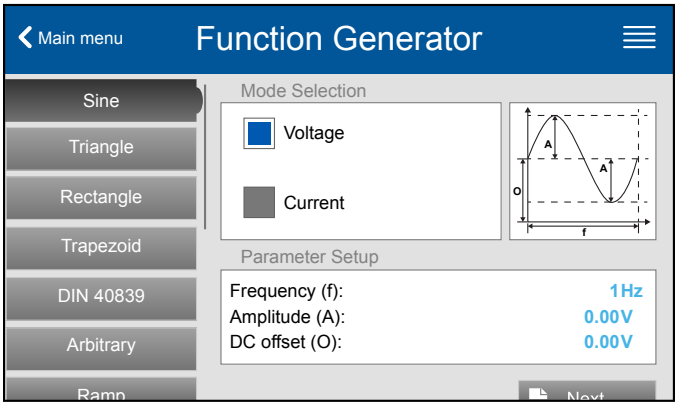


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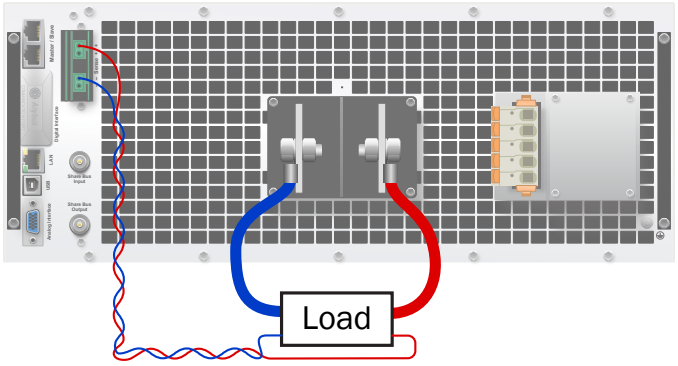


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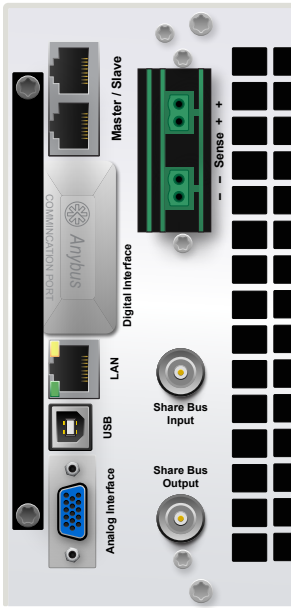

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Up to 64 units can be wired in parallel in order to create a single-functioning system with higher total current, and thus higher power (1920 kW). With the latest generation systems, this parallel setup can be comprised of identical units, or units of the same voltage but different power ratings. The current and power will be automatically proportionately shared.

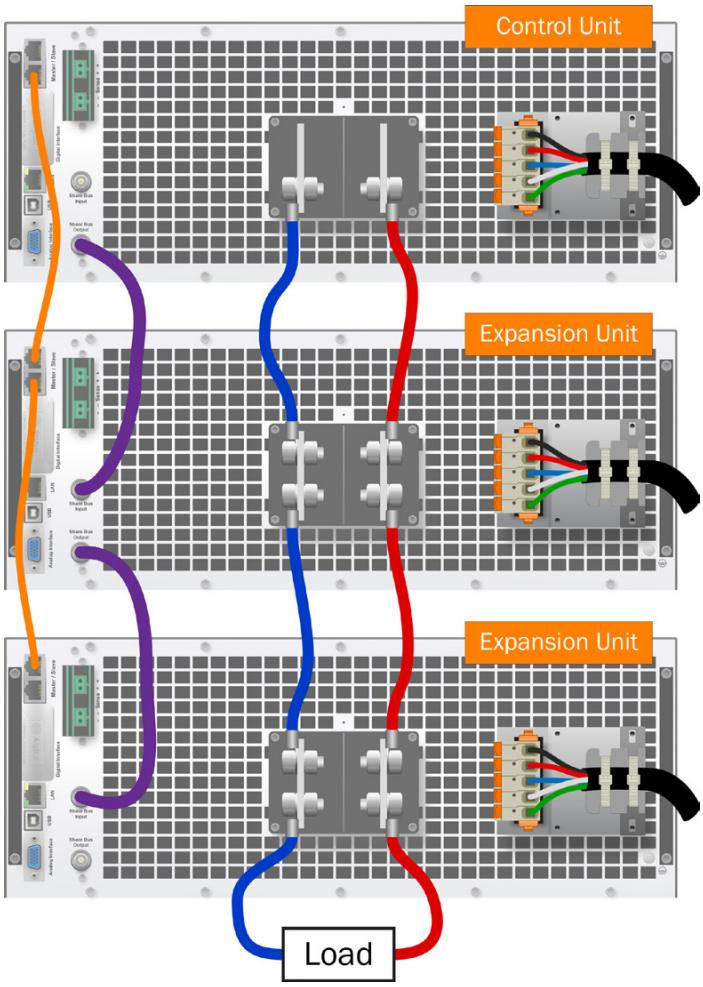
There are two buses involved in the operation of multiple units in parallel: a Share bus, and a Master-Slave bus. Both buses are connected when operating multiple units in parallel—with one unit designated as a control unit, and additional units designated as expansion units.

