

# PiezoDrive

## PDX Series High-Speed Voltage Amplifiers with Dynamic Current Control™



The PDX voltage amplifiers set a new standard for the bandwidth and power of piezoelectric drives. The exceptional bandwidth with large capacitive loads and the high output current enables a range of new applications not previously possible. The PDX amplifiers are employed in demanding applications such as high-speed physics, video-speed microscopy, precision manufacturing and piezoelectric vibration control.

The PDX amplifiers are available in two output voltage ranges and three peak current ranges. The b variant is designed for general purpose and scanning applications where peak current may last for up to 100ms. The c variant is designed for applications where a large output current is required for a short period of time. The d variant provides up to 10A of current for applications that require fast step changes in voltage.

The PDX amplifiers contain a new technology called Dynamic Current Control™. Compared to other amplifiers with fixed current limits, Dynamic Current Control dramatically improves the maximum output current which allows the reproduction of larger amplitude waveforms with higher frequency.

In addition to the fast response, the PDX amplifiers are also easy to use and can drive any capacitive load. Other features include: comprehensive overload protection; an external shutdown function; voltage and current monitor outputs; and front-panel bias-voltage adjustment.

A detailed discussion of the performance specifications is contained on the following page.

## Brief Specifications

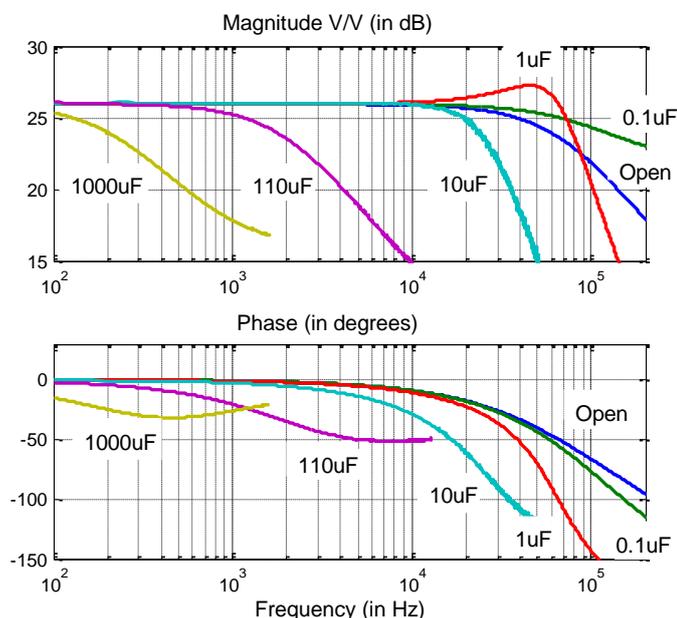
Model	PDX150			PDX200		
Variant	b	c	d	b	c	d
Peak Current	2A	5A	10A	1.5A	5A	10A
Overload Time	100ms	1ms	100us	100ms	1ms	100us
RMS Current	1.6 A			1.1 A		
Voltage	-30V to 150V*			-30V to 200V*		
Gain	20 V/V					
Signal Bandwidth	Greater than 80 kHz (1uF Load)					
Power Bandwidth	9.5 kHz			7.2 kHz		
Offset	From 0V to Full-Range with front panel adjustment					
Input	Differential, $Z_{in} = 22 \text{ k}\Omega$ (to eliminate ground loops and noise)					
Connectors	Input: BNC, Monitor Outputs: BNC, Output: LEMO and 4mm Jack					
Load	Stable with unlimited capacitive loads					
Overload	Thermal, current and voltage overload protection					
Noise	Ultralow noise, < 320 $\mu\text{V}$ RMS					
Environment	0 - 40°C (32-104°F) Non-condensing humidity					
Enclosure	Rugged desktop enclosure. 19 inch rack compatible					
Dimensions	212.6 x 304.8 x 132.6 mm (w x d x h)					
Power Supply	115V or 230V AC (selectable)					

\*This is the minimum peak voltage. The actual voltage range will be larger.

