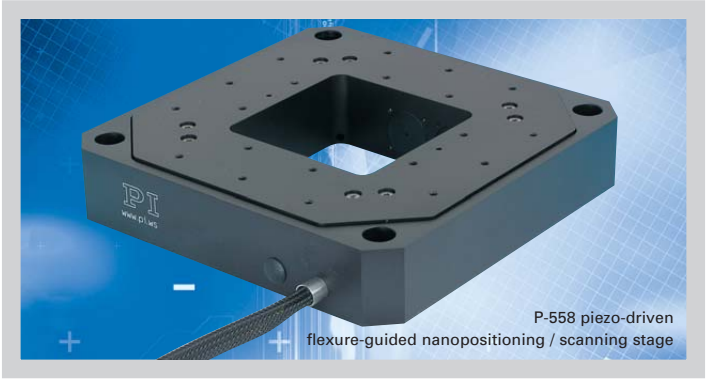
P-518 · P-528 · P-558

Z/Tip/Tilt Piezo Flexure Nanopositioning / Scanning Stages with Parallel Metrology

>> Click http://www.pi.ws/fwd/Piezo-Stage for the Latest Specs on these Products



P-558 piezo-driven flexure-guided nanopositioning / scanning stage

- **Precision Trajectory Control**
- **Parallel-Kinematics/Metrology for Enhanced Responsiveness / Multi-Axis Precision**
- **Travel Ranges to 200 µm / 4 mrad**
- **Clear Aperture 66 x 66 mm**
- **Direct Metrology with Capacitive Sensors for Highest Precision**
- **PICMA® High-Performance Piezo Drives**

P-5x8 series, Z/tip/tilt nanopositioners / scanners are open-frame, high-resolution, piezo-driven stages providing motion to 200 µm and 4 mrad with resolutions of up to 0.5 nm and 50 nrad. The 66 x 66 mm clear aperture is ideal for transmitted-light applications.

Higher Precision Through Parallel Kinematics/Metrology

P-5x8 piezo scanning stages feature a parallel-kinematics design with direct-measuring, non-contact capacitive position sensors (parallel, direct metrology).

Application Examples

- Metrology
- Lithography
- Nanopositioning
- Scanning microscopy
- Disk-drive testing
- Biotechnology
- Laser technology
- Micromanufacturing

Unlike conventional sensors, capacitive sensors measure the actual distance between the fixed frame and the moving part of the stage. They detect errors contributed by all components in the drive train—from the actuator through the flexures to the platform. This results in higher phase fidelity, bandwidth, long-term stability and—because external disturbances are seen by the sensor immediately—a stiffer, faster-responding servo-loop.

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 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 that all motion is inside the servo-loop, no matter which actuator may have caused it, resulting in superior multi-axis precision.

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).

Working Principle / Reliability

P-5x8 nanopositioning stages are equipped with the award winning PICMA® piezo drives, integrated into a sophisticated parallel-kinematics flexure guiding system. The flexures are FEA-modeled for zero-friction and high guiding precision. The ceramic-encapsulated PICMA® drives are more robust

Ordering Information

P-558.ZCL / P-558.ZCD *
Z Piezo Flexure Stage, 50 µm, Capacitive Sensor.

P-518.ZCL / P-518.ZCD *
Z Piezo Flexure Stage, 100 µm, Capacitive Sensor.

P-528.ZCL / P-528.ZCD *
Z Piezo Flexure Stage, 200 µm, Capacitive Sensor.

P-558.TCD
Z/Tip/Tilt Piezo Flexure Stage, 50 µm, 1 mrad, Capacitive Sensor, Sub-D Connector

P-518.TCD
Z/Tip/Tilt Piezo Flexure Stage, 100 µm, 2 mrad, Capacitive Sensor, Sub-D Connector

P-528.TCD
Z/Tip/Tilt Piezo Flexure Stage, 200 µm, 4 mrad, Capacitive Sensor, Sub-D Connector

* .ZCL with LEMO Connectors
* .ZCD with Sub-D Connector

Ask about custom designs!

Technical Data

Models	P-528.ZCL/ P-558.ZCD	P-518.ZCL/ P-518.ZCD
Active axes	Z	Z
Open-loop travel @ 0 to 100 V	50	100
Closed-loop travel	50	100
Integrated feedback sensor	1 x capacitive	1 x capacitive
* Closed-loop / open-loop resolution	0.5 / 0.2	0.5 / 0.4
Closed-loop linearity (typ.)	0.03	0.03
Full-range repeatability (typ.)	±5	±5
Stiffness	Z: 4.0	Z: 2.7
Push / pull force capacity (in operating direction)	Z: 100 / 50	Z: 100 / 50
Max. (±) normal load	50	50
** Electrical capacitance	6.5	9
** Dynamic operating current coefficient (DOCC)	16.5	11.5
Unloaded resonant frequency	570	500
Resonant frequency @ 500 g load	410	350
Resonant frequency @ 2500 g load	240	190
Operating temperature range	-20 to 80	-20 to 80
Voltage connection	VL ***	VL ***
Sensor connection	2 x C ***	2 x C ***
Weight (with cables)	1380	1400
Body material	Al	Al
Recommended amplifier/controller (codes explained p. 2-17)	H, F, L / M	H, F, L / M

