

## E-470 – E-472 / E-421 PICA™ Piezo Controller Modular High-Power Amplifier/Controller



E-471 Configuration example: E-471.20 HVPZT amplifier, with optional E-509 PZT servo-controller and E-516 20-bit DAC interface/display

- Peak Power 550 W
- Output Voltage 3 to 1100 V or Bipolar
- Optional Position Servo-Control Modules
- Optional 20-Bit Computer Interface Module & Display
- Precision DC-Offset Potentiometer for Input-Signal Bias & Manual Control

The E-470 series high-power piezo amplifiers/controllers are specifically designed to drive high-capacitance PICA™ PZT actuators. They are based on the E-421 four-quadrant amplifier module, which can output

and sink a peak current of 500 mA and an average current of 100 mA in a voltage range of 3 to 1100 V (jumper selectable bipolar range also provided). 3 standard configurations are available:

- E-470.20 is a bench-top amplifier in a 9.5" chassis for open-loop operation (1 channel)
- E-471.20 is the amplifier module in a 19" rackmount chassis that can hold additional servo-control, interface and display modules
- E-472.20 is a 2-channel version in a 19" rackmount chassis for dynamic open-loop operation

These amplifiers can be used to drive open and closed-loop piezo positioning systems.

### Open Loop Piezo Operation

For open-loop piezo operation the amplifier output voltage is determined by the analog signal at the Control Input combined with the DC-offset potentiometer setting. Open-loop operation is ideal for applications where the fastest response and the highest bandwidth are essential. Here, commanding and reading the target position in absolute values is either not important or carried out by an external feedback loop.

### Optional Servo Controller Upgrade

The E-471.20 version allows easy installation of an optional E-509 sensor- / servo-controller module for closed-loop piezo position control. In this mode the amplifier is slaved to the E-509 servo controller. Depending on the attached piezo mechanics and feedback sensor, positioning accuracy and repeatability in the nanometer range and below are feasible.

### Computer Control

The E-517 computer interface/display module can also be installed in the E-471 / E-472.

### Ordering Information

- E-470.20**  
HVPZT Piezo Amplifier, 550 W, 1100 V, Bench-Top
- E-471.20**  
HVPZT Piezo Amplifier, Controller & Interface / Display Upgrade possible, 550 W, 1100 V, Bench-Top, 19"
- E-472.20**  
HVPZT Piezo Amplifier, 2 Channels, 550 W, 1100 V, Bench-Top, 19"
- E-421.00**  
HVPZT Piezo Amplifier Module, 550 W, 1100 V, Integrated P / S

### Upgrades for E-471.20

#### Sensor / Position Servo-Control Modules

**E-509.C1A**  
Sensor / Servo-Controller Module, Capacitive Sensor

**E-509.S1**  
Sensor / Servo-Controller Module, SGS - Sensor

#### Computer Interface & Display Modules

**E-517.i1**  
Interface- / Display Module, 24 Bit D/A, TCP/IP, USB, RS-232, 1 Channel

**E-515.01**  
Display Module for PZT Voltage and Position

**E-500.ACD**  
CD with Driver Set for Analog Controllers

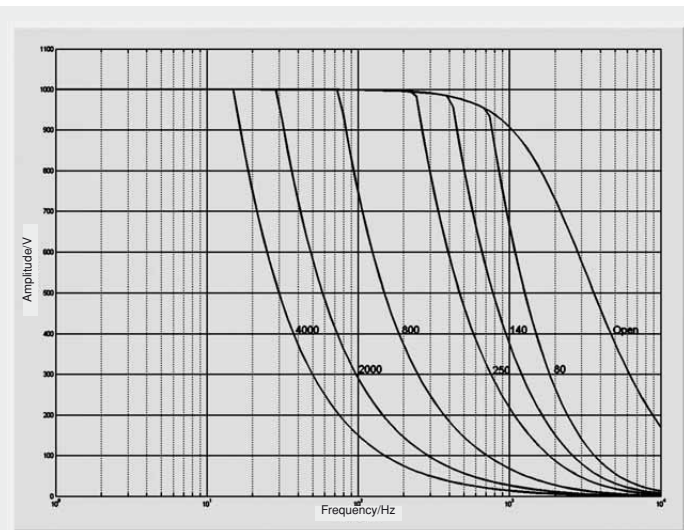
**E-500.HCD**  
Hyperbit™ Functionality for Enhanced System Resolution

Supports certain D/A boards.

Extension cables, adapters & connectors: see in "Accessories" in the "Piezo Drivers / Servo Controllers" (page 2-168 ff).

**Ask about custom designs!**

Optionally digital control via a D/A converter is possible. For several D/A boards from National Instruments PI offers a corresponding LabVIEW™ driver set which is compatible with the PI General Command Set (GCS), the command set used by all PI controllers. A further option includes the patent-



E-421, E-470, E-471, E-472: operating limits with various PZT loads, capacitance is measured in nanofarads

ed HyperBit™ technology providing enhanced system resolution.

Please read details on Calibration Information (see p. 2-103).



E-421.00 HVPZT piezo amplifier module

### Technical Data

<b>Model</b>	<b>E-470.20, E-471.20, E-472.20, E-421.00</b>
Function	Power amplifier for PICA™ high-voltage PZTs (servo-controller option for E-471)
<b>Amplifier</b>	
Output voltage	3 to +1100 V (default) (Selectable -260 to +780 V -550 to +550 V +260 to -780 V -3 to -1100 V)
Amplifier channels	1 (E-472: 2)
Average output power	110 W
Peak output power, <5 ms	550 W
Average current	100 mA
Peak current, <5 ms	500 mA
Amplifier bandwidth, small signal	DC to 3 kHz, related to load capacitance, see operating limits graph
Amplifier bandwidth, large signal	DC to 3 kHz, related to load capacitance, see operating limits graph
Ripple, noise 0 to 100 kHz	<25 mV <sub>RMS</sub> 100 mV <sub>P-P</sub> (200 nF)
Current limitation	Short-circuit-proof
Voltage gain	+100 ±1, -100 ±1 (selectable)
Control input voltage	Servo off: ±1/100 of selected output range Servo on: 0 to 10 V
Input impedance	100 kΩ
<b>Interfaces and operation</b>	
PZT voltage output	LEMO EGG.0B.701.CJL1173
Control input	BNC
DC Offset	10-turn pot., adds 0 to +10 V to Control IN
<b>Miscellaneous</b>	
Operating voltage	100-120 or 220-240 VAC, selectable (fuse change required)
Operating temperature range	+5 to +50 °C (over 40 °C, max. av.) power derated 10%
Mass	5.2 kg (E-470); 7.6 kg (E-471); 10.1 kg (E-472); 2.5 kg (E-420)
Dimensions	236 x 132 x 296 mm + handles (E-470) 450 x 132 x 296 mm + handles (E-471, E-472) 215 x 123 x 185 mm (E-420)

### Linear Actuators & Motors

### Nanopositioning / Piezoelectrics

Piezo Flexure Stages / High-Speed Scanning Systems

Linear

Vertical & Tip/Tilt

2- and 3-Axis

6-Axis

Fast Steering Mirrors / Active Optics

### Piezo Drivers / Servo Controllers

Single-Channel

Multi-Channel

### Modular

Accessories

Piezoelectrics in Positioning

### Nanometrology

### Micropositioning

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