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 48 VDC. 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. Parameterized overload behavior provides configurable current and switching modes allowing you to tailor your power supply to meet your system requirements.

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 the most 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

**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
- 5 VDC, 20 W, 4 A output
- 12 VDC from 24 to 120 Watts
- 24 VDC from 24 to 240 Watts
- Compact footprint
- Plastic housing
- Overload and overvoltage protection

**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
- 12 to 90 Watts
- Plastic housed, low-profile

**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.

**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 1, Division 2 hazardous locations.

**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.

**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 99.5% efficiency
- Built-in DC OK relay and LED indicator
- IP20 finger-safe protection rating

**PSB-S Series Power Supplies**

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- 24-28 VDC adjustable output voltage
- Up to 99.5% efficiency
- Built-in DC OK relay and LED indicator
- IP20 finger-safe protection rating

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**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.

Starting at $29.00

Starting at $37.00

Starting at $29.00

Starting at $76.00

Starting at $49.50

Starting at $123.00

Starting at $56.00

Starting at $49.50

Starting at $76.00

Starting at $76.00

Starting at $49.50

Starting at $123.00

Starting at $56.00

Starting at $49.50

Starting at $123.00

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High Performance Power Supplies

High Performance PSN Series Power Supplies

RHINO PRO PSN series high performance 24 VDC switching power supplies are available with single-phase and three-phase inputs, universal AC input voltage range, and a built-in constant current circuit for charging applications.

- Universal AC input voltage range (single-phase units)
- Built-in constant current circuit for charging applications (three-phase units)
- Active Power Factor Correction (IFC) - Active input current wave shaping, high frequency filtering, and source current feedback sensing for waveform control

- Power Boost of 150% up to 7 seconds
- Advanced Power Boost (APB) – ensures continuous operation when a large inrush current is detected due to faulty load on a multiple load connection
- DC OK contact and LED indicator for DC OK/Overload

Starting at $97.00 (PSN24-080)

High Performance PSD Series with LCD

RHINO PRO PSD series versatile 24 VDC switching power supplies feature an LCD which displays output current, output voltage, peak hold current, lifetime expectancy, and ambient temperature data.

- Universal AC input voltage range
- Lifetime expectancy alarm signal and monitoring
- Built-in active Power Factor Correction with up to 94% efficiency
- Power Boost of 150% up to 7 seconds
- LCD display of output current / voltage / peak current and temperature
- Advanced Power Boost (APB) – protects system to ensure continuous operation when large inrush current detected due to faulty load on a multiple load connection
- DC OK contact and LED indicator for DC OK Overload

Starting at $204.00 (PSD24-120)

High Efficiency PSH Series Power Supplies

RHINO PSH series power supplies offer best-in-class efficiencies up to 94.5%, temperature performance range of -25°C to 70°C, and agency approvals for extreme conditions. They are UL 508 and hazardous location listed, UL 60950 recognized, ATEX certified, CE marked, and RoHS compliant.

- Universal 85 to 264 VAC input voltage
- 12, 24 and 48 VDC output options
- 80 to 480 Watts
- Up to 94.5% efficiency
- Short circuit and overload protection

Starting at $104.00 (PSH-48-080)

Compact PSRP Series

RHINO PRO PSRP series power supplies offer a sleek, space-saving design with push-in connectors and a rugged aluminum housing.

- Up to 94.8% efficiency
- 12 and 24 VDC output options
- Short circuit and overload protection

Starting at $156.00 (PSRP-24-120)

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.

- 12 and 24 VDC output options
- Universal input 85 to 264 VAC
- Universal input 90 to 264 VAC
- IP67 and NEMA 4X protection rating

Starting at $269.00 (PSX-24-120)

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% efficiency
- 24 VDC output
- Universal power input 90 to 264 VAC
- IP67 protection rating

Starting at $263.00 (PSRT-24-120)

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

Starting at $62.00 (PSE12-1 15)

PSS-S Series

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

Starting at $13.00 (PSS12-035-S)

PSS*-U Series

- Offers battery switchover capability
- Output Power: 151 W

Starting at $263.00 (PSRT-24-100)

Enclosed Chassis Mount 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.

