Compact and Cost-Optimized Digital Piezo Controller

For SGS, Piezoresistive and Capacitive Sensors, 1 Axis

E-709

- Linearity error maximum of 0.02 %
- Fast 25 Mbit/s serial interface
- Comprehensive I/O functions
- Inexpensive OEM versions available
- Extensive software package

Fast digital servo controller
Benchtop (.xRG) or OEM board (.xR). Voltage range -30 to 130 V.

Interfaces
USB, digital RS-232, fast serial interface with up to 25 MBit/s. Additional high-bandwidth analog control input / sensor input. Analog output, e.g., for external amplifiers.

User software and functions
PIMikroMove, PI General Command Set (GCS). Drivers for NI LabVIEW, shared libraries for Windows and Linux. Compatible with µManager, MATLAB. Wave generator. Linearization. Data recorder. Autozero. Trigger I/O. Software-configurable parameters.

Application fields
- Multiphoton microscopy, confocal microscopy
- 3-D imaging
- Screening
- Autofocus systems
- Surface analysis
- Wafer inspection

25.03.2024

Specifications

	E-709.SR / E-709.SRG	E-709.PR / E-709.PRG	E-709.CR / E-709.CRG
Sensor type	Strain gauge sensors	Piezoresistive sensors	Capacitive sensors
Function	Digital controller for single-axis piezo nanopositioning systems (.SR: OEM board)	Digital controller for single-axis piezo nanopositioning systems (.PR: OEM board)	Digital controller for single-axis piezo nanopositioning systems (.CR: OEM board)
Axes	1	1	1
Processor	DSP 32-bit floating point, 150 MHz	DSP 32-bit floating point, 150 MHz	DSP 32-bit floating point, 150 MHz
Controller type	PID, two notch filters, sensor linearization	PID, two notch filters, sensor linearization	PID, two notch filters, sensor linearization
Sampling rate, servo control	10 kHz	10 kHz	10 kHz
Sampling rate, sensor	10 kHz	10 kHz	10 kHz

Sensor	E-709.SR / E-709.SRG	E-709.PR / E-709.PRG	E-709.CR / E-709.CRG
Linearization	5th order polynomials	5th order polynomials	5th order polynomials
Sensor bandwidth	5 kHz	5 kHz	5 kHz
Sensor resolution	16-bit	16-bit	16-bit
External synchronization	No	No	No

Amplifier	E-709.SR / E-709.SRG	E-709.PR / E-709.PRG	E-709.CR / E-709.CRG
Output voltage	-30 V to 130 V	-30 V to 130 V	-30 V to 130 V
Peak power (<5 ms)	10 W	10 W	10 W
Average output power (>5 ms)	5 W	5 W	5 W
Peak current (<5 ms)	100 mA	100 mA	100 mA*
Average output current (>5 ms)	50 mA	50 mA	50 mA*
Current limitation	Short-circuit proof	Short-circuit proof	Short-circuit proof
Resolution DAC	17-bit	17-bit	17-bit

| Interfaces and operation	E-709.SR / E-709.SRG	E-709.PR / E-709.PRG	E-709.CR / E-709.CRG
Communication	USB, RS-232, SPI	USB, RS-232, SPI	USB, RS-232, SPI
Piezo / sensor connector	D-sub 9 (f)	D-sub 9 (f)	D-sub special connector
I/O	HD D-sub 26 (f) 1 analog input 0 to 10 V (configurable) 1 analog output 0 to 10 V (configurable) 1 monitor piezo voltage -0.3 to 1.3 V 1 digital input (LVTTL, programmable) 5 digital outputs (LVTTL, 3x predefined, 2x programmable)		
Command set	PI General Command Set (GCS)		
User software	PIMikroMove		
Software drivers	C, C++, C#, MATLAB, NI LabVIEW, Python; supported by MATLAB, µManager, Andor iQ		
Supported functions	Wave generator, data recorder, autozero, trigger I/O		
Display and indicators	Status LED, overflow LED		

Miscellaneous	E-709.SR / E-709.SRG	E-709.PR / E-709.PRG	E-709.CR / E-709.CRG
Operating temperature range	5 to 50 °C (above 40 °C, power derated)	5 to 50 °C (above 40 °C, power derated)	5 to 50 °C (above 40 °C, power derated)
Dimensions	160 mm × 96 mm × 33 mm	160 mm × 96 mm × 33 mm	160 mm × 96 mm × 33 mm
Mass	260 g / 470 g	260 g / 470 g	260 g / 470 g
Operating voltage	24 V DC (for .SRG included in the scope of delivery: external power adapter)	24 V DC (for .PRG included in the scope of delivery: external power adapter)	24 V DC (for .CRG included in the scope of delivery: external power adapter)
Max. power consumption	24 W	24 W	24 W

* The E-709 is also available for capacitive sensor-equipped positioning systems in a version with higher output current.

