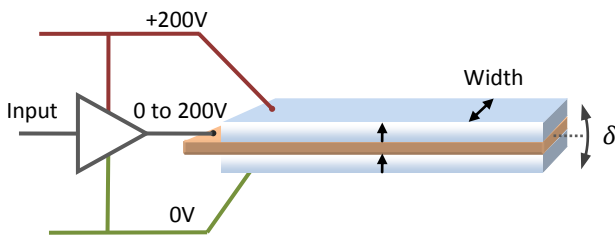


## Insulated Piezoelectric Bender Actuators PiezoDrive BA Series

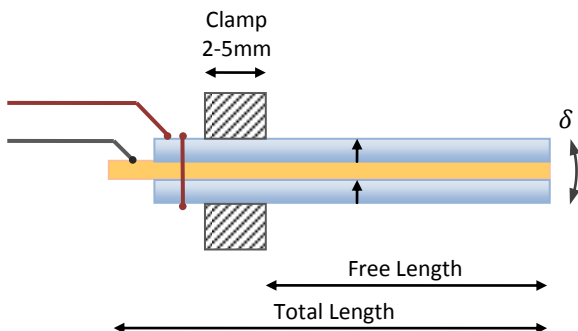
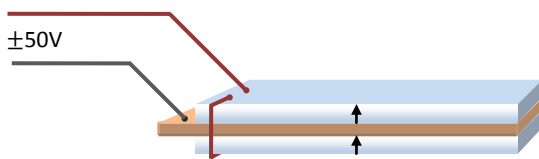


The BA Series are piezoelectric bimorph actuators poled in the parallel configuration. An insulated resin coating is applied to the external surfaces to protect the actuator and to eliminate electrical faults. The actuators can be wired in a three-wire or two-wire configuration as illustrated below.

Three Wire Connection (Unipolar)



Two Wire Connection



Specifications	BA4902	BA3502
Dimensions	49 x 2.1 mm	35 x 2.1 mm
Deflection	±0.65 mm	±0.3 mm
Force	0.1 N	0.07 N
DC Voltage	0 to 200 V	0 to 150V
AC Voltage	±50V	±37V
Thickness	0.75 mm	0.60 mm
Capacitance	20 nF	18 nF
Stiffness	154 N/m	233 N/m
Resonance Freq	140 Hz	230 Hz
Mass	0.41g	0.23g
Free Length	38 mm	28 mm
Clamp	5 mm	2 mm

The three wire configuration requires a single +200V supply; however, a bipolar configuration with a ±100V supply is electrically equivalent. In the two-wire configuration, the maximum deflection and force is reduced by 30%.

### Electrical Current Requirements

The required current is  $I = C \, dV/dt$ , where  $I$  is the current,  $C$  is the effective capacitance, and  $dV/dt$  is the voltage rate-of-change. For a sine-wave, the required peak current is equal to:

$$I_p = \pi C f V_{p-p}$$

where  $V_{p-p}$  is the peak-to-peak voltage and  $f$  is the frequency in Hz. For a triangle wave, the required peak current is

$$I_p = 2C f V_{p-p}$$

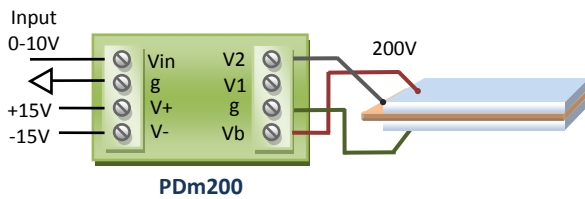
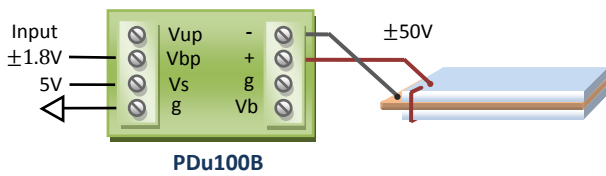
## Mounting

Bimorph actuators can be mounted with a clamp or bonded to a base using an adhesive such as Araldite. Wires are soldered to the electrodes with a one second contact at 300 degrees C. The use of a rosin flux will improve the bond. The positive terminal is indicated by a red stripe.

## Recommended Drivers

The recommend drivers and example connection diagrams are shown below

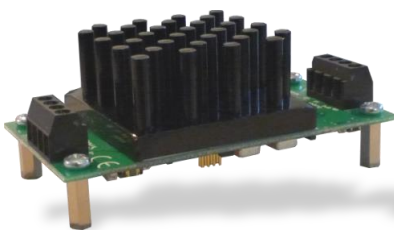
Amplifier	Applications	Configuration
PDu100B	General purpose	Two-wire $\pm 50V$
PDu100	Miniature	Two-wire $\pm 50V$
PDm200	High performance	Three-wire +200V Two-wire $\pm 50V$



## Recommended Drivers (Actual Size)



**PDu100B**



**PDm200**

## Piezoelectric Properties

The piezoelectric material is similar to PZT-5H and Navy Type VI. The material properties are listed below.

Property	Symbol	Value	Unit
Piezoelectric constants	$d_{33}$	600	$10^{-12} \text{m/V}$
	$d_{31}$	-270	$10^{-12} \text{m/V}$
	$g_{33}$	19.4	$10^{-3} \text{Vm/N}$
	$g_{31}$	-9.2	$10^{-3} \text{Vm/N}$
Electro-mechanical coupling coefficients	$K_p$	0.65	NA
	$K_t$	0.37	NA
	$K_{31}$	0.38	NA
Frequency constant	$N_p$	1980	Hz·m
	$N_t$	1950	Hz·m
	$N_{31}$	1450	Hz·m
Elastic constant	$Y_{33}$	5.3	$10^{10} \text{N/m}^2$
	$Y_{11}$	7.2	$10^{10} \text{N/m}^2$
Q Factor	$Q_m$	80	NA
Dielectric constant	$\frac{\epsilon_{33}^T}{\epsilon_0}$	3500	@1kHz
Dissipation factor	$\tan \delta$	2.5	% @1kHz
Curie Temp.	$T_c$	220	$^{\circ}\text{C}$
Density	$\rho$	7.8	$\text{g/cm}^3$

## Options / OEM Customization

- Custom range and dimensions
- Custom wiring arrangement / connectors

## Contact and Support

[info@piezodrive.com](mailto:info@piezodrive.com)