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E-710 Digital Piezo Controller

3 to 6 axes, for highest precision



E-710.6CD 6-axis Digital Piezo Controller top model of the E-710 family, shown with custom Super-Invar 6-DOF piezo flexure nanopositioning stage

- **For Nanopositioning Systems with Capacitive Feedback Sensors**
- **All Control Parameters Software-Settable**
- **3-, 4- & 6-Channel Versions**
- **Firmware Linearization: Dynamic Digital Linearization (DDL) Option Improves Scanning Linearity**
- **Coordinate Transformation for Parallel-Kinematics / Parallel-Metrology Systems**
- **Auto-Loading of Calibration Data from Stage ID-Chip for Interchangeability of Controller and Mechanics**
- **Interface Options: High-Speed Parallel I/O Interface and Analog Inputs**
- **Notchfilter for Higher Bandwidth**
- **Extensive Software Support**
- **Option: Digital Sensor-Signal Transmission over 15 m and More**

E-710 digital piezo controllers offer sophisticated functionality in a variety of configurations. Based on powerful 32-bit DSPs (digital signal processor) they include integrated, low-noise power amplifiers for piezo actuators and excitation/read-out electronics for extremely high-resolution capacitive position sensors. E-710s provide up to 8 piezo driver channels, 7 sensor channels and the processing power for coordinated control of up to 6 logical axes, e. g. for parallel kinematics systems.

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. The high-speed processor with a sensor sampling rate of 25 kHz, assures settling times in the millisecond range and below. The controller is perfectly suited for high-dynamics operation, thanks to its high-resolution DA-converters and high-performance voltage amplifiers.

More than just a Controller—Trajectory Control and Data Recording

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.
This control algorithm enables the spatial and temporal tracking during a dynamic scan. 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. The flexibly configurable data recorder enables simultaneous recording and read-out of the corresponding data.

Sensor-Signal Transmission up to 15 m

A remote sensor interface box is available for applications where the distance between the mechanics and electronics is greater than 10 m. This DST option (digital sensor-signal transmission), includes a compatible E-710 controller. It is designed to reduce the interference that begins to degrade performance when the analog sensor excitation and readout signal paths exceed 10 m. The connection between the sensor box and the controller can be up to 15 m (longer distances on request), as the digital signals it carries are far more robust.

Simple System Integration

All parameters can be checked and reset via software. System setup and configuration is done with the included NanoCapture™ and PIMikroMove™ user-interface software. Interfacing to custom software is facilitated with included LabVIEW drivers and DLLs. System programming is the same with all PI controllers, so controlling a system with a variety of different controllers is possible without difficulty.

Ordering Information

See Ordering Numbers / Interface Options on next page

Options and Accessories

E-710.SCN
DDL (Dynamic Digital Linearization) Firmware Upgrade

E-710.3X3
Extension Cable for E-710.3CD, 3 Sub-D Connectors, 3 m

E-710.3X5
Extension Cable for E-710.3CD, 3 Sub-D Connectors, 5 m

E-710.1X3
Extension Cable for E-710, 1 Sub-D Connectors, 3 m

E-710.DST4
DST Cable (Digital Signal Transmission) for E-710.6SD, 8 m

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Ordering Information / Interface Options

Channels	Connector (piezomechanics)	Base Model	Parallel I/O Interface	Analog Input*	Analog Input* + Parallel I/O Interface	DST** + Analog Input*
3	1 x Special Sub-D, 3 ch.	E-710.3CD	E-710.P3D	E-710.A3D	E-710.APD	incl. Parallel I/O Interface E-710.APS
4	4 x LEMO	E-710.4CL	E-710.P4L	–	–	–
	4 x Special Sub-D, 1 ch.	E-710.4CD	E-710.P4D	–	–	–
	1 x Special Sub-D, 3 ch. + 1 x Special Sub-D, 1 ch.	E-710.C4D	E-710.4PD	–	–	–
6	2 x Special Sub-D, 3 ch.	E-710.6CD	–	Standard	–	Analog input on DST box E-710.6SD

*LEMO connector
**Digital Signal Transmission



The digital sensor-signal transmission (DST) allows a distance up to 15 m between positioning unit and controller

Technical Data

Model	E-710.3CD / E-710.P3D / E-710.A3D E-710.APD / E-710.APS	E-710.4CD / E-710.4CL / E-710.C4D E-710.4PD / E-710.P4D / E-710.P4L	E-710.6CD / E-710.6SD
Function	Digital piezo controller for multi-axis nanopositioning systems with capacitive sensors	Digital piezo controller for multi-axis nanopositioning systems with capacitive sensors	Digital piezo controller for multi-axis nanopositioning systems with capacitive sensors
Axes	3	4	6
Processor	32-bit, floating-point DSP	32-bit, floating-point DSP	2 x 32-bit, floating-point DSP
Sampling rate, servo-control	200 µs / 5 kHz	200 µs / 5 kHz	200 µs / 5 kHz
Sampling rate, sensor	50 µs / 20 kHz	50 µs / 20 kHz	40 µs / 25 kHz
Sensor			
Servo characteristics	P-I, two notch filters	P-I, two notch filters	P-I, two notch filters
Sensor type	Capacitive	Capacitive	Capacitive
Sensor channels	3	4	6
Sensor resolution	16 bit	16 bit	16 bit
Ext. synchronization	Yes	Yes	Yes
Amplifier			
Output voltage	-20 to 110 V	-20 to 110 V	-20 to 110 V
Amplifier channels	4	4	8
Peak output power per channel,	25 W	25 W	25 W
Average output power per channel	6 W	6 W	6 W
Peak current per channel, <20 ms	200 mA	200 mA	200 mA
Average current per channel, >20 ms	60 mA	60 mA	60 mA
Current limitation	Short-circuit-proof	Short-circuit-proof	Short-circuit-proof
Resolution DAC	20 bit	20 bit	20 bit
Interfaces and operation see separate table			
Communication interfaces	RS-232; IEEE 488 Parallel I/O (E-710.Pxx / .xPx only)	RS-232; IEEE 488; Parallel I/O (E-710.Pxx / .xPx only)	RS-232; IEEE 488
Command set	GCS	GCS	GCS
User software	PIMikroMove™, PZTControl™, NanoCapture™	PIMikroMove™, PZTControl™, NanoCapture™	PIMikroMove™, PZTControl™, NanoCapture™
Software drivers	LabVIEW drivers, DLLs	LabVIEW drivers, DLLs	LabVIEW drivers, DLLs
Supported functionality	Wave generator, data recorder	Wave generator, data recorder	Wave generator, data recorder
Display	Power LED	Power LED	Power LED
Linearization	4th order polynomials, DDL (optional)	4th order polynomials, DDL (optional)	4th order polynomials, DDL
Miscellaneous			
Operating temperature range	5 to 50 °C	5 to 50 °C	5 to 50 °C
Dimensions	450 x 88 x 343 mm + handles	450 x 88 x 343 mm + handles	450 x 88 x 343 mm + handles
Mass	7 kg	7 kg	7 kg
Operating voltage	90–120 or 220–264 VAC, 50–60 Hz	90–120 or 220–264 VAC, 50–60 Hz	90–120 or 220–264 VAC, 50–60 Hz
Max. power consumption	60 W	60 W	120 W

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