Drawings / Images
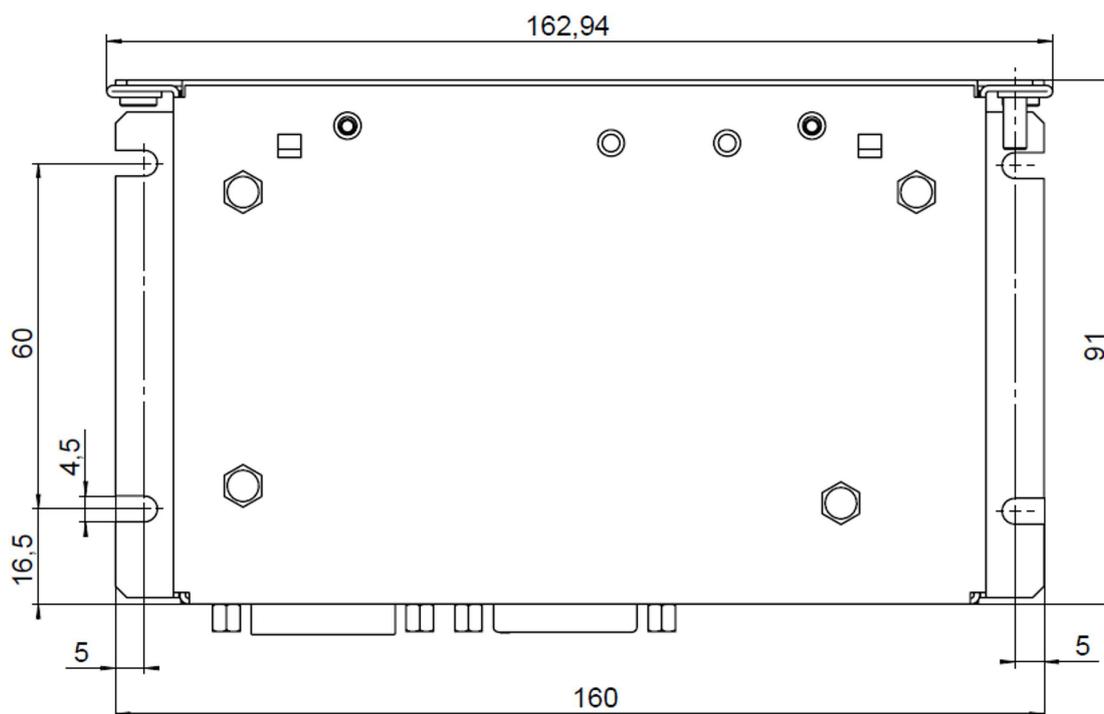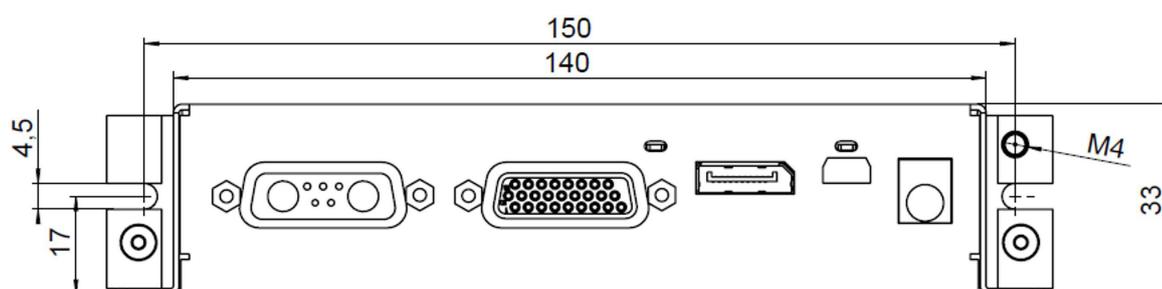
E-709.xRG: dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.
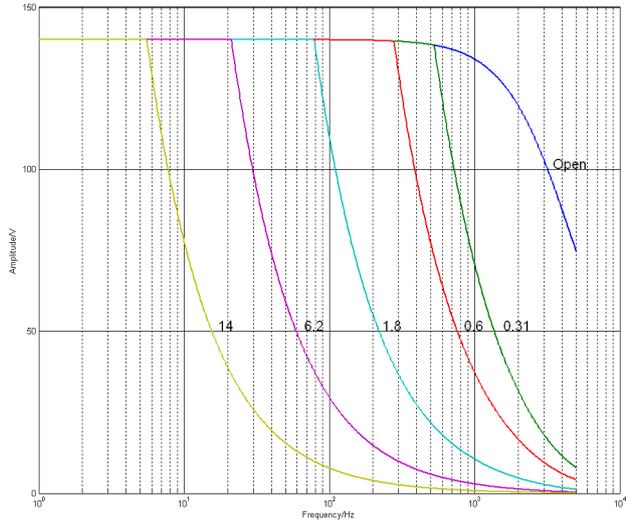
E-709: Operating limits (open loop) with various piezo loads, capacitance values in µF
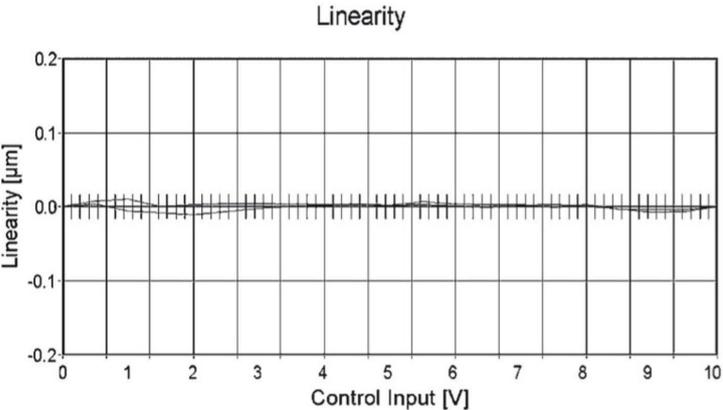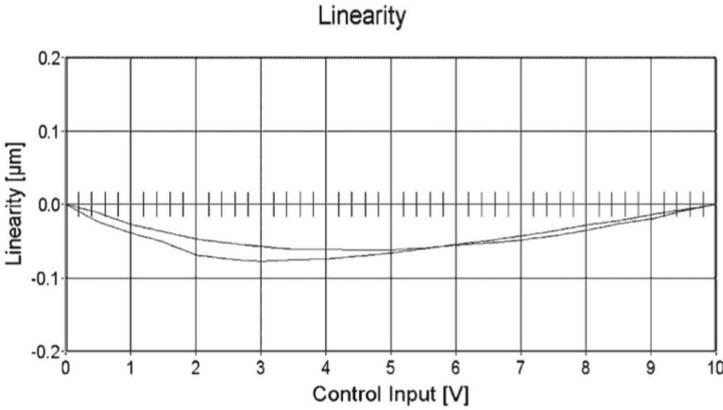
Comparison of the linearity of a strain gauge sensor with analog controller (top) and the E-709 digital controller (bottom), which improves the linearity by up to one order of magnitude
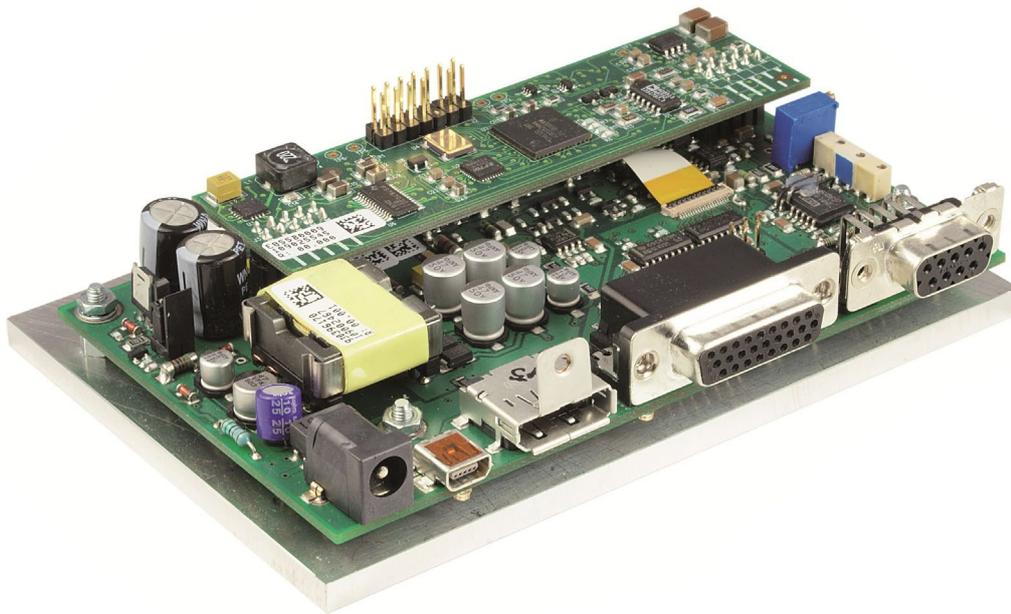
OEM version of the E-709 without housing

Ordering Information

E-709.PRG
Digital piezo controller, 1 axis, -30 to 130 V, piezoresistive sensor, benchtop device

E-709.SRG
Digital piezo controller, 1 axis, -30 to 130 V, strain gauge sensor, benchtop device

E-709.CRG
Digital piezo controller, 1 axis, -30 to 130 V, capacitive sensor, benchtop device

E-709.PR
Digital piezo controller, 1 axis, -30 to 130 V, piezoresistive sensor, OEM module

E-709.SR
Digital piezo controller, 1 axis, -30 to 130 V, strain gauge sensor, OEM module

E-709.CR
Digital piezo controller, 1 axis, -30 to 130 V, capacitive sensor, OEM module