Power Supplies & Electronic Circuit Breakers

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DC Power Supplies

What is a power supply?
Industrial power supplies convert AC power to DC power for manufacturing and process equipment such as PLCs, HMIs, relays, sensors, actuators, and drives. Most common are linear power supplies and switching power supplies. The main difference between switching and linear power supplies is how they convert AC to DC output voltage. Switching power supplies first rectify the AC line supply and then transform it, while linear power supplies first transform the AC supply, then rectify it. Switching power supplies, intended for general use in automation, have better efficiency, less heat loss, wider input voltage ranges, and smaller size and weight. Linear power supplies have fewer harmonics and have more precise output regulation.

Considerations when selecting a power supply:
- Input voltage
- Output voltage
- Output current
- Mounting
- Environmental ratings

Input Voltage
The typical input voltage range for a power supply is 120-240VAC single-phase. However, power supplies are available that accept 3-phase inputs; some even take DC inputs.

Output Voltage
Power supplies have standard DC output voltages such as 5, 12, 24, and 48VDC. They usually come with an adjustment potentiometer to trim the output by approximately +/- 10%, and a built-in DC OK LED indicator and contact to provide alerts for overload conditions.

Output Current
When DC power is required, it is crucial to calculate the worst-case current draw of all devices powered from the DC supply. Some loads require a higher starting current which can be several times their nominal operating full-load current. For example, a capacitive load appears as a short circuit with a high current draw until the capacitor reaches full charge. When selecting a power supply, it is critical to account for this additional inrush current. Some power supplies provide short-term reserve power to handle this extra load, eliminating the need for oversized power supplies and their associated costs.

Applications with high output requirements call for power supplies that can handle power peaks. High-efficiency power supplies reduce losses, save cabinet space, and increase energy savings. Intelligent load management reliably powers equipment and protects it at the same time. Parameterizable overload behavior provides configurable current alerts for overload conditions.

Mounting
Power supplies are typically DIN-rail mounted; however, open frame and panel mount power supplies offer more flexibility because they can easily be screw-mounted in three different orientations. Machine mount supplies mount directly to the equipment without requiring an enclosure, even when used outdoors.

Environmental Ratings
Some power supplies are Class 1, Div 2 rated, making them suitable for use in hazardous locations. Others offer rugged machine mount options with IP67 and NEMA 4X ratings for harsh outdoor environments. Encapsulated power supplies come in ultra-compact, low-profile housings and are ideal for space-limited applications. Open frame power supplies are very cost-effective; however, they have little or no protection from the elements. They must be mounted in a suitable enclosure or have a conformal coating applied to protect them from dust, humidity, and contamination.

Overload, Overvoltage and Thermal Protection
Many power supplies have built-in protection for transient surges, overloads, short circuits, and overvoltage protection. NEC Class 2 power supplies limit voltage and current output, making them less of a shock and fire hazard. Using NEC Class 2 circuits means reduced and less expensive wiring methods and over-current protection requirements. Also, the testing and approval process is much easier.

DC Ripple
Ripple is the amplitude of the AC component that rides on a DC voltage output. A typical rating for most applications is 100mV peak-to-peak. It is necessary to determine the amount of ripple that powered devices can tolerate and then select a power supply that meets this stringent requirement.

Output De-rating for Power Supplies
Manufacturers offer a way to extend a power supply’s input voltage and temperature rating when it is run at a decreased capacity. As a result, they often publish derating curves in their specifications which illustrate the relationship between temperature or input voltage and output capacity.

Output Load De-rating vs. Surrounding Air Temperature
Power supplies have a maximum temperature threshold for 100% output capacity. It is common for manufacturers to allow a derating for temperatures above this threshold. Power supplies are affected by temperature and will fail if used above their maximum temperature rating. As a result, manufacturers provide a derating curve to show the relationship between temperature and safe output level.

