Compact and Cost-Optimized Digital Piezo Controller

For Capacitive Sensors, 1 Axis, with Monitoring Functionality

E-709.1C1L

- Many configuration options for application-optimized dynamics
- Active control of device temperature
- Extensive safety and monitoring functionalities
- Linearity error maximum of 0.01 %

Cost-optimized, high-performance controller

For piezo-based single-axis nanopositioning systems with capacitive sensors. Output voltage -30 to 130 V. Amplifier and sensor evaluation optimized for dynamic applications. Digital linearization. Digital servo controller can optionally be combined with profile generator and position feedforward control. Wave generator. Data recorder. Autozero. Trigger I/O. Supports all current ID chips from PI. Compact design with functional blocks for an easy derivation of OEM versions.

Temperature management

High position stability of the sensor electronics thanks to active temperature control. Adaptable to a wide variety of operating conditions. Temperature stable in less than 10 minutes after switching on. A short warm-up phase allows continuous operation to be dispensed with, therefore increasing the lifetime of the nanopositioning system while reducing energy requirement.

Safety and monitoring functionalities

Overtemperature protection for amplifier and sensor electronics. Short-circuit proof. Continuous, hardware-based measurement of input and output values such as voltage and current as well as internal temperature. High-frequency measurements for static and dynamic evaluation. Remote diagnostics possible thanks to specific query and recording of values.

Interfaces

USB and RS-232/RS-485 for commanding via PI General Command Set (GCS). Real-time SPI interface for position specification and query. High-bandwidth analog control input or sensor input. Analog output for sensor monitor or controlling an external amplifier. The servo cycle can be synchronized via differential inputs and outputs and the SPI interface.

Software interfaces

Extensive software support, e.g., for NI LabVIEW, C, C++, MATLAB, Python. Compatible with µManager and MetaMorph. PIMikroMove user software.

03.09.2020

Application fields

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

	E-709.1C1L
Function	Digital controller for single-axis piezo nanopositioning systems
Axes	1
Processor	DSP 32-bit floating point, 200 MHz
Supported functionality	Wave generator, data recorder, autozero, trigger I/O (short-circuit proof), ID chip (short-circuit proof), temperature management for sensor electronics and amplifier

Servo controller and sensor	E-709.1C1L
Controller type	PID, 2 notch filters, profile generator for velocity and acceleration (trapezoidal profile), position feedforward control
Sampling rate control	20 kHz, externally synchronizable (100 kHz/SPI LDAT)
Sampling rate sensor	20 kHz
Sensor type	Capacitive
Linearization	4th order polynomials
Sensor bandwidth (-3 dB)	6.7 kHz
Sensor resolution	19-bit
Warm-up phase after switching on	<10 min (at 20 °C ambient temperature and 55 °C target temperature)

| Amplifier	E-709.1C1L
Output voltage	-30 V to 130 V
Peak current (< 40 ms)	200 mA
Average output current, typical	100 mA
Peak power*	28 W
Average output power*	14 W
Current limitation	Short-circuit proof
Resolution DAC	24-bit

Interfaces and operation	E-709.1C1L
Communication interfaces	USB 2.0: Mini B RS-232: D-sub 9 (m) or RS-485: HD D-sub 26 (f) SPI: DisplayPort
Piezo / sensor connector	D-sub special 7W2
Analog input	SMB; -10 to 10 V (configurable)
Analog output	SMB; -10 to 10 V (configurable)

| Interfaces and operation	E-709.1C1L
I/O connector	HD D-sub 26 (f) 4 multipurpose digital inputs (TTL, programmable) 4 multipurpose digital outputs (TTL, programmable) 1 servo cycle output (TTL) 1 reset input (TTL) 1 differential input and 1 differential output for the external synchronization of the servo cycle (100 kHz) Differential lines RxD and TxD for RS-485
Command set	PI General Command Set (GCS)
User software	PIMikroMove
Application programming interfaces	API for C / C++ / C# / VB.NET / MATLAB / Python, drivers for NI LabVIEW; supported by MATLAB, MetaMorph, µManager, Andor iQ
Monitoring	On-board recording of temperature, input and output voltages, and current consumption of different components Recording with 20 kHz and 15-bit resolution Query by GCS command and recording by data recorder
Display and indicators	Status LED, ON-target/overflow LED

Miscellaneous	E-709.1C1L
Operating temperature range	5 to 40 °C
Dimensions	160 mm × 104 mm × 44 mm
Mass	415 g
Operating voltage	24 V DC (in the scope of delivery: external power adapter)
Max. power consumption	40 W

* At a nominal peak-peak voltage of 140 V.
Ask about customized versions.

