

PDX[®] Low-Power Series

Lightweight, Compact, CE-Marked Power Supplies with High Reliability

Benefits

- Enhances process flexibility
- Improves throughput
- Optimizes process control
- Ensures high repeatability
- Eases integration

Features

- Sinusoidal RF output for low harmonic distortion
- Wide operating frequency range for optimal process control
- Tightly regulated output power
- Low EMI/RFI
- Remote operation capability

The PDX[®] low-power (1250 and 1400 W) series of mid-frequency power supplies offers a highly efficient, compact, easy-to-integrate source of power for a wide variety of process applications. These highly reliable power supplies enhance process flexibility, deliver a wide operating frequency range for optimized process control, ensure high process repeatability, and improve throughput.

Enhances Process Performance and Flexibility

Advanced Energy[®]'s PDX low-power (LP) series is available in 1250 and 1400 W versions. These power supplies offer a highly efficient, compact, easy-to-integrate source of power for a wide variety of semiconductor process applications, including:

- PECVD
- Etch
- Dielectric sputtering
- Plasma polymer processes
- Substrate biasing

The LP PDX power supply's precise measurements provide accurate, highly repeatable process control, helping to ensure process uniformity and high throughput. Its wide frequency range of operation delivers optimal control across a variety of applications.

The PDX 1250 power supply uses a single- ϕ input, while the PDX 1400 supply uses a three- ϕ input. The mean time between failures for the PDX 1250 power supply's field population is in excess of 200,000 hours.

Key LP PDX Power Supply Features

- Sinusoidal RF output with low harmonic distortion: At full output power, all harmonics are > 40 dB below the fundamental output frequency.
- Operation over a wide frequency range for optimum control of particular specie production: Fixed frequencies between 235 and 450 kHz are available. The center frequency can be varied over 50 kHz via the front panel or I/O controls.
- Tightly regulated output power based on an operator-provided set point signal: The set point can be established using either the front panel or the remote user interface. You can choose the set point power to represent the LP PDX supply's output power or the power delivered to the load. (Load power is computed from the forward power.)
- A power-conversion technique that stores virtually no energy at the output and, with proper system shielding techniques, produces little EMI/RFI: The LP PDX power supply is equipped with a standard internal power line filter.

Remote Operation

User connectors provide remote interface and control from the rear panel. Automatic limiting occurs when voltage, current, or power dissipation exceed preset limits.

Digital input signals can be either open collector drain or 15 V CMOS. Digital outputs are open drain. Analog signals are 0 to 10 V.

Theory of Design

The LP PDX design has four main sections:

- *RF filter*
- *Left chassis*
- *Switch*
- *Output*

The switch section uses pulse-width-modulated (PWM) switching technology, a highly efficient design that produces a tightly regulated, ripple-free input to the RF section.

Built-In Protection

The LP PDX power supply has complete internal protection for over-voltage, over-current, over-power, and open and short circuits.

Compliance Certifications

Many CE-marked LP PDX models are available. Some models are GS certified, while others are NRTL certified.

Specifications

Physical	PDX® 1250	PDX® 1400
Size	89 mm (H) x 483 mm (W) x 483 mm (D) 3.5" (H) x 19" (W) x 20" (D) standard rack mount	
Weight	< 14 kg (31 lb)	
Customer Interface	User port and/or active front-panel controls	
User Port Connector	25-pin, sub-miniature D, male	9-pin, sub-miniature D, female
Serial Port Connector	None	
50 W Output Connector and Load Match Output Connector	N or C	C or HN

Electrical	PDX® 1250	PDX® 1400
RF Output Power	18 to 1250 W	25 to 1400 W
Frequency	325 to 450 kHz	235 to 305 kHz
Load Match Transformer	10 to 350 Ω, 7 taps	40 to 200 Ω, 7 taps
Internal Reactive Match	Inductor available	
Maximum Reflected Power	250 W	280 W
Harmonics	At full rated power, all harmonics are > 50 dB below the fundamental output frequency.	At full rated power, all harmonics are > 40 dB below the fundamental output frequency.
Input Voltage	180 to 253 VAC, 50/60 Hz, single φ	180 to 230 VAC, 50/60 Hz, 3 φ
Input Current	15 A _{RMS} max	
Maximum Output Voltage	300 V	
Maximum Output Current	6 A	
Regulatory Accuracy	1% of set point or 2 W, whichever is greater	

Environmental	PDX® 1250	PDX® 1400
Operating Temperature	35° C (95°F) max	
Cooling	Air (gas), 35° C (95°F) max	

Note: Specifications are subject to change without notice.



Advanced Energy Industries, Inc. • 1625 Sharp Point Drive • Fort Collins, Colorado 80525
T: 800.446.9167 or 970.221.4670 • F: 970.221.5583 • support@aei.com • www.advanced-energy.com

© Advanced Energy Industries, Inc. 2005
All rights reserved. Printed in U.S.A.
SL-PDXlo-250-01 0M 7/05

United Kingdom
T: 44.1869.320022
F: 44.1869.325004

Germany
T: 49.711.779270
F: 49.711.7778700

Korea
T: 82.31.777.9191
F: 82.31.777.9195

Japan
T: 81.3.32351511
F: 81.3.32353580

Taiwan
T: 886.2.82215599
F: 886.2.82215050

China
T: 86.21.58579011
F: 86.21.58579003

Advanced Energy®, AE®, and PDX® are trademarks of Advanced Energy Industries, Inc.