The following illustration shows the derating curve for a RHINO PRO PSD24-120-L power supply. The power supply must be derated from 100% output at 50 °C [122 °F] to 50% at 70 °C [158 °F] horizontally mounted. However, if vertically mounted, it is derated from 100% at 60 °C [140 °F] to 75% at 70 °C [158 °F].

Output Load De-rating vs. Input Voltage
A derating curve shows the relationship between the input voltage and the maximum allowable output level. Manufacturers often require derating when the input voltage falls below the minimum threshold specified. The following curve shows the derating curve for a RHINO TOUGH PSX-24-120 power when the input voltage drops below 120 VAC.

Following these derating practices will increase the life and reliability of a power supply and prevent premature failure.
Switching power supplies at great prices!

**DIN Rail Mount Power Supplies**

**PSL Series Low-Profile Power Supplies**
- RHINO PSL series power supplies are plastic low-profile switching supplies that are UL508 listed and UL60950-1 recognized for NEC Class 2 compliance in industrial, commercial, and residential applications.
  - Universal 90 - 264 VAC/125-375 VDC input voltage and output current limitation
  - 5, 12, and 24 VDC adjustable outputs
  - Output power ratings of 7.5 to 91.2 Watts
  - Plastic housed low-profile form factor
  - *PSL-12-090 is not NEC Class 2*

**PSV Series Value Power Supplies**
- The RHINO PSV value series offers economical power supplies in a wide selection of voltage and wattage ranges. The 15-100 W models feature ultra-compact plastic housings and are NEC Class 2 compliant.
  - Universal 85-264 VAC input voltage
  - 5, 12, 24, and 48 VDC output voltage
  - Ultra-compact sizes available
  - Up to 89% efficiency
  - Plastic or metal housings

**PSC Series Low-Profile Power Supplies**
- RHINO PSC series power supplies are plastic low-profile housed switching supplies available in 5, 12, and 24 VDC adjustable output models. They are UL508 listed and UL1310 recognized for NEC Class 2 compliance in industrial, commercial, and residential applications.
  - Universal 85 to 264 VAC input voltage and output current limitation
  - 5, 12, and 24 VDC adjustable outputs
  - Plastic housed, low-profile

**PSB-S Series Power Supplies**
- RHINO SELECT PSB-S series power supplies offer high performance and reliability at a low cost. They feature rugged aluminum housings, conformal coated circuit boards, and select models offer approval for Class I, Division 2 hazardous locations.
  - Universal input, 85-264 VAC / 120-375 VDC single-phase or 320-600 VAC three-phase input
  - 12, 24, and 48 VDC outputs, 15 to 960 Watts
  - Overload, overvoltage and thermal protection
  - 24 VDC output, single phase input models for Class 1 Div 2 hazardous locations
  - 24 VDC [adjustable], 40A (960W) output, 320-600 VAC 3-phase model

**PSR Series Power Supplies**
- RHINO PSR series DIN rail mount high-efficiency industrial power supplies feature an ultra-slim design in a rugged aluminum housing. These economical power supplies offer overcurrent protection in constant current mode, making them suitable for charging applications.
  - 120/240 VAC single-phase or 480 VAC three-phase input options
  - Up to 40A (960W) output current
  - 24-28 VDC adjustable output voltage
  - Up to 99% efficiency
  - Built-in DC OK relay and LED indicator
  - IP20 finger-safe protection rating
  - Overload, overvoltage and thermal protection
  - 24 VDC output, single phase input models for Class 1 Div 2 hazardous locations
  - 24 VDC (adjustable), 40A (960W) output, 320-600 VAC 3-phase model

**PSM Series Industrial Grade Power Supplies**
- RHINO SELECT PSM series power supplies are industrial grade switching DC output supplies with a sturdy steel case to withstand harsh environments. Autoselect inputs for 115 VAC or 230 VAC and international agency approvals make the RHINO PSM series suitable for worldwide use.
  - Universal 100/230 VAC input voltage
  - Industrial grade
  - Sturdy metal case
  - 12 VDC from 78 to 156 Watts
  - Overload and overvoltage protection