## Performance Specifications

### Frequency Response

The PDX amplifiers have an extremely wide bandwidth and can tolerate any capacitive load. The frequency response and small-signal bandwidth are described in the following figure and table.



Frequency response for a range of capacitive loads

Load Capacitance	Bandwidth
No Load	78 kHz
0.1 uF	200 kHz
1.0 μF	84 kHz
10 μF	27 kHz
100 μF	2.7 kHz

Approximate bandwidth versus load capacitance.

### Power bandwidth

The power bandwidth is the maximum frequency sine-wave that can be reproduced at full voltage. The b variants of the PDX150 and PDX200 are designed to maximize the power bandwidth in general purpose and scanning applications.

With a capacitive load, the maximum frequency sine wave is

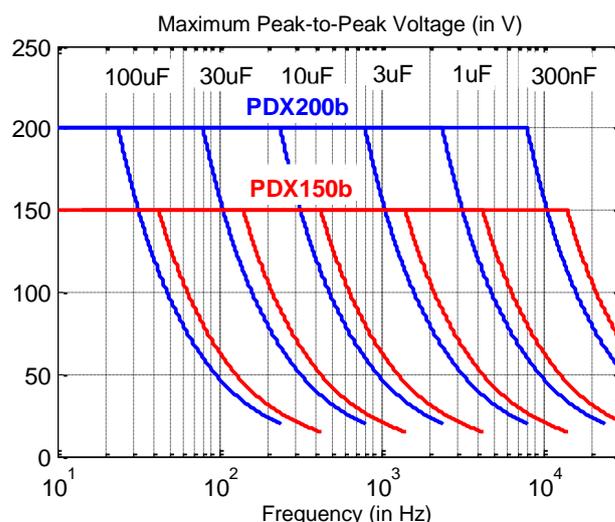
$$f^{max} = \frac{I^{pk}}{V_{p-p}\pi C}$$

A table of the approximate power bandwidths for a range of capacitive loads is shown below.

Load Cap.	PDX150b	PDX200b
100 nF	*9.5 kHz	*7.2 kHz
300 nF	9.2 kHz	*7.2 kHz
1.0 μF	4.2 kHz	2.3 kHz
3.0 μF	1.4 kHz	790 Hz
10 μF	424 Hz	230 Hz
30 μF	141 Hz	79 Hz
100 μF	42 Hz	23 Hz

Approximate power bandwidth

Also of interest is the maximum amplitude sine-wave that can be delivered to a capacitive load versus frequency.



Maximum sine-wave amplitude versus frequency

\* With very small loads, the power bandwidth is limited by the slew-rate, which is approximately 4.5 V/us. This can be doubled to 8 V/us if necessary.

### Noise Performance

The PDX amplifiers are low noise devices designed to exceed the requirements of positioning and imaging systems with sub-atomic resolution. The following table lists the output noise voltage versus load capacitance .

Load Cap.	Bandwidth	Noise (RMS)
No Load	78 kHz	300 uV
0.1 uF	200 kHz	320 uV
1.0 μF	84 kHz	312 uV
10 μF	27 kHz	280 uV
100 μF	2.7 kHz	167 uV
1000 μF	270 Hz	192 uV

Measured noise versus load capacitance

### Signal Conditioning

The differential input circuit eliminates ground-loops and noise resulting from the interconnection of different instruments.

### Enclosure.

The PDX amplifiers are housed in a desktop enclosure that can be bolted together in a side-by-side configuration. Mounting in a standard 19-inch rack is also possible with the addition of rack-mount handles.

### Options

The PDX amplifiers can be customized to meet a range of industrial or scientific requirements. Specific options include:

- 19-inch rack kit for two amplifiers
- 19 inch rack kit for a single amplifier

### Contact

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