

P-734

Ultra-Precision Trajectory, XY Nanopositioning Stages with Parallel Metrology

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P-734 flexure nanopositioning stage with ultra-precise trajectory control

- Ultra-Precision Trajectory Control, Ideal for Surface Analysis and Scanning Microscopy
- Flatness in the Low Nanometer Range
- Parallel-Kinematics/Metrology for Enhanced Responsiveness and Automatic Runout Compensation
- 100 x 100 μm Travel Range
- Direct-Metrology Capacitive Sensors for Higher Precision
- 56 x 56 mm Clear Aperture
- PICMA® High-Performance Piezo Drives

Application Examples

- Scanning microscopy
- Metrology
- Surface structure analysis
- Semiconductor test equipment
- Precision mask and wafer alignment
- Scanning interferometry
- Imaging (resolution enhancement)
- Biotechnology
- Micromanipulation and other applications where single-plane high-precision XY motion is required

P-734 open-frame XY-nanopositioning and scanning stages feature an ultra-precise, flexure guiding system which confines motion to the XY plane and reduces runout in Z to a few nanometers or less. This unsurpassed trajectory precision is fundamental for highest-precision surface metrology applications.

These stages provide a positioning and scanning range of 100 x 100 μm with accuracy and resolution in the nanometer and sub-nanometer range. The 56 x 56 mm clear aperture is ideal for transmitted-light applications, such as near-field scanning microscopy.

Higher Precision Through Parallel Kinematics/Metrology

P-734 piezo stages feature a parallel-kinematics design with direct-measuring, non-contact capacitive position sensors (parallel, direct metrology).

Unlike conventional indirect 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.

Parallel kinematics means that all actuators act directly on the same moving platform leading to reduced size, inertia and the elimination of microfriction caused by moving cables. The advantages are enhanced dynamics, higher scanning rates, and better reproducibility.

With parallel metrology, all sensors measure the position of the same moving platform against the same stationary reference (the fixed frame). This means all motion is inside the servo-loop, no matter which actuator may have caused it, resulting in superior multi-axis precision (Active Trajectory Control).

Ordering Information

P-734.2CL
XY Piezo Flexure Stage, Ultra-Precision Trajectory Control, 100 x 100 μm , Parallel Metrology, Lemo Connectors

P-734.2CD
XY Piezo Flexure Stage, Ultra-Precision Trajectory Control, 100 x 100 μm , Parallel Metrology, sub-D Connector

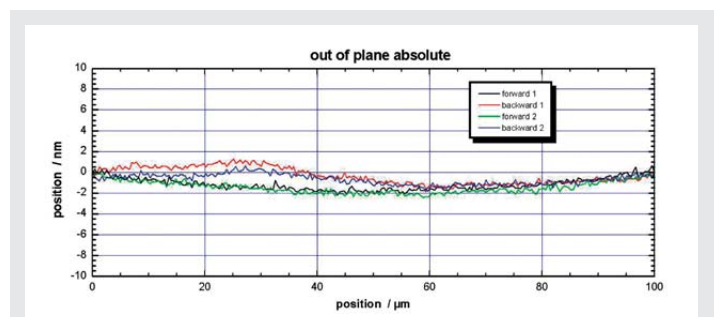
Ask about custom designs!

Dynamic Digital Control for Best Scanning Linearity

Use our new digital control electronics with DDL (Dynamic Digital Linearization) to increase linearity and effective bandwidth in scanning applications by up to 1000-fold (see p. 6-16). By virtually eliminating tracking errors, DDL also increases the usable travel range.

Working Principle / Reliability

P-734 nanopositioning stages are equipped with the award winning PICMA® piezo drives, integrated into a sophisticated, single-module, parallel-kinematics, 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.