PSX Series

- 12 and 24 VDC output options
- Universal input 85 to 264 VAC
- Hazardous location Class I, Div 2
- IP67 and NEMA 4X protection rating

Starting at $289.00 (PSX-24-120)

MAD Series

- Universal 100 to 240 VAC input range
- 12, 24 and 48 VDC output options
- 50 to 400 Watts
- Up to 94.5% efficiency
- Short circuit and overload protection

Starting at $156.00 (MAD-24-120)

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% efficiency
- 24 VDC output
- Universal power input 90 to 264 VAC
- IP67 protection rating

Starting at $263.00 (PSRT-24-120)

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

Starting at $62.00 (PSE12-1 15)

PSS-S Series

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

Starting at $13.00 (PSS12-035-S)

PSS*-U Series

- Offers battery switchover capability
- Output Power: 151 W

Starting at $263.00 (PSRT-24-100)

Enclosed Chassis Mount 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.
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

Switching Power Supply Feature Comparison

<table>
<thead>
<tr>
<th>Power Supply Series</th>
<th>Functionality</th>
<th>Price ($)</th>
<th>Case</th>
<th>Mount</th>
<th>UL</th>
<th>Hazard Rated</th>
<th>NEC Class 2</th>
<th>Output Power (W)</th>
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<tbody>
<tr>
<td>PSS-S</td>
<td>BASIC</td>
<td>$</td>
<td>Metal</td>
<td>Panel</td>
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<td>✔</td>
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<td>PSL</td>
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<td>7.5 - 91.2</td>
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<td>PSSV</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>15 - 480</td>
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<tr>
<td>PSE</td>
<td>BASIC</td>
<td>$</td>
<td>Compact, Encapsulated</td>
<td>DIN Rail/Panel</td>
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<td>✔</td>
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<td>15 - 60</td>
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<td>✔</td>
<td>✔</td>
<td>120 - 960</td>
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<td>FA</td>
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<td>Open Frame</td>
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<td>✔</td>
<td>✔</td>
<td>10 - 89</td>
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<td>Panel</td>
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<td>✔</td>
<td>✔</td>
<td>151</td>
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<td>✔</td>
<td>✔</td>
<td>60 - 960</td>
</tr>
<tr>
<td>PSP</td>
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<td>Compact, Plastic</td>
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<td>✔</td>
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<td>20 - 240</td>
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<td>60</td>
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<td>PSMF</td>
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<td>DIN Rail</td>
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<td>✔</td>
<td>80 - 960</td>
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<tr>
<td>PSBP</td>
<td>PERFORMANCE</td>
<td>$</td>
<td>Metal</td>
<td>DIN Rail</td>
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<td>✔</td>
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<td>120 - 960</td>
</tr>
<tr>
<td>PSDF</td>
<td>PERFORMANCE</td>
<td>$</td>
<td>Metal/Plastic</td>
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<td>✔</td>
<td>✔</td>
<td>120 - 480</td>
</tr>
<tr>
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<td>Metal</td>
<td>DIN Rail</td>
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<td>✔</td>
<td>✔</td>
<td>80 - 480</td>
</tr>
<tr>
<td>WAGO Pro2</td>
<td>PERFORMANCE</td>
<td>$</td>
<td>Metal</td>
<td>DIN Rail</td>
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<td>✔</td>
<td>✔</td>
<td>120 - 960</td>
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<tr>
<td>PSX</td>
<td>TOUGH</td>
<td>$</td>
<td>Metal-Outdoor</td>
<td>Classic</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>96 - 120</td>
</tr>
<tr>
<td>PSRT</td>
<td>TOUGH</td>
<td>$</td>
<td>Metal-Outdoor</td>
<td>Classic</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>91.2 - 192.2</td>
</tr>
</tbody>
</table>

WAGO Pro2 Series Power Supplies and Modules

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.

- TopBoost provides a 600% current pulse for 16 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.

Examples of data that can be accessed with the Pro2 communication modules:
- Current/Current
- Constant current (latching mode)
- Constant current (Hiccup mode)
- Constant current (Top Boost)
- Electronic circuit breaker
- Hiccup mode
- Latching after thermal overload
- Line dropout
- Overload limit active
- Overload limit active
- Parallel mode
- Series mode
- Top Boost mode
- Voltage/Current

WAGO Pro2 communication modules easily snap into place as an add-on to Pro2 power supplies. These modules support various communication protocols with their respective communication ports, allowing connectivity to PLCs for programming and monitoring. Communication modules also provide accessibility to select features and real-time data gathered by the power supplies.

Quick and easy connectivity with Productivity, CLICK, and Do-More PLCs.