**PSP Series Slimline Power Supplies**
- RHINO SELECT PSP series slimline power supplies are plastic housed ultra-compact switching power supplies that offer an excellent price/performance ratio. They feature universal inputs, adjustable DC voltage outputs, and low output ripple.
  - Universal input 120/240 VAC or 85-264 VDC
  - 20 to 960 Watts
  - 5 VDC, 20 W, 4 A output
  - 12 VDC from 24 to 120 Watts

**PSB-S Series Power Supplies**
- RHINO SELECT PSB-S series power supplies offer high performance and reliability at a low cost. They feature rugged aluminum housings, conformal coated circuit boards, and select models offer approval for Class I, Division 2 hazardous locations.
  - Universal input, 85-264 VAC / 120-375 VDC single-phase or 320-600 VAC three-phase input
  - 12, 24, and 48 VDC outputs, 15 to 960 Watts
  - Overload, overvoltage and thermal protection
  - 24 VDC output, single phase input models for Class 1 Div 2 hazardous locations
  - 24 VDC [adjustable], 40A (960W) output, 320-600 VAC 3-phase model

**Starts at $37.00 (PSV5-15S)**

**Starts at $56.00 (PSC-05-012)**

**Starts at $29.00 (PSL-12-010)**

**Starts at $123.00 (PSP05-020S)**

**Starts at $69.50 (PSB24-060S)**

**Starts at $76.00 (PSR-24-120)**

**Starts at $49.50 (PSM24-090S)**

**Starts at $49.50 (PSB-S Series)**

**Starts at $76.00 (PSR Series)**

**For the latest prices, please check AutomationDirect.com.**
WAGO Pro2 series high-efficiency power supplies reduce losses, save cabinet space, and increase energy savings. With TopBoost, PowerBoost, and configurable overload behavior, the WAGO Pro2 power supply protects equipment and provides intelligent current and switching modes. The free configuration software includes long-term monitoring for preventative maintenance and service, preventing costly downtime.

Starting at $179.00

Pro2 Configuration and Monitoring Software

- TopBoost provides a 600% current pulse for 15 milliseconds which safely trips downstream circuit breakers, dropping out problem circuits with high overload or short-circuit conditions
- PowerBoost allows 150% output current for five seconds to reliably power high in-rush loads
- Configurable overload behavior
- Configurable digital signal input and output, optical status indication, function keys
- Free configuration and monitoring software
- Suitable for both parallel and series operation
- Single and three-phase models

For the latest prices, please check AutomationDirect.com.
Open Frame Power Supplies

Open frame switching power supplies are a compact, inexpensive option for DC power needs. With up to 90 Watts of output power, these flexible power supplies require only convection cooling for full-power operation. Units with UPS functionality are available.

PSFA Series
Offers battery switchover capability
Output Power: 60 W

FA Series
Hazardous location rating at a low cost
Output Power: 30 to 89 W

Rugged Machine Mount Power Supplies

PSX Series
Rugged RHINO TOUGH series machine mount power supplies are perfect for applications that require a dependable DC power supply in harsh environments.
- Up to 94.4% efficiency
- 24 VDC output
- Universal input 90 to 264 VAC
- IP67 protection rating

PSRT Series
RHINO TOUGH PSRT series machine mount power supplies are designed for industrial applications outside of the control cabinet. These field-mountable power supplies offer a compact footprint and allow machine mounting near the load.
- Up to 94.4% efficiency
- 24 VDC output
- Universal input 90 to 264 VAC
- IP67 protection rating

Encapsulated Chassis Mount Power Supplies

Fully encapsulated power supplies provide maximum environmental protection for reliable DC power. These low-profile, plastic-housed units, with a universal input of 120/240 VAC, are available with single (up to 60W) or dual outputs (up to 30W).

