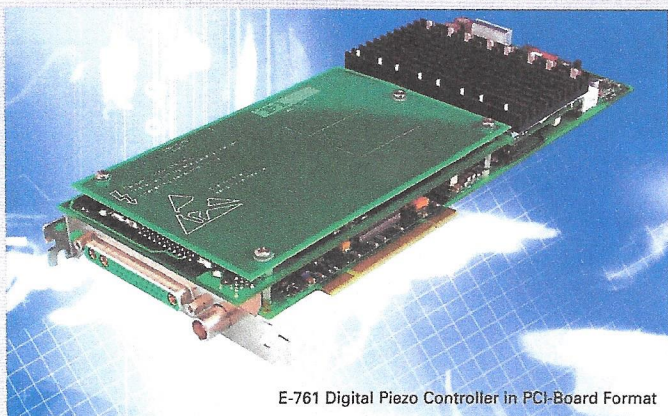


## E-761 Digital Piezo Controller

### Cost-Efficient PCI Board for Piezo Stages with up to 3 Axes



E-761 Digital Piezo Controller in PCI-Board Format

- For Piezo Stages with Capacitive Sensors
- High-Speed PCI Interface
- 3 Logical Axes, 4 Piezo Amplifiers
- Additional High-Bandwidth Analog Interface
- 32-Bit Digital Filters
- Notch Filter for Higher Bandwidth
- 24-Bit Ultra-Low-Noise DAC Converters
- Auto-Loading of Calibration Data from Stage ID-Chip for Interchangeability of Controller and Mechanics
- Coordinate Transformation for Parallel-Kinematics / Parallel-Metrology Systems
- Extensive Software Support

E-761 digital piezo controllers offer advanced control technology in a cost-effective PCI-board format. They were designed to run piezo stages with up to three logical axes. The E-761 incorporates four instrumentation-class, 24-bit digital-analog converters (DAC) behind ultra-low-noise power amplifiers, and is based on a specialized 32-bit digital signal processor (DSP) with proprietary firmware.

Having PCI-board format, the E-761 digital controller can be easily installed in any commercial or industrial PC, allowing for easy integration with other devices such as frame grabbers. The PCI interface with its high bandwidth makes possible a very fast communication between software and

controller. This is a definite plus in time-critical applications or when controlling several axes.

Additionally, the E-761.3CT version offers three digital output lines for a variety of triggering tasks.

#### Improved Trajectory Accuracy Through Parallel Metrology

Digital controllers have a number of advantages over conventional analog piezo controllers. Sensor and actuator axes need not be parallel to each other, or to the orthogonal logical axes used to command the system. The flexible coordinate transformation algorithm permits operation of complex, multi-axis, parallel metrology stages (e.g. 3-axis Z-tip-tilt-stages).

With parallel motion metrology, the controller compensates the undesired off-axis motion of each actuator automatically using the others (active trajectory control). High-end nan positioning systems with active trajectory control can attain motion accuracies in the sub-nanometer range.

#### Digital Linearization and Control Algorithms for Highest Accuracy

Linearization algorithms based on higher-order polynomials improve the positioning accuracy to 0.001% of the travel range.

During fast periodic motion, as typical for scanning applications, the tracking accuracy can be further improved with Dynamic Digital Linearization (DDL, E-710.SCN). This optionally available control algorithm reduces the tracking error by a factor of up to 1000.

The integrated wave generator can save and output periodic motion profiles. In addition to sine and triangle waves, arbitrary, user-defined profiles can be created.

#### Automatic Configuration

PI digital piezo controllers and nan positioning stages with ID-chips can be operated in any combination, supported by the controller's AutoCalibration function. Individual stage data and optimized servo-control parameters are stored in the ID-Chips and are read out automatically by the digital controller.

#### Simple System Integration

All parameters can be set and checked by software. System setup and configuration is done with the included

#### Ordering Information

**E-761.3CD**  
Digital Piezo Nan positioning Controller, 3 Axes, Sub-D-Special, PCI Board

**E-761.00T**  
Trigger Output Bracket for E-761.3CD

**E-761.3CT**  
Digital Piezo Nan positioning Controller, 3 Axes, Sub-D-Special, PCI Board, Trigger Output

Ask about custom designs!