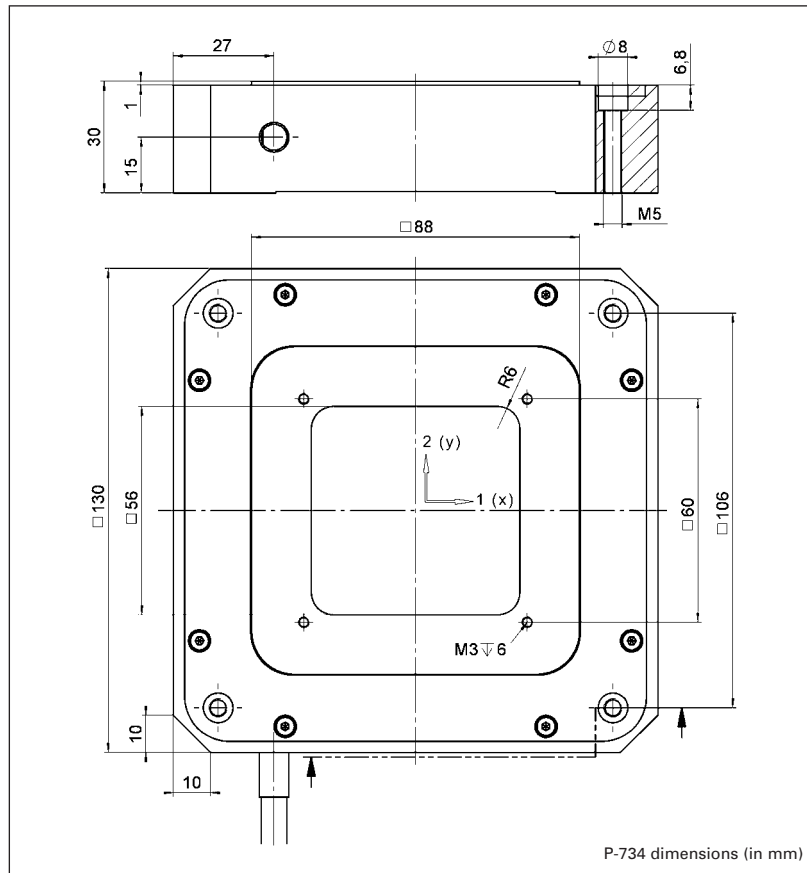


The typical flatness of P-734 motion is in the low nanometer range.

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

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.



Technical Data

Models	P-734.2CL	P-734.2CD	Units	Notes see p. 2-84
Active axes	X, Y	X, Y		
Open-loop travel @ 0 to 100 V	100 x 100	100 x 100	µm ±20%	A2
Closed-loop travel	100 x 100	100 x 100	µm	A5
Integrated feedback sensor	2 x capacitive	2 x capacitive		B
* Closed-loop / open-loop resolution	0.3 / 0.2	0.3 / 0.2	nm	C1
Closed-loop linearity (typ.)	0.03	0.03	%	
Full-range repeatability (typ.)	±2.5	±2.5	nm	C3
Stiffness	3	3	N/µm ±20%	D1
Push / pull force capacity (in operating direction)	300 / 100	300 / 100	N	D3
Max. (±) normal load	20	20	N	D4
Electrical capacitance	6.0 / axis	6.0 / axis	µF ±20%	F1
** Dynamic operating current coefficient (DOCC)	7.5 / axis	7.5 / axis	µA/(Hz x µm)	F2
Unloaded resonant frequency	500	500	Hz ±20%	G2
Resonant frequency @ 200 g load	350	350	Hz ±20%	G3
Resonant frequency @ 500 g load	250	250	Hz ±20%	G3
Operating temperature range	-20 to 80	-20 to 80	°C	H2
Voltage connection	2 x VL	sub-D, special		J1
Sensor connection	4 x C	sub-D, special		J2
Weight (with cables)	580	580	g ±5%	
Body material	Al	Al		L
Recommended amplifier/controller (codes explained p. 2-17)	H, E, L	K		

* 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 amplifier.
 ** Dynamic Operating Current Coefficient in µA per Hz and µm. Example: Sinusoidal scan of 30 µm at 10 Hz requires approximately 2.3 mA drive current.

- Piezo Actuators
- Nanopositioning & Scanning Systems**
- Active Optics / Steering Mirrors
- Tutorial: Piezo-electrics in Positioning
- Capacitive Position Sensors
- Piezo Drivers & Nanopositioning Controllers
- Hexapods / Micropositioning
- Photonics Alignment Solutions
- Motion Controllers
- Ceramic Linear Motors & Stages
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