PSE Series
A cost-effective solution for commercial and industrial applications in dirty and dusty environments
Output Power: 15 to 60 W

Enclosed Chassis Power Supplies

RHINO enclosed chassis-mount power supplies offer high performance for a low cost. All units are overload, overvoltage, and thermally protected, with rugged aluminum cases that mount in various physical orientations. Units with UPS functionality are available.

PSS-S Series
Reliable power at a low cost
Output Power: 35 to 100 W

PSS-U Series
Offers battery switchover capability
Output Power: 151 W

### Switching Power Supply Feature Comparison

<table>
<thead>
<tr>
<th>Power Supply Series</th>
<th>Functionality</th>
<th>Price ($-$$$$)</th>
<th>Case</th>
<th>Mount</th>
<th>UL</th>
<th>NEC Class 2 Models</th>
<th>Hazard Rated</th>
<th>Output Power (W)</th>
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<tbody>
<tr>
<td>PST-S</td>
<td>BASIC $</td>
<td>Metal Panel</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35 - 180</td>
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<tr>
<td>PSL</td>
<td>BASIC $</td>
<td>Low-Profile, Plastic Din Rail</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.5 - 91.2</td>
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<tr>
<td>PSS</td>
<td>BASIC $</td>
<td>Metal/Plastic Din Rail</td>
<td>5</td>
<td></td>
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<td></td>
<td></td>
<td>15 - 480</td>
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<tr>
<td>PSE</td>
<td>BASIC $$$</td>
<td>Compact, Plastic, Encapsulated Din Rail/Panel</td>
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<td></td>
<td></td>
<td>15 - 460</td>
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<tr>
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<td>BASIC $$</td>
<td>Metal Din Rail</td>
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<td>120 - 960</td>
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<td>Open Frame Din Rail</td>
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<td>90 - 120</td>
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<td>BASIC $</td>
<td>Steel Panel</td>
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<td>35 - 180</td>
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<td>PSF*</td>
<td>STANDARD $</td>
<td>Metal Panel</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35 - 180</td>
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<tr>
<td>PSC</td>
<td>STANDARD $</td>
<td>Low-Profile, Plastic Din Rail</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>35 - 180</td>
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<tr>
<td>PSB</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>35 - 180</td>
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<td>PSP</td>
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<td>35 - 180</td>
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<td>35 - 180</td>
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<td>PSM</td>
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<td>Metal Din Rail</td>
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<td></td>
<td></td>
<td>35 - 180</td>
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<td>PSSP</td>
<td>PERFORMANCE $</td>
<td>Metal/Plastic Din Rail</td>
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<td>35 - 180</td>
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<tr>
<td>PSD</td>
<td>PERFORMANCE $</td>
<td>Metal/Plastic Din Rail</td>
<td>5</td>
<td></td>
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<td>35 - 180</td>
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<tr>
<td>PSH</td>
<td>PERFORMANCE $</td>
<td>Metal Din Rail</td>
<td>5</td>
<td></td>
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<td></td>
<td></td>
<td>35 - 180</td>
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<tr>
<td>MADO 2700</td>
<td>PERFORMANCE $</td>
<td>Metal/Plastic Din Rail</td>
<td>5</td>
<td></td>
<td></td>
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<td></td>
<td>35 - 180</td>
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<tr>
<td>PSSX</td>
<td>TOUGH $</td>
<td>Metal-Enclosed Chassis</td>
<td>5</td>
<td></td>
<td></td>
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<td></td>
<td>96 - 120</td>
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<tr>
<td>PSRT</td>
<td>TOUGH $</td>
<td>Metal-Enclosed Chassis</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>91.2 - 192</td>
</tr>
</tbody>
</table>

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**Linear Power Supplies**
Regulated and unregulated open frame linear power supplies offer several advantages, including low output ripple, high output voltage accuracy, and low output noise. They are relatively simple in design and generate minimal electromagnetic interference (EMI) due to the absence of high-frequency switching components.

