

## **READ COMPLETELY BEFORE OPERATING PI CERAMIC PIEZOELECTRIC ACTUATORS (PICA and PICMA® Series)**

The following instructions will help you to obtain maximum performance from your actuator and avoid failures. Failure to heed warnings in this document can result in bodily injury (warning) or material damage (caution). Failure to follow the instructions below may void warranty!

More detailed handling precautions and information are available at [www.piceramic.com](http://www.piceramic.com)



### **WARNING—HIGH VOLTAGE**

Do not disassemble the piezoelectric actuator. This will cause electric shock.

To avoid electric shock, make sure the bare piezoelectric actuator is discharged (see “Electrical Handling” instructions below) before touching and keep the outer electrodes (solder terminals or leads) shorted.

PICA piezoelectric actuators require high voltages of up to 1000 volts, PICMA® actuators of up to 120 volts. Follow General Accident Prevention Rules! Working with these devices requires adequately trained and experienced operating personnel.

Use of gloves and safety glasses during handling is recommended.

### **! CAUTION—ELECTRICAL HANDLING**

When shorting the leads of a possibly charged actuator, always use a 10 kΩ current limiting resistor. Shorting a charged piezoelectric actuator without limiting the discharge current can fracture the PZT ceramics due to the extremely high dynamic forces caused by the rapid discharge.

Do not operate piezo actuators at higher voltages or different polarity than stated in the PIC catalog or in the product manual. For polarity information see below.

Switch off power to the actuator immediately if you hear or see any resonant behavior. For the unloaded resonant frequency see the PIC catalog or the product manual. Any resonant operation should generally be avoided. Due to self-heating effects, the specified operating temperature range of the actuator could be exceeded rapidly and irreparable damage may occur.

Polarity assignment for piezoelectric actuators

a) Actuators with wire leads (pigtailed):

The red lead has to be driven with a voltage that is positive relative to the other lead. (Please note that PI amplifiers generally have negative polarity!)

b) Actuators with termination points only, i.e. solder pads:

The polarity indication is given either by the shape of the outer electrodes (PICMA® stack) or a black dot nearby one solder terminal marking the positive face (PICMA® chip). For making the soldered connections, see Technical Note P885T0001 at [www.piceramic.com](http://www.piceramic.com)

## ! CAUTION—MECHANICAL HANDLING

Piezo actuators are sensitive to moisture, high relative humidity, liquids and contact with any other conductive material. Avoid operating actuators under these environmental conditions since they can cause dielectric breakdown.

Do not drop the piezo actuator; avoid subjecting it to any kind of mechanical shock.

Do not exceed the maximum load (blocking force) specified in the PIC catalog or product manual.

Do not apply any torque, bending forces or lateral forces to the actuator because they are ceramic elements that can withstand compressive forces, but are sensitive to forces in other directions (see figures below). A mechanical preload is strongly recommended for operation.

