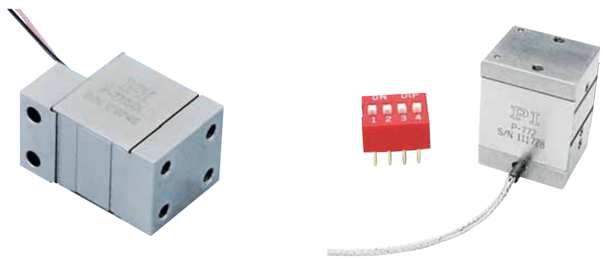
High Dynamics and Direct Position Measurement



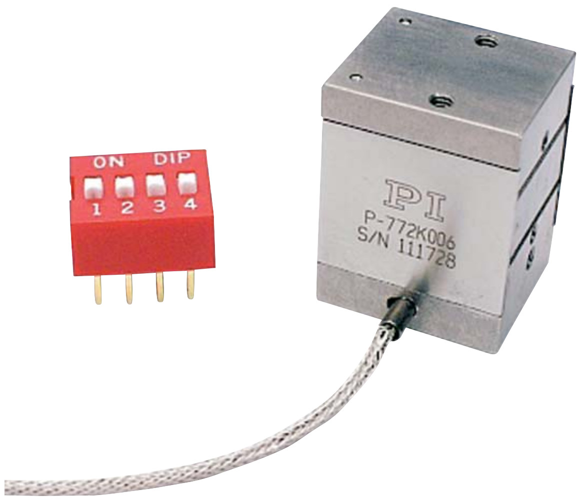
The P-772 piezo nanopositioning system is available with capacitive sensors for closed-loop operation (left) or as open-loop version (right). DIP switch for size comparison.

- **Smallest Stage with Direct Metrology**
- **Frictionless, High-Precision Flexure Guiding System**
- **Resolution <0.1 nm**
- **Travel Range to 12 µm**
- **Closed-Loop and Open-Loop Versions**
- **Rapid Response and Settling**
- **Outstanding Lifetime Due to PICMA® Piezo Actuators**

Modell	Closed-loop / open-loop travel @ 0 to +100 V	Closed-loop / open-loop resolution	Linearity	Unloaded resonant frequency	Load capacity
P-772.1CD / P-772.1CL	10 / 12 µm	0.05 / 0.05 nm	0.03 %	1.7 kHz	5 N
P-772.0L	– />10 µm	– / 0.05 nm	–	1.7 kHz	5 N

P-772

Ultra-Compact Piezo NanoAutomation® Stage with Direct Metrology



P-772.1CD piezo nanopositioning / scanning stage (DIP switch for size comparison)

- **Smallest Flexure-Guided Stage with Capacitive Feedback**
- **Ideal for Head/Media Test & Fiber Optics**
- **Resolution <0.1 nm**
- **Ultra-Fast Response (1.7 kHz Resonant Frequency)**
- **ID-Chip for Auto Calibrate Function**
- **Frictionless Precision Flexure Guiding System**
- **PICMA® High-Performance Piezo Drives**

P-772 nanopositioning stages are the smallest flexure-guided, piezo-driven positioning systems with integrated capacitive sensors currently available. They provide a positioning and scanning range of up to 10 µm, sub-nanometer resolution and ultra-fast response.

Application Examples

- Head/media test
- Disk drive test
- Laser tuning
- Fiber optics
- Metrology
- Nanopositioning
- Scanning microscopy
- Scanning interferometry
- Biotechnology
- Micromanipulation, etc.

Nanometer Precision in Milliseconds

Careful attention to mass minimization, results in significant reduction in inertial recoil forces applied to the supporting structures, enhancing overall system response, throughput and stability with settling times in the millisecond range. Furthermore our new digital control electronics with DDL (Dynamic Digital Linearization) can be used to increase linearity and effective bandwidth in scanning applications by up to 1000-fold (see p. 6-16).

AutoCalibration

For optimized operation and interchangeability of nanomechanisms and controllers, model P-772.1CD is equipped with an ID-chip which holds all calibration data and sends it to the digital controller (e.g. E-750.CP). Model P-772.1CL can be used with either analog or digital controllers.

Superior Accuracy Through Direct-Motion Metrology with Capacitive Sensors

P-772 stages are equipped with absolute-measuring, direct-metrology capacitive sensors. These sensors make possible motion linearity to 0.03% with effective resolution in the sub-nanometer range. They boast high bandwidth and exhibit no periodic errors.