**Regulated Open Frame Linear Power Supplies**
International Power IH series regulated open frame linear power supplies are designed to operate over a wide range of AC power sources. They maintain a constant output voltage, regardless of changes in input voltage or load variations, and offer better voltage regulation than other types of power supplies, ensuring accurate and consistent power delivery.

- 5, 12 to 15, ±12, ±15, and 24 VDC output options
- 100/120/208/230-240 VAC input ranges
- Overvoltage protection on 5 VDC outputs
- +/-0.05% regulation
- Made in USA

**Unregulated Open Frame Linear Power Supplies**
International Power IP500U series unregulated open frame linear power supplies are designed for low-cost, high-current applications where full regulation is not required. These rugged, highly reliable power supplies are ideal for powering solenoids, relays, DC motors, battery chargers, and DC-to-DC converters.

- 36, 48, and 75 VDC output options
- Isolated 100/240 VAC input
- Secondary fuse protection
- Made in USA

**SureStep Unregulated Open Frame Linear Power Supplies**
SureStep unregulated open frame linear power supplies offer full load outputs of 32 VDC/4A, 48 VDC/5A, 48 VDC/10A, 70 VDC/5A, and are perfectly suited to provide power for stepper drives and stepper motors.

- 120/240 VAC selectable input
- Less susceptible to motor regeneration than switching supplies
- All models have an additional 5VDC, 500 mA regulated logic supply with electronic overload protection
- Fusing included for both incoming AC and outgoing DC

**Starting at $52.50**
RHINO and WAGO DIN-rail mount DC-to-DC converters accept a wide range of DC source inputs and convert them to the required voltage levels. Slim-case models are perfect for space limited applications; an isolated converter helps eliminate ground loops.

**Starting at $75.00**
International Power IH series regulated open frame linear power supplies are designed to operate over a wide range of AC power sources. They maintain a constant output voltage, regardless of changes in input voltage or load variations, and offer better voltage regulation than other types of power supplies, ensuring accurate and consistent power delivery.

**Starting at $367.00**
International Power IP500U series unregulated open frame linear power supplies are designed for low-cost, high-current applications where full regulation is not required. These rugged, highly reliable power supplies are ideal for powering solenoids, relays, DC motors, battery chargers, and DC-to-DC converters.

**Starting at $159.00**
SureStep unregulated open frame linear power supplies offer full load outputs of 32 VDC/4A, 48 VDC/5A, 48 VDC/10A, 70 VDC/5A, and are perfectly suited to provide power for stepper drives and stepper motors.

**Starting at $159.00**
SureStep unregulated open frame linear power supplies offer full load outputs of 32 VDC/4A, 48 VDC/5A, 48 VDC/10A, 70 VDC/5A, and are perfectly suited to provide power for stepper drives and stepper motors.

**Starting at $159.00**
SureStep unregulated open frame linear power supplies offer full load outputs of 32 VDC/4A, 48 VDC/5A, 48 VDC/10A, 70 VDC/5A, and are perfectly suited to provide power for stepper drives and stepper motors.

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SureStep unregulated open frame linear power supplies offer full load outputs of 32 VDC/4A, 48 VDC/5A, 48 VDC/10A, 70 VDC/5A, and are perfectly suited to provide power for stepper drives and stepper motors.

**Reliable DC-to-DC Converters**
What is a DC-to-DC converter?
DC-to-DC converters provide reliable, overload and short-circuit protected, adjustable outputs when an application requires a different DC voltage than what is readily available. They have excellent voltage regulation, taking a varying input voltage and providing a stable output voltage. They isolate sensitive electronic equipment and can filter spikes, noise, and ripple in problem circuits.