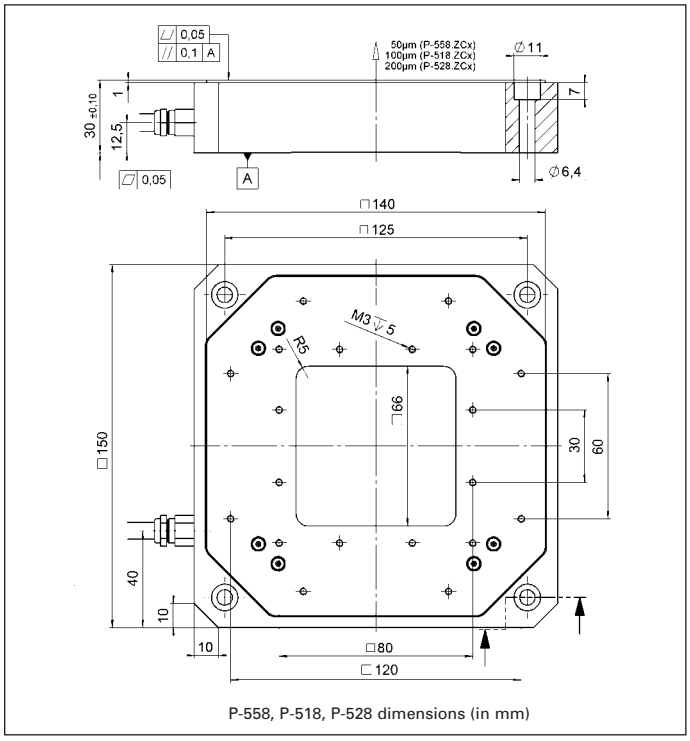
than conventional piezo actuators, featuring superior lifetime and performance in both dynamic and static applications.

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

Notes

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

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



P-558, P-518, P-528 dimensions (in mm)

P-528.ZCL/ P-528.ZCD	P-558.TCD	P-518.TCD	P-528.TCD	Units	Notes see p. 2-84
Z	Z, θ_x, θ_y	Z, θ_x, θ_y	Z, θ_x, θ_y		
200	50 (1 mrad)	100 (2 mrad)	200 (4 mrad)	µm ±20%	A2
200	50 (1 mrad)	100 (2 mrad)	200 (4 mrad)	µm	A5
1 x capacitive	3 x capacitive	3 x capacitive	3 x capacitive		B
1 / 0.6	0.5 / 0.2 (50 / 20 nrad)	0.5 / 0.4 (50 / 40 nrad)	1 / 0.6 (100 / 60 nrad)	nm	C1
0.03	0.03	0.03	0.03	%	
±10	±5 (±0.1 µrad)	±5 (±0.1 µrad)	±10 (±0.1 µrad)	nm	C3
Z: 1.5	Z: 4.0	Z: 2.7	Z: 1.5	N/µm ±20%	D1
Z: 100 / 50	Z: 100 / 50	Z: 100 / 50	Z: 100 / 50	N	D3
50	50	50	50	N	D4
12.5	Z: 6.5	Z: 9	Z: 8	µF ±20%	F1
8	Z: 16.5	Z: 11.5	Z: 8	µA/(Hz x mrad)	F2
350	Z: 570 θ_x, θ_y: 610	Z: 500 θ_x, θ_y: 530	Z: 350 θ_x, θ_y: 390	Hz ±20%	G2
210	Z: 410 θ_x, θ_y: 430	Z: 350 θ_x, θ_y: 370	Z: 210 θ_x, θ_y: 250	Hz ±20%	G3
115	Z: 240 θ_x, θ_y: 245	Z: 190 θ_x, θ_y: 200	Z: 115 θ_x, θ_y: 130	Hz ±20%	G3
-20 to 80	-20 to 80	-20 to 80	-20 to 80	°C	H2
VL ***	D	D	D		J1
2 x C ***	D	D	D		J2
1420	1380	1400	1420	g ±5%	
Al	Al	Al	Al		L
H, F, L / M	K	K	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-710, E-750, E-503 amplifiers.

** Dynamic Operating Current Coefficient of linear axes is in µA per Hz and µm. Example P-558.CZL: Sinusoidal scan of 10 µm at 10 Hz requires approximately 1.7 mA drive current.

*** Version .ZCD with one Sub-D special connector only (sensor and operating voltage).