PiezoDrive

PDL200
200 V Linear Amplifier
with Dynamic Current Control™

The PiezoDrive PDL200 is a 200 Volt linear amplifier designed to optimize the performance of multilayer piezoelectric stack actuators. The PDL200 is compact in size but provides a level of performance not currently available from commercial amplifiers.

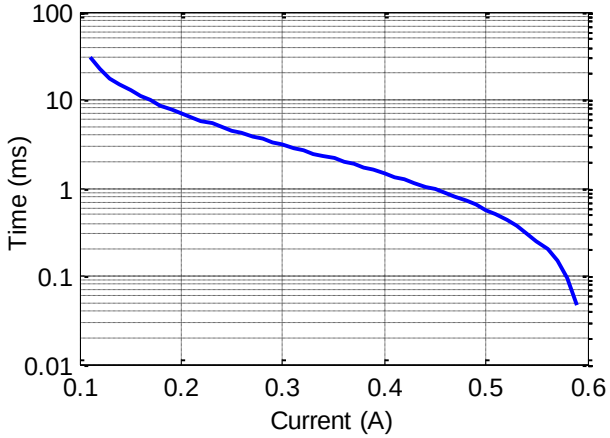
The foremost speed limitation of a piezoelectric actuator is the current limit of the drive. Standard amplifiers have a fixed current limit designed to protect the output stage from overheating and short-circuit. However, due to the capacitive nature of piezoelectric actuators, a basic current limit is unnecessarily conservative and severely degrades the dynamic performance and power bandwidth. (The power bandwidth is the maximum frequency sine-wave that can be applied at full output voltage)

The PDL200 contains a new proprietary output stage with Dynamic Current Control that provides exceptionally large output currents for short periods of time. Compared to a standard voltage amplifier, the PDL200 provides three times greater power bandwidth and up to six times faster rise-time. A plot of the allowable overload current versus time is shown in on the right.

In addition to the fast response, the PDL200 is also extremely low noise. This is ideal for precision positioning applications where sub-atomic resolution is required. Other features that make the PDL200 suitable for almost any scientific or industrial application include the compact size, ease-of-use, and ability to drive any capacitive load. A description of these features is contained on the following page.

Brief Specifications

Input	Differential input stage that eliminates ground loops and noise. Z_{in} = 22 kΩ
Output Voltage	-10V to +60V, +150V or +200V (Selectable on front panel)
Output Current	Dynamic Current Limiting™ +/-600 mA Peak, +/-100 mA Average.
Gain	20 V/V
Bias Voltage	0 V to 200 V with front panel adjustment
Connectors	BNC input and output connectors
Load	Stable with unlimited capacitive loads
Bandwidth	Greater than 400 kHz (unloaded)
Overload	Thermal, current and voltage overload protection
Noise	Ultralow noise <150 µV RMS with 1µF load
Environment	0 - 40°C (32-104°F)
Enclosure	Rugged desktop enclosure with no fan or vents. Also mounts into a Eurocard subrack or DIN rail. Dimensions: 226x111x83mm
Power	115 or 230/240 Vac.



Overload current versus time

Performance Specifications

Power bandwidth

The power bandwidth of the PDL200 is more than three times greater than a standard amplifier with a static current limit. For signals over 100Hz the maximum frequency sine-wave is approximately,

$$f^{max} = \frac{0.1}{V_{pp}C} \text{ Hz},$$

where V_{pp} is the peak-to-peak voltage and C is the load capacitance. Some approximate values are tabulated below.

Load Capacitance	Power Bandwidth
100 nF	5.0 kHz
300 nF	1.66 kHz
1.0 µF	500 Hz
3.0 µF	167 Hz
10 µF	50 Hz
30 µF	6 Hz
100 µF	2 Hz

Power bandwidth versus load capacitance

Signal Conditioning

The differential input circuit of the PDL200 eliminates ground-loops and noise resulting from the interconnection of different instruments.

Bias/Offset Voltage

A bias voltage of 0V to 200V can be set from a 10-turn potentiometer on the front panel.

Voltage Limit

The voltage limit switch restricts the maximum output voltage to either: 60V, 150V or 200V.

Frequency Response

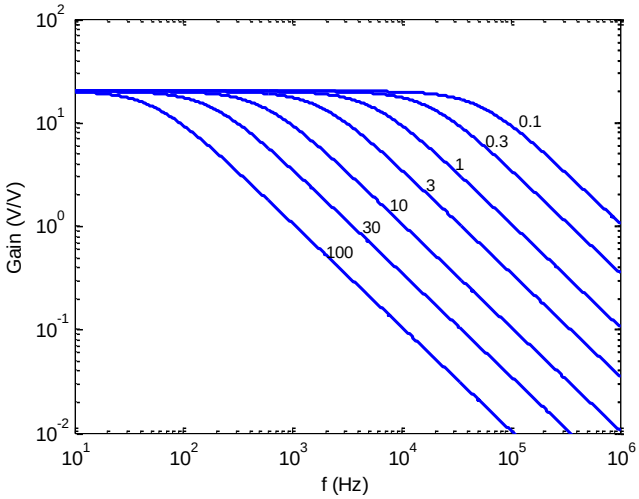
The unloaded bandwidth of the PDL200 is extremely high and typically greater than 400kHz. The PDL200 exhibits an approximately first-order response with a bandwidth of

$$f^{3dB} = \frac{1}{190C} \text{ Hz},$$

where C is the load capacitance. Some typical values of bandwidth are tabulated below.

Load Capacitance	Signal Bandwidth
100nF	53 kHz
300nF	18 kHz
1.0µF	5.3 kHz
3.0µF	1.8 kHz
10µF	530 Hz
30µF	180 Hz
100µF	53 Hz

Bandwidth versus load capacitance.



Frequency response for a range of capacitive loads (in uF)

Noise Performance

The PDL200 is a low noise amplifier designed to exceed the requirements of positioning and imaging systems with sub-atomic resolution. The following table lists some experimentally measured noise voltages.

Load Capacitance	Bandwidth	Noise (RMS)
100nF	53 kHz	770 uV
300nF	18 kHz	290 uV
1.0µF	5.3 kHz	125 uV
3.0µF	1.8 kHz	95 uV
10µF	530 Hz	57 uV
30µF	180 Hz	42 uV
100µF	53 Hz	27 uV

Measured noise versus load capacitance

Enclosure.

The PDL200 is housed in a compact and rugged aluminium enclosure with no fans or vents. In addition to desktop operation, the PDL200 also mounts into a standard Eurocard subrack or onto an industrial DIN rail.

Options

The PDL200 can be customized to meet a range of industrial or scientific requirements. Specific options include:

1) 19 inch subrack front panel.
2) Alternate Connectors e.g. Lemo 00

Contact

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