**DIN Rail Mount DC-to-DC Converters**
**Starting at $52.50**
RHINO and WAGO DIN-rail mount DC-to-DC converters accept a wide range of DC source inputs and convert them to the required voltage levels. Slim-case models are perfect for space limited applications; an isolated converter helps eliminate ground loops.
Battery Control Modules

Starting at $34.50

The battery control module, when combined with a DC power supply, makes a perfect DC UPS (uninterruptible power system) by providing the means to charge and monitor an external lead acid battery.

- For use with 24VDC or 48VDC (PSH only) bus voltages; 12 or 24 volt battery
- Redundant inputs or can be paired with RHINO redundancy modules for more reliable power systems
- Battery protection for over voltage, over current, over temperature, deep discharge, reverse connection and battery overcharge
- 7.5, 10, 15 and 40A ratings
- DIN rail mounted
- Universally compatible battery controller modules available

### Encapsulated Chassis Mount DC-to-DC Converters

Encapsulated DC-to-DC converters provide maximum environmental protection for reliable DC power. RHINO PSE Series DC-to-DC converters offer ultra-wide input voltage ranges that allow these models to operate from all popular DC supply voltage systems.

**PSE Series DC-to-DC Converters**

RHINO PSE Series DC-to-DC converters offer ultra-wide input voltage ranges that allow these models to operate from all popular DC supply voltage systems.

**PSR Series DC-to-DC Converters**

RHINO PRO industrial DC-to-DC converters feature robust protection ratings, such as high EMC immunity, shock and vibration resistance, and thermal shock resistance. They provide constant current output at 100% load and are ideal for battery charging applications.

**Battery Control Module Feature Comparison**

<table>
<thead>
<tr>
<th>Series</th>
<th>Price</th>
<th>Case</th>
<th>Compatibility</th>
<th># of Inputs</th>
<th>Battery Type</th>
<th>Temperature Sensor Compatible</th>
<th>UL</th>
<th>Output Voltage/Amp/Power Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td>$66.00</td>
<td>Metal</td>
<td>Universal</td>
<td>One power supply</td>
<td>24V sealed lead acid</td>
<td>X</td>
<td>24VDC / 10A / 360W</td>
<td></td>
</tr>
<tr>
<td>PSL</td>
<td>$34.50</td>
<td>Low-Profile, Plastic</td>
<td>Universal</td>
<td>One power supply</td>
<td>24V sealed lead acid</td>
<td>X</td>
<td>24VDC / 20A / 240W</td>
<td></td>
</tr>
<tr>
<td>PSM</td>
<td>$196.00</td>
<td>Metal</td>
<td>Requires RHINO PSM24 power supply</td>
<td>One power supply</td>
<td>24V sealed lead acid</td>
<td>X</td>
<td>24VDC / 15A / 360W</td>
<td></td>
</tr>
<tr>
<td>PSH</td>
<td>$242.00</td>
<td>Metal</td>
<td>Universal</td>
<td>Redundant inputs for two independent power supplies</td>
<td>12V sealed lead acid</td>
<td>X</td>
<td>24VDC / 15A / 360W, 48VDC / 7.5A / 300W</td>
<td></td>
</tr>
</tbody>
</table>

## Specialty Modules

RHINO specialty modules for DC power supplies include redundancy, buffer, and battery control modules to provide steady, reliable power even through a power failure. Build a backup system or DC UPS with these practical, low-cost modules.
Dealing with Low-voltage Power Issues

When a power failure brings a manufacturing process down, it can cost thousands of dollars. As a result, companies turn to redundancy modules, buffer modules, and battery backup systems to protect their sensitive electronic equipment from power issues. Do not offer power loss protection. Redundant systems fail when the main power is lost.

Redundancy Modules

In a critical process, a power supply failure can be a serious concern, even if the facility has stable incoming power. In this case, a wise solution would be to use a redundancy module. Redundancy modules monitor parallel power supplies and switch to the backup when a failure occurs. The main drawback to using redundancy systems is they do not offer power loss protection. Redundant systems fail when the main power is lost.