The Share bus primarily manages the sharing of current load between multiple units. The Master-Slave bus facilitates a greater sharing of data between the control and expansion units allowing true single-unit control after the primary role of each unit has been configured.

The control unit software automatically sums the current and power capacity, and data entry limits are adjusted. Various status data for the whole setup is also shown on the control unit.

## Series Operation

Series connection is also possible to increase the voltage potential across units. Each individual unit is operated independently (there is no single control unit), but where a rare need for higher voltage arises, existing lower voltage system can be combined for greater operational flexibility.



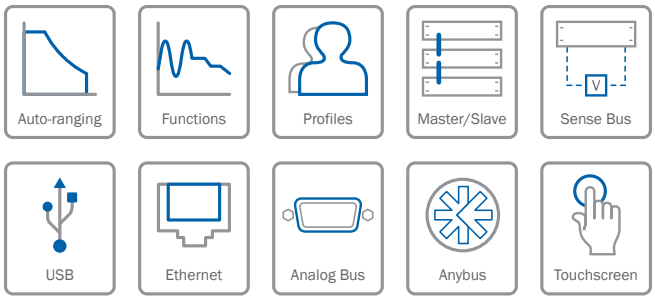
# mPower 411 Series 4U

**30** kW

**4U** Rackmount

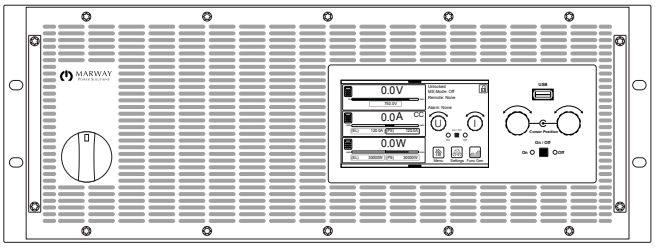
**380**[1]
**480**
3ph Vac

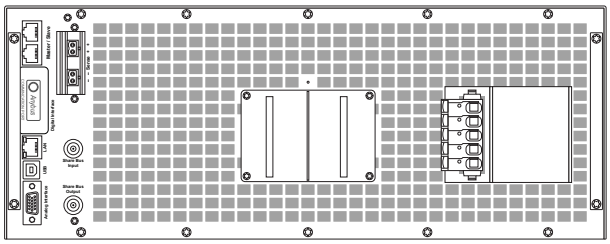
## Models 411-54




| Model Number | Volts | Amps |
|---|---|---|
| MPW 411-54-0010-1000-004 | 10 | 1000 |
| MPW 411-54-0060-1000-004 | 60 | 1000 |
| MPW 411-54-0080-1000-004 | 80 | 1000 |
| MPW 411-54-0200-420-004 | 200 | 420 |
| MPW 411-54-0360-240-004 | 360 | 240 |
| MPW 411-54-0500-180-004 | 500 | 180 |
| MPW 411-54-0750-120-004 | 750 | 120 |
| MPW 411-54-0920-125-004 | 920 | 125 |
| MPW 411-54-1000-080-004 | 1000 | 80 |
| MPW 411-54-1500-060-004 | 1500 | 60 |
| MPW 411-54-2000-040-004 | 1500 | 40 |

Detailed specifications by model can be found in the Operating Guide.





[1] 208 Vac 3-phase input is possible with power derating to 18 kW. We generally do not promote use of 208 Vac, but it can be used if a need arises.