PDX® High-Power Series

Compact, CE-Marked, Mid-Frequency Power Supplies with High Reliability and Sweep Frequency Load Mismatch Tuning

Benefits

- Enhances process flexibility
- Optimizes process control
- Ensures high repeatability
- Eases integration

Features

- Sweep Frequency
- Sinusoidal RF output for low harmonic distortion
- Wide operating frequency range for optimal process control
- Tightly regulated output power
- Low EMI/RFI
- Remote operation capability

The PDX® high-power (5000 and 8000 W) series of power supplies offers a highly efficient, compact, easy-to-integrate source of mid-frequency power for a wide variety of process applications. These highly reliable power supplies enhance process flexibility, deliver a wide operating frequency range for optimized process control, ensure high process repeatability, and improve throughput.

Enhances Process Performance and Flexibility

The PDX high-power (HP) series is available in 5000 and 8000 W versions. These power supplies offer a highly efficient, compact, easy-to-integrate source of power for a wide variety of semiconductor process applications, including:

- *PECVD*
- *Etch*
- *Dielectric sputtering*
- *Plasma polymer processes*
- *Substrate biasing*

The HP PDX power supply's precise measurements provide extremely accurate, highly repeatable process control, helping to ensure process uniformity and high throughput. Its wide frequency range of operation delivers optimal control across a variety of applications.

Sweep frequency

The HP PDX power supply features a sweep frequency capability, which incorporates direct digital synthesis (DDS) technology for control of its operating frequency when the power system is mismatched. This field-

proven, robust technology has been incorporated in Advanced Energy® products since 1996. The frequency can be programmed to dither over a pre-determined range, enable plasma ignition, and minimize the mismatch to the power system during plasma processing. The DDS operating parameters can be set via an RS-232 or Ethernet port and are stored indefinitely in non-volatile RAM.

Advanced Capabilities

- *Sinusoidal RF output with low harmonic distortion: At full output power, all harmonics are > 40 dB below the fundamental output frequency.*
- *Operation over a wide frequency range for optimum control of particular specie production: Fixed frequencies between 360 and 460 kHz are available. The center frequency can be varied over 50 kHz.*
- *Tightly regulated output power based on an operator-provided set point signal: You can choose the set point power to represent the HP PDX output power or the power delivered to the load.*

- A power-conversion technique that stores virtually no energy at the output and, with proper system shielding techniques, produces little EMI/RFI: The HP PDX power supply is equipped with a standard internal power line filter.

Remote Operation

User connectors provide remote interface and control from the rear panel. Automatic limiting occurs when voltage, current, or power dissipation exceed preset limits.

Digital input signals can be either open collector drain or 15 V CMOS. Digital outputs are open drain. Analog signals are 0 to 10 V.

Theory of Design

The HP PDX design has four main sections:

- RF filter
- Left chassis
- Switch
- Output

The switch section uses pulse-width-modulated (PWM) switching technology, a highly efficient design that produces a tightly regulated, ripple-free input to the RF section.

Built-In Protection

The HP PDX power supply has complete internal protection for over-voltage, over-current, over-power, and open and short circuits.

Compliance Certifications

Many CE-marked PDX models are available. Some models are GS certified, while others are NRTL certified.

Specifications

Physical	PDX® 5000	PDX® 8000
Size	178 mm (H) x 483 mm (W) x 508 mm (D) 7" (H) x 19" (W) x 20" (D) standard rack mount	
Weight	41 kg (90 lb)	
User Port Connector	25-pin, sub-miniature D, male	
Serial Port Connector	RS-232 or RS-485, 9-pin, sub-miniature D, female	
Output Connector	HN	

Electrical	PDX® 5000	PDX® 8000
RF Output Power	100 to 5000 W	100 to 8000 W
Frequency	330 to 460 kHz	340 to 440 kHz
Maximum Reflected Power	1500 W	
Harmonics	At full-rated power, all harmonics are > 40 dB below the fundamental output frequency	
Input Voltage	180 to 230 VAC, 50/60 Hz, 3 Φ	
Input Current	18 A nominal	29 A nominal
Maximum Output Voltage	735 V	
Maximum Output Current	14.9 A	
Regulatory Accuracy	1% of set point or 5 W, whichever is greater	1% of set point or 8 W, whichever is greater

Environmental	PDX® 5000	PDX® 8000
Operating Temperature	5° C (41°F) min 30° C (86°F) max	
Cooling	Water, 2 gpm (7.6 lpm) at 0 to 30° C (32 to 86°F)	

Note: Specifications are subject to change without notice.



Advanced Energy Industries, Inc. • 1625 Sharp Point Drive • Fort Collins, Colorado 80525
T: 800.446.9167 or 970.221.4670 • F: 970.221.5583 • support@aei.com • www.advanced-energy.com

© Advanced Energy Industries, Inc. 2006
All rights reserved. Printed in U.S.A.
SL-PDXhi-250-03 0M 6/06

United Kingdom
T: 44.1869.320022
F: 44.1869.325004

Germany
T: 49.711.779270
F: 49.711.7778700

Korea
T: 82.31.777.9191
F: 82.31.777.9195

Japan
T: 81.3.32351511
F: 81.3.32353580

Taiwan
T: 886.2.82215599
F: 886.2.82215050

China
T: 86.21.58579011
F: 86.21.58579003

Advanced Energy®, AE®, and PDX® are trademark of Advanced Energy Industries, Inc.