Buffer Modules

Starting at $129.00

The buffer module will maintain the output voltage of a 24 VDC power supply after brownouts or voltage dips for up to 4 seconds depending on load.

- Corrosion-resistant aluminum housing available
- Connect modules in parallel to increase buffering time
- Class I Division 2 hazardous location ratings offered
- Storage capacity does not deteriorate over the lifetime of the unit
- Start buffering voltage adjustment (switch or potentiometer)
- Alarm contact for operation monitoring
- Remote on/off

### Buffer Module Feature Comparison

<table>
<thead>
<tr>
<th>Series</th>
<th>Price</th>
<th>Buffer time</th>
<th>Case</th>
<th>Mount</th>
<th>Hazardous Location Rated</th>
<th>Protection Type</th>
<th>Output Voltage/Amp Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td>$129.00</td>
<td>250 msec hold-up at 20A or 5 sec at 1A</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>✓</td>
<td>Overvoltage, Overcurrent</td>
<td>24VDC / 20A</td>
</tr>
<tr>
<td>PSN</td>
<td>$231.00</td>
<td>230 msec hold-up at 25A or 4 seconds at 1.2A</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>X</td>
<td>X</td>
<td>24VDC / 25A</td>
</tr>
</tbody>
</table>

Redundancy Modules

Starting at $41.00

The RHINO redundancy modules are used with two power supplies in parallel to create a redundant supply to prevent costly downtime due to power supply failure.

- Even if one power supply fails or becomes disconnected, the second power supply unit will supply the full current to the load
- Class I Division 2 hazardous location ratings offered
- Wide input and output ranges
- Active current sharing (PSM only)

### Redundancy Module Feature Comparison

<table>
<thead>
<tr>
<th>Series</th>
<th>Price</th>
<th>Requires</th>
<th>Case</th>
<th>Mount</th>
<th>Agency Approvals</th>
<th>Protection Type</th>
<th>Alarm Contact</th>
<th>Input Voltage</th>
<th>Output Voltage/Amp Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td>Starting at $41.00</td>
<td>(2) PSB48 or PSB24 power supplies</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>CE, UL Listed, CSA Listed, CE Listed</td>
<td>✓</td>
<td>Overcurrent</td>
<td>24VDC</td>
<td>24VDC / 20A or 24VDC / 40A</td>
</tr>
<tr>
<td>PSP</td>
<td>$59.00</td>
<td>(2) PSP24 power supplies</td>
<td>Plastic</td>
<td>DIN Rail / Panel</td>
<td>UL Listed, CE</td>
<td>X</td>
<td>X</td>
<td>5/12/24 VDC</td>
<td>5/12/24 VDC / 8A</td>
</tr>
<tr>
<td>PSM</td>
<td>$199.00</td>
<td>(2) PSM24 power supplies</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>CE</td>
<td>X</td>
<td>✓</td>
<td>24VDC</td>
<td>24VDC / 15A</td>
</tr>
</tbody>
</table>

RHINO PSB60-REM series redundancy module connected to two 240 W power supplies

For the latest prices, please check AutomationDirect.com.
### Buffer Modules
A buffer module keeps a system running smoothly, even with frequent voltage drops and brownouts. It consists of large capacitive banks that release energy when a power failure occurs. The module, installed in parallel with a power supply, provides backup when a power failure occurs. It is maintenance-free because there are no moving parts, and its storage capability does not deteriorate over time.

Wiring diagram for a Buffer Module connected between a power supply and load

### Battery Backup System
A battery backup system is required when there are frequent power issues, especially if the process is in a remote location. It consists of a power supply, battery backup module, batteries, and optional monitoring equipment. The power supply keeps the battery charged under normal conditions, then seamlessly switches to battery operation on power loss. This system provides the most robust protection and covers the broadest range of power faults.