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LUTZE, a well-known name in the automation industry for over 60 years, manufactures a wide range of dependable products including quality, economical, and reliable compact power supplies. LUTZE Compact series power supplies are ideal for industrial applications where high inrush power is essential and where space-saving designs and long-lasting operation are desired. These power supplies are smaller than the industry standard, yet still operate with supreme efficiency using advanced digital technology.

**CPS ECO Series Switching Power Supplies**
LUTZE ECO series 24 VDC single-phase power supplies were developed with the newest technical innovations in mind. This compact, economical series of power supplies provides up to 91% power conversion efficiency. The output voltage adjustment provides easy tuning of desired voltage.

- Compact footprint fits any tight space application
- Status indicators and output relay allows remote monitoring
- Aluminum housing
- 35mm DIN rail mount
- IP20 rated
- Available in 120, 240, or 480W models
- 5 year warranty

**CPS Ultra Series Switching Power Supplies**
LUTZE Ultra series 24 VDC single-phase power supplies are compact units that are 50% smaller than standard industrial power supplies, which results in considerable space and money savings. This series provides up to 93% power conversion efficiency.

- Compact footprint even smaller than ECO series
- Status indicators and output relay allows remote monitoring
- Power boost - 150% for 5s
- Aluminum housing
- 35mm DIN rail mount
- IP20 rated
- Available in 120, 240, or 480W models
- 5 year warranty

**CPS Universal Series Switching Power Supplies**
LUTZE Universal series 24 VDC power supplies provide high efficiency, compact size, and power boost while allowing maximum installation flexibility. These units offer 1-, 2-, or 3-phase inputs, making them a versatile power supply that can be used for many applications.

- Compact footprint fits tight applications
- Status indicators and output relay allows remote monitoring
- Aluminum housing
- 35mm DIN rail mount
- IP20 rated
- Available in 240 or 480W models
- 5 year warranty

**CPS 3-Phase Series Switching Power Supplies**
LUTZE compact 3-phase series 24 VDC power supplies have an efficiency rating of over 91%, which means low power loss and low heat dissipation. The integrated power boost function allows higher peak loads to be energized for a short period of time. In addition, this unit has the convenience of allowing remote ON/OFF control to significantly reduce energy consumption.

- Compact footprint fits any tight space application
- Status indicators and output relay allows remote monitoring
- Aluminum housing
- 35mm DIN rail mount
- IP20 rated
- Available in 120, 240, or 960W models
- 5 year warranty

For the latest prices, please check AutomationDirect.com.
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

**IH Series 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
- 100/120/220/230-240 VAC input ranges
- Overvoltage protection
- 5 VDC outputs
- +/- 0.05% regulation
- Made in USA

**Unregulated Open Frame Linear Power Supplies**

**IP500U Series Unregulated Open Frame Linear Power Supplies**

International Power IP500U series unregulated open frame linear power supplies are designed for low-cost, high-current applications when 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 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.

- 100/240 VAC selectable input
- Less susceptible to motor regeneration than switching supplies
- Fusing included for both incoming AC and outgoing DC

**Starting at $367.00**

**Starting at $159.00**

For the latest prices, please check AutomationDirect.com.

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**

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.

**RHINO PSP Series**

Features a wide input range to support all popular DC voltage systems

**RHINO FA-DCDC-1 Series**

Eliminates ground loops and addresses isolation issues when interfacing to PLC analog I/O modules

**WAGO Terminal Block Style**

Terminal-block style DC-to-DC converters optimize cabinet space

**WAGO PNP/NPN Converter**

Easily convert a signal from PNP to NPN or vice-versa

**Starting at $52.50**

**Starting at $75.00**

**Starting at $367.00**

**Starting at $159.00**

For the latest prices, please check AutomationDirect.com.
Battery Control Modules

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 24 VDC or 48 VDC (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

### 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>×</td>
<td>24 VDC / 40A / 960W</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>×</td>
<td>24 VDC / 15A / 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>✓</td>
<td>24 VDC / 15A / 360W</td>
<td></td>
</tr>
<tr>
<td>PSH</td>
<td>$242.00</td>
<td>Metal</td>
<td>Universal</td>
<td>Two independent power supplies</td>
<td>12V sealed lead acid</td>
<td>✓</td>
<td>24 VDC / 15A / 360W, 48 VDC / 7.5A / 360W</td>
<td></td>
</tr>
</tbody>
</table>

Encapsulated DC-to-DC converters provide maximum environmental protection for reliable DC power. These low-profile, plastic and aluminum housed units accept a wide range of DC inputs and convert them to the needed voltage levels, and offers features such as remote on/off control and overload protection.