NanoCapture™ and PZTControl™ user-interface software. Interfacing to custom software is facilitated with included LabVIEW drivers and DLLs. All PI controllers use the same command set, a significant advantage during application software development, system upgrade or when operating a variety of different controllers from one application.

## Linear Actuators &amp; Motors

## Nanopositioning/Piezoelectrics

Piezo Flexure Stages /  
High-Speed Scanning Systems

Linear

Vertical &amp; Tip/Tilt

2- and 3-Axis

6-Axis

Fast Steering Mirrors /  
Active OpticsPiezo Drivers /  
Servo Controllers

Single-Channel

Multi-Channel

Modular

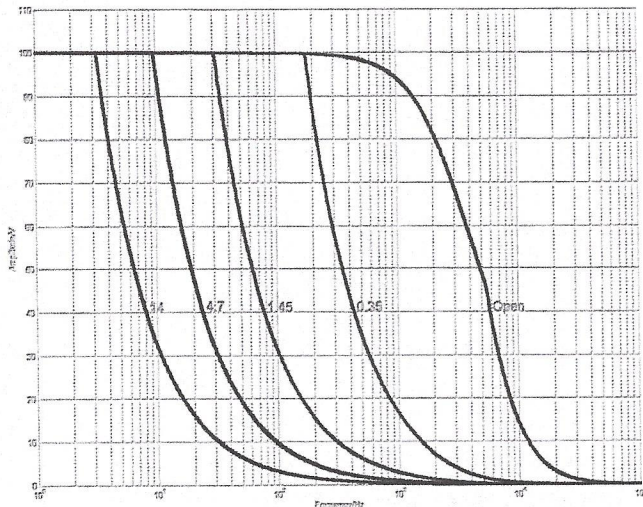
Accessories

Piezoelectrics in Positioning

## Nanometrology

## Micropositioning

## Index

E-761: operating limits with various PZT loads (open-loop), capacitance is measured in  $\mu\text{F}$ 

## Technical Data

Model	E-761.3CD	E-761.3CT
Function	Digital piezo controller and power amplifier, PCI board	Digital piezo controller and power amplifier, PCI board, trigger output
Axes	3	3
Processor	32-bit, floating-point DSP	32-bit, floating-point DSP
Sampling rate, servo-control	40 $\mu\text{s}$ / 25 kHz (sensor-oversampling factor 4)	40 $\mu\text{s}$ / 25 kHz (sensor-oversampling factor 4)
<b>Sensor</b>		
Servo characteristics	P-I, two notch filters	P-I, two notch filters
Sensor type	Capacitive	Capacitive
Sensor channels	3	3
Sensor resolution	16-bit	16-bit
Ext. synchronization	Yes	Yes
<b>Amplifier</b>		
Output voltage	-20 to 120 V	-20 to 120 V
Amplifier channels	4	4
Peak output power per channel,	5.3 W	5.3 W
Average output power per channel	1.7 W	1.7 W
Peak current per channel, <20 ms	50 mA	50 mA
Average current per channel, >20 ms	10 mA	10 mA
Current limitation	Short-circuit-proof	Short-circuit-proof
Resolution DAC	24-bit	24-bit
<b>Interfaces and operation</b>		
Interface / communication	PCI connector	PCI connector
Piezo / sensor connector	Sub-D special	Sub-D special
Control Input sockets	LEMO	LEMO
Digital output	-	3 x TTL
Command set	GCS	GCS
User software	NanoCapture™, PZTControl™	NanoCapture™, PZTControl™
Software drivers	LabVIEW drivers, Windows and Linux Libraries (DLL)	LabVIEW drivers, Windows and Linux Libraries (DLL)
Supported functionality	Wave generator	Wave generator, trigger output
Display	Status LED for piezo voltage	Status LED for piezo voltage
Linearization	4th order polynomial	4th order polynomial
<b>Miscellaneous</b>		
Operating temperature range	+5 to +50 °C (derated 10% over 40 °C)	+5 to +50 °C (derated 10% over 40 °C)
Overtmp protection	Deactivation at 60 °C	Deactivation at 60 °C
Dimensions	287 x 108 x 25 mm (2 slots)	287 x 108 x 25 mm + 122 x 45x 26 mm (3 slots)
Mass	0.56 kg	0.56 (PCI-board only)
Operating voltage	5 V	5 V
Power consumption	20 W, 4 A max.	20 W, 4 A max.