Battery Control Module wiring diagram

As power systems grow increasingly taxed, you can depend on auxiliary protection modules to keep processes running to their fullest potential.

### Electronic Circuit Breakers
Electronic circuit breakers protect electrical circuits from overcurrent and short-circuit faults. They use solid-state components and advanced algorithms to quickly sense and interrupt the current flow, minimizing the duration of a fault and reducing the potential for damage to the electrical system. They provide improved reliability, accuracy, and flexibility compared to traditional counterparts and offer advanced features, such as: adjustable trip characteristics, remote signaling, and thermal-magnetic or electronic trip units.

#### Single-Channel Electronic Circuit Breakers
Starting at $57.00
WAGO single-channel ECBs provide electronic circuit protection for 24 VDC circuits in a slim package. They are much smaller than comparably sized circuit breakers, saving even more space, particularly when used in control cabinets. These ECBs enable high-capacitive loads greater than 50,000 microfarads to be switched on – helping you reduce false tripping due to inrush currents.
- Space-saving ECB with one channel
- This model safely and reliably stops power in the event of an overload or if it short circuits on the secondary side
- 24 VDC, six versions available for rated currents of 1 to 8 A
- Switch-on capacity: >50,000 µF
- Minimizes wiring via two voltage outputs and maximizes commoning options in both input and output sides
- Switch the breaker on or off via remote input, or a local switch
- Bus up to 10 units together with the use of Jumper Bars

#### Multi-Channel Electronic Circuit Breakers
Starting at $183.00
WAGO’s space-saving ECBs provide reliable protection of 24 VDC circuits. They offer outstanding features and reliable protection against overload and short circuits. These ECBs feature high-channel density to save space in the control cabinet.
- Space-saving ECBs with two-, four- and eight-channel protective switch with currents adjustable from 0.5 to 10 A
- NEC Class 2 3.8A fixed models available
- High switch-on capacity: >50,000 µF
- Remote input resets tripped channels or switches on/off any number of channels via pulse sequence
- Optional active current limitation
- Easy-to-use Push In CAGE CLAMP terminals
- Approvals: CE, UL 60950, UL 2367, DNV GL

### mPWR-16 Power Supplies
For the latest prices, please check AutomationDirect.com.
Electronic Circuit Protectors

E-T-A REX protectors safeguard electrical circuits from overcurrent, short circuit, and other faults. Designed to create a modular system, individual protection modules can be combined to meet specific circuit protection requirements, allowing for flexible configurations and easy installation.

- Add up to 16 protection modules (40A max current per system)
  - 2-4, and 6A fixed, 2-channel
  - 8 and 10A fixed, 1-channel
  - 1-10A adjustable, 2-channel

Optional ground supply module
- EM-T00-000-GND-40A
- EM-T01-001-24-40A

Components
- Starting at $11.00
- Starting at $37.00

Auxiliary status contact output
- Easy-to-wire push-in terminals with release buttons
- 24 VDC power supply connections
- Manual ON/OFF/reset switch
- PM-T03-00-GND-20A Optional ground distribution module

GECP-24-SS Optional 24 VDC supply set (requires busbar)
- Switches allow quick ON/OFF toggling of power from the busbar

GECP-0V-TERM Optional ground supply modules
- White comb jumper for 0V supply terminals
- Protection modules are standalone or can be integrated into a modular system using supply and ground modules
- Remote set/reset for applications where access to the breaker is difficult or dangerous
- Bus up to 8 modules together using jumper bars

Protection Modules
- 1, 2, 4, 6 and 8A fixed, 1-channel
- 1-10A adjustable, 1-channel

Features
- Fast reaction time
- Precise trip characteristics
- Low power consumption
- Low noise output
- Remote monitoring
- Increased reliability
- Compact size
- Remote monitoring
- Increased reliability
- Compact size

For the latest prices, please check AutomationDirect.com.