Drawings / Images
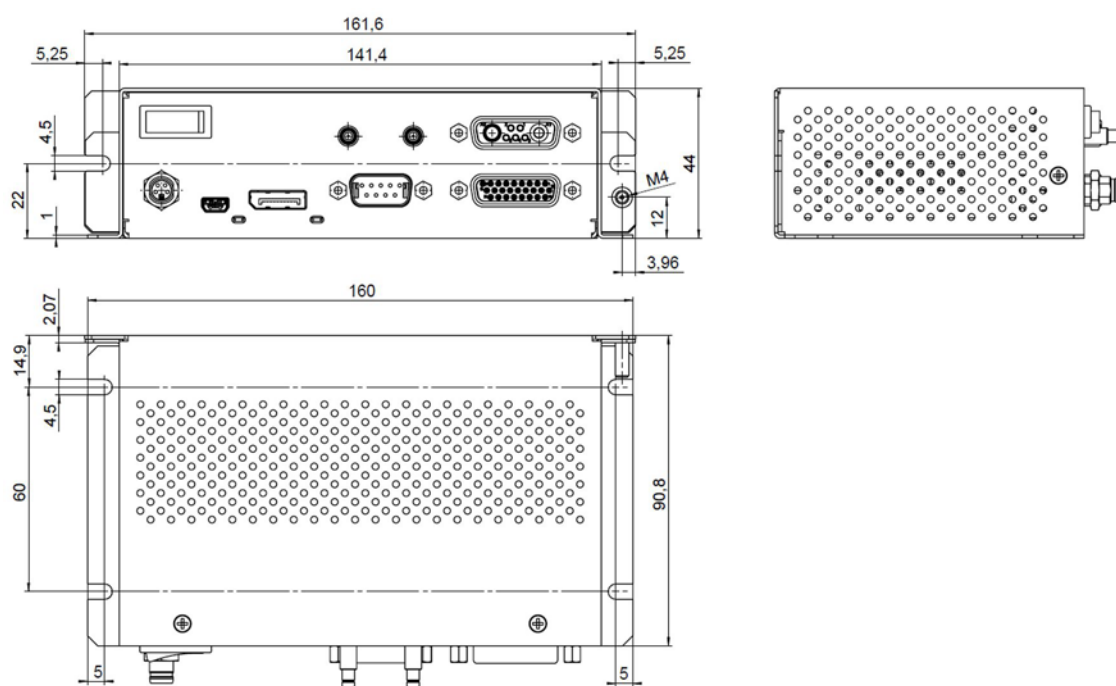
E-709.1C1L: dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

![Graph]
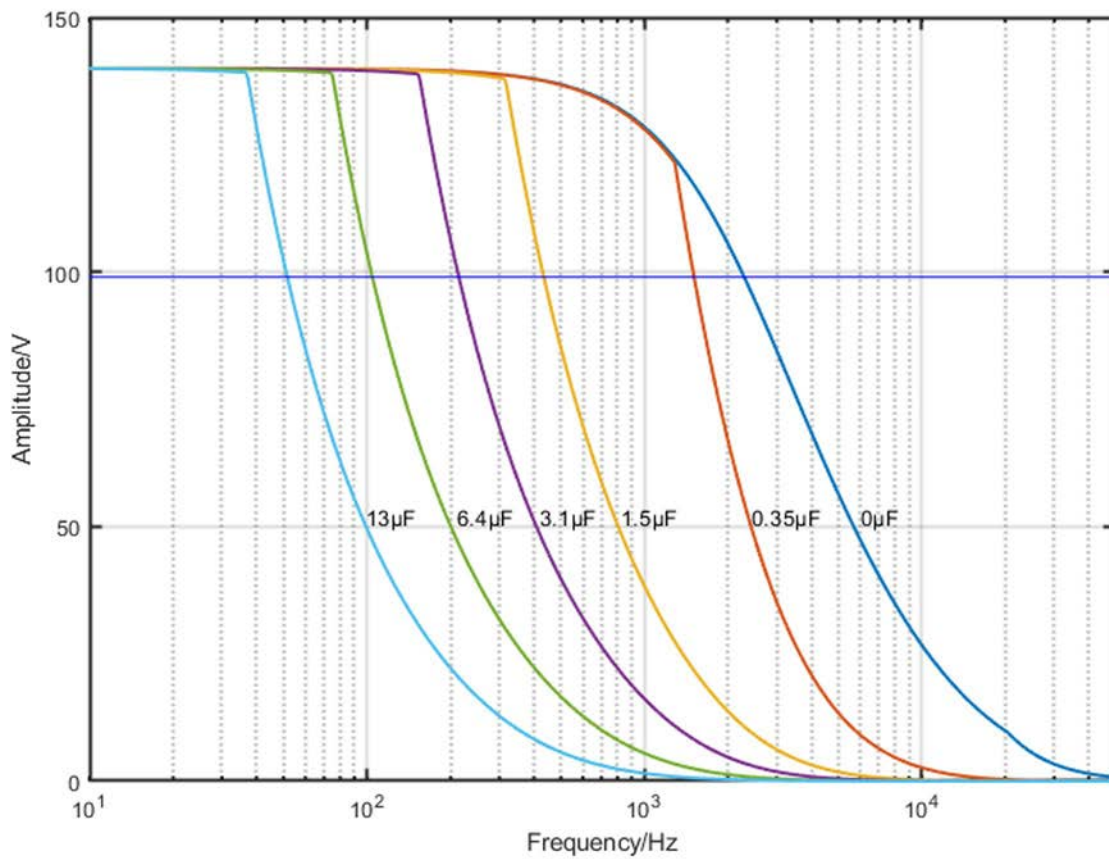
E-709.1C1L: Operating limits (open loop) with various piezo loads, capacitance values in µF

Ordering Information

E-709.1C1L
Digital piezo controller, 1 axis, -30 to 130 V, capacitive sensor, monitoring functionality, benchtop device