### 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.

#### Battery Control Modules

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 24 VDC or 48 VDC (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

#### Battery Control Module Feature Comparison

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<td>✓</td>
<td>24 VDC / 15A / 360W, 48 VDC / 7.5A / 360W</td>
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</tbody>
</table>

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

Encapsulated DC-to-DC converters provide maximum environmental protection for reliable DC power. These low-profile, plastic and aluminum housed units accept a wide range of DC inputs and convert them to the needed voltage levels, and offers features such as remote on/off control and overload protection.

#### 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.

#### PSRP 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.
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. However, some types of equipment 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.

Redundancy Modules

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)

<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>$129.00</td>
<td>(2) PSB24 or PSB48 power supplies</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>UL, Intrinsic Safe, UL Listed, CSA, ETL, CE, UL Listed</td>
<td>Overvoltage, Overcurrent</td>
<td>✓</td>
<td>24/48 VDC</td>
<td>24 VDC / 20A</td>
</tr>
<tr>
<td>PSM</td>
<td>$231.00</td>
<td>(2) PSM24 power supplies</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>UL Listed, CE</td>
<td>X</td>
<td>X</td>
<td>24 VDC / 25A</td>
<td></td>
</tr>
</tbody>
</table>

Buffer Modules

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

<table>
<thead>
<tr>
<th>Buffer Module Feature Comparison</th>
<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>Alarm Contact</th>
<th>Output Voltage/Amp Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td>$129.00</td>
<td>250 msec hold-up at 30A or 5 sec at 1A</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>✓</td>
<td>Overvoltage, Overcurrent</td>
<td>24 VDC / 20A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSM</td>
<td>$231.00</td>
<td>200 msec hold-up at 25A or 4 seconds at 1.2A</td>
<td>Metal</td>
<td>DIN Rail</td>
<td>X</td>
<td></td>
<td>24 VDC / 25A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the latest prices, please check AutomationDirect.com.
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.

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

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

For the latest prices, please check AutomationDirect.com.

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.

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

For the latest prices, please check AutomationDirect.com.
Electronic Circuit Protectors

**Modular 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**
- 1, 2, 4, 6, and 8A fixed, 1-channel
- 1-10A adjustable, 1-channel

**Components**
- EM-T01-001-24-40A Supply module required for all systems
- EM-T00-000-GND-40A Optional ground supply module
- PM-T03-00-GND-20A Optional ground distribution module
- GECP-24-SS Optional 24 VDC supply set (requires busbar)
- GECP-0V-TERM Optional 0V supply terminals

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

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

**Protection Modules are standalone or can be integrated into a modular system using supply and ground modules**
- Adjustable module offers adjustable trip current range (1-10A) and trip characteristics
- 10 to 30 VDC operating voltage
- LED signaling at 90% overload provides early warning of potential overloads, allowing corrective action to be taken before a fault occurs
- Remote set/reset for applications where access to the breaker is difficult or dangerous
- Bus up to 8 modules together using jumper bars

**Power Supplies**
- mPWR-20
  - For the latest prices, please check AutomationDirect.com
- mPWR-21
  - For the latest prices, please check AutomationDirect.com

**Gladiator GECP Series Circuit Protectors**

Gladiator GECP series circuit protectors can be customized to fit the needs of any application, featuring an adjustable trip current range, adjustable trip characteristics, and LED signaling with output alarms for real-time status monitoring. The GECP series is compact, lightweight, and available at a very low cost per channel.

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

**Components**
- EM-T00-000-GND-40A Supply module required for all systems
- PM-T03-00-GND-20A Optional ground distribution module
- GECP-24-SS Optional 24 VDC supply set (requires busbar)
- GECP-0V-TERM Optional 0V supply terminals

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- Remote set/reset for applications where access to the breaker is difficult or dangerous
- Bus up to 8 modules together using jumper bars

**Remote set/reset functions**
- Switches allow quick ON/OFF toggling of power from the busbar
- White comb jumper for 0V supply terminals

**Bottom view of load, remote set/reset, and status output (red jumper) terminals**

**mPWR-20 Power Supplies**
- For the latest prices, please check AutomationDirect.com

**mPWR-21 Power Supplies**
- For the latest prices, please check AutomationDirect.com