Unlike conventional sensors, capacitive sensors measure the actual distance between the fixed frame and the moving part of the stage. This results in higher motion linearity, long-term stability, phase fidelity, and—because external disturbances are seen by the sensor immediately—a stiffer, faster-responding servo-loop. See p. 2-4 *ff.* and p. 5-2 *ff.* for more information.

Working Principle / Reliability

P-772 stages are equipped with the award winning PICMA® piezo drives, integrated into a sophisticated flexure guiding system. The wire-EDM-cut flexures are FEA modeled for zero stiction, zero friction and exceptional guiding precision. The ceramic-encapsulated PICMA® drives are more robust than conventional piezo actuators, featuring superior lifetime and performance in both dynamic and static applications.

Because guidance, actuators and sensors are all frictionless and maintenance-free, these nanopositioning systems achieve outstanding levels of reliability.

Ordering Information

P-772.1CD
Ultra-Compact NanoAutomation® Stage, Capacitive Sensor, AutoCalibrate, Sub-D Connector

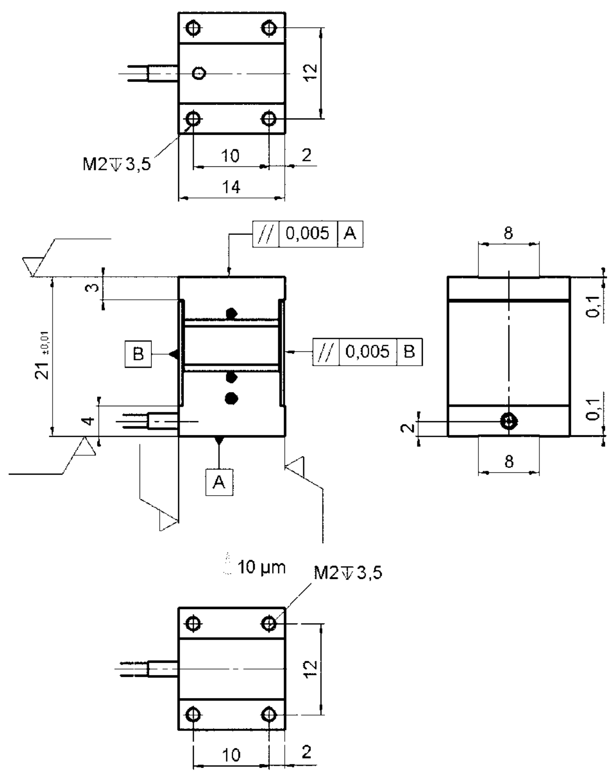
P-772.1CL
Ultra-Compact NanoAutomation® Stage, Capacitive Sensor, Lemo Connector

Ask about custom designs!

Notes

See the "Piezo Drivers & Nanopositioning Controllers" section, p. 6-8 *ff.* for our comprehensive line of low-noise control electronics.

See the "Selection Guide" on p. 2-14 *ff.* for comparison with other nanopositioning systems.



P-772.1CD dimensions (in mm)

Technical Data

Models	P-772.1CD	P-772.1CL	Units	Notes see page 2–84
Active axes	X	X		
Open-loop travel @ 0 to 100 V	12	12	µm ±20%	A2
Closed-loop travel	10	10	µm	A5
Integrated feedback sensor	capacitive	capacitive		B
* Closed-loop / open-loop resolution	0.05 / 0.05	0.05 / 0.05	nm	C1
** Closed-loop linearity (typ.)	0.03	0.03	%	
Full-range repeatability (typ.)	±1	±1	nm	C3
Stiffness	7	7	N/µm ±20%	D1
Push/pull force capacity (in operating direction)	50 / 5	50 / 5	N	D3
Max. (±) normal load	5	5	N	D4
Lateral force limit	10	10	N	D5
Electrical capacitance	0.8	0.8	µF ±20%	F1
*** Dynamic operating current coefficient (DOCC)	7.5	7.5	µA/(Hz x µm)	F2
Unloaded resonant frequency	1700	1700	Hz ±20%	G2
Operating temperature range	-20 to 80	-20 to 80	°C	H2
Voltage connection	ID	VL		J1
Sensor connection	ID	2 x C		J2
Weight (w/o cables)	170	170	g ±5%	
Body material	N-S	N-S		L
Recommended amplifier/controller (codes explained p. 2-17)	M	H, F, L		

* For calibration information see p. 2-8. Resolution of PI piezo nanopositioners is not limited by friction or stiction. The value given is noise equivalent motion with E-503, E-710

** with digital controller

*** Dynamic Operating Current Coefficient in µA per Hz and µm. Example: Sinusoidal scan of 10 µm at 10 Hz requires approximately 0.8 mA drive current.