[2] The 10 Vdc model provides high accuracy for low voltage applications, but yields 10 kW, and not 30 kW.

# mPower™ DC Series

## Programmable Power Supplies

mPower DC

AB

# mPower™ DC Anybus Modules

## Field Replaceable Modules for 311 and 411 Series Anybus Slot

### RS232

- Type: IF-AB-RS232
- Transfer speed: max. 115200 baud
- D-sub, male, 9 pole for null modem cable
- SCPI and Modbus RTU protocol

### Ethernet (1 port / 2 ports)

- Type: IF-AB-ETH1P
- Type: IF-AB-ETH2P
- Transfer speed: 10/100MBit/s
- Transparent socket
- 1x RJ45 socket, 8 pole (1P)
- 2x RJ45 socket 8 pole, with Ethernet switch (2P version)

### Profibus

- Type: IF-AB-PBUS
- Transfer speed: max. 12MBit/s
- Full DPV1 slave
- GSD (Generic Station Device) file included
- 1x D-Sub socket, female, 9 pole

### Profinet I/O (1 port / 2 ports)

- Type: IF-AB-PNET1P
- Type: IF-AB-PNET2P
- Transfer speed: 100MBit/s, full duplex
- GSDML included
- 1x RJ45 socket, 8 pole (1P)
- 2x RJ45 socket 8 pole, with Ethernet switch (2P version)

### Modbus TCP (1 port / 2 ports)

- Type: IF-AB-MBUS1P
- Type: IF-AB-MBUS2P
- Transfer speed: 10/100MBit/s
- 256 Bytes in/out
- Additional Modbus RTU over Ethernet support
- 1x RJ45 socket, 8 pole (1P)
- 2x RJ45 socket 8 pole, with Ethernet switch (2P version)

### CAN

- Type: IF-AB-CAN
- Transfer speed: max. 1MBit/s
- CAN standard 2.0 A and 2.0 B compatible
- 1x D-Sub socket, male, 9 pole

### CANopen

- Type: IF-AB-CANO
- Transfer speed: max. 1MBit/s
- Basic CANopen slave
- Auto-baud
- EDS (Electronic Data Sheet) included
- 1x D-Sub socket, male, 9 pole

### EtherCAT

- Type: IF-AB-ECT
- Basic EtherCAT slave
- CANopen protocol (CoE)
- PDOs and SDOs
- Diagnostic LEDs on the body

## Compatibility

# 2U/3U/4U

311 and 411 Series

| Description | Part Number |
|---|---|
| RS232 Serial Interface | MPW OPT3-001 |
| Profibus DPV1- Interface | MPW OPT3-002 |
| CANopen Interface | MPW OPT3-003 |
| Modbus-TCP 1 Port Interface | MPW OPT3-004 |
| Modbus-TCP 2 Port Interface | MPW OPT3-005 |
| Ethernet/IP 1 Port Interface | MPW OPT3-006 |
| Ethernet/IP 2 Port Interface | MPW OPT3-007 |
| Profinet-IO 1 Port Interface | MPW OPT3-008 |
| Profinet-IO 2 Port Interface | MPW OPT3-009 |
| CAN Interface | MPW OPT3-010 |
| EhterCAT Interface | MPW OPT3-011 |

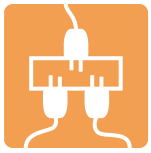
# mPower™ DC Series
## Programmable Power Supplies

| Description | Part Number |
|---|---|
| In-Depth Calibration Certificate | MPW OPT3-012 |
| Control Software | MPW OPT3-013 |
| Multi-seat License (5) (unlock code) | MPW OPT3-014 |
| 3 Years Extended Warranty | MPW OPT3-015 |
| 5 Years Extended Warranty | MPW OPT3-016 |

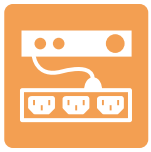
mPower DC
Options

**Optima™ PDUs**
Custom and Standard
for Ac, Dc, 400Hz

**mPower™ PPSs**
Programmable DC
power supplies



**TwinPower™ ATSs**
Auto Transer Switches
for power redundancy



**Commander™ UCPs**
Remote and EPO
control panels

**PowerPlus™**
Turn-key rack
power integration

Contact Our Power Specialists

info@marway.com • 800-462-7929

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1721 S. Grand Ave., Santa Ana, CA 92705

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