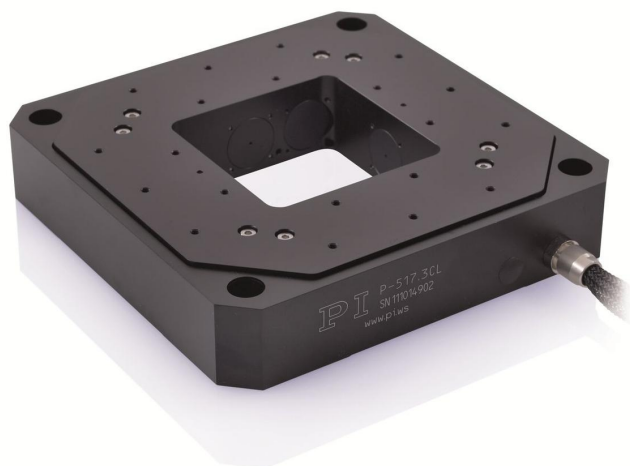


Multi-Axis Piezo Scanner

High Dynamics Nanopositioner / Scanner with Direct Position Measuring



P-517 • P-527

- 2- and 3-axis versions (XY and XYθ_z)
- Travel ranges to 200 μm
- Subnanometer resolution

Application fields

- Metrology
- Interferometry
- Photonics / integrated optics
- Lithography
- Nanopositioning
- Scanning microscopy
- Sample alignment
- Micromachining

Outstanding lifetime thanks to PICMA® piezo actuators

The PICMA® piezo actuators are all-ceramic insulated. This protects them against humidity and failure resulting from an increase in leakage current. PICMA® actuators offer an up to ten times longer lifetime than conventional polymer-insulated actuators. 100 billion cycles without a single failure are proven.

Subnanometer resolution with capacitive sensors

Capacitive sensors measure with subnanometer resolution without contacting. They guarantee excellent linearity of motion, long-term stability, and a bandwidth in the kHz range.

High guiding accuracy due to zero-play flexure guides

Flexure guides are free of maintenance, friction, and wear, and do not require lubrication. Their stiffness allows high load capacity and they are insensitive to shock and vibration. They work in a wide temperature range.

Automatic configuration and fast component exchange

Mechanics and controllers can be combined as required and exchanged quickly. All servo and linearization parameters are stored in the ID chip of the D-sub connector of the mechanics. The autocalibration function of the digital controllers uses this data each time the controller is switched on.

High tracking accuracy in the nanometer range due to parallel position measuring

All degrees of freedom are measured against a single fixed reference. Undesired crosstalk between axes can be actively compensated (active guiding) in real time (depending on the bandwidth). High tracking accuracy is achieved in the nanometer range even in dynamic operation.

Motion	Unit	Tolerance	P-517.2CD	P-517.2CL	P-517.3CD	P-517.3CL	P-517.RCD	P-527.2CD	P-527.2CL	P-527.3CD
Active axes			X, Y	X, Y	X, Y, Z	X, Y, Z	X, Y, θ Z	X, Y	X, Y	X, Y, Z
Travel range in X	μm		100	100	100	100	100	200	200	200
Travel range in Y	μm		100	100	100	100	100	200	200	200
Travel range in Z	μm				20	20				20
Travel range in X, open loop	μm	$\pm 20\%$	130	130	130	130	130	250	250	250
Travel range in Y, open loop	μm	$\pm 20\%$	130	130	130	130	130	250	250	250
Travel range in Z, open loop	μm	$\pm 20\%$			25	25				25
Rotation range in θ Z	mrad						1			
Rotation range in θ Z, open loop	mrad	$\pm 20\%$					2.6			
Linearity error in X	%	Typ.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Linearity error in Y	%	Typ.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Linearity error in Z	%	Typ.			0.03	0.03				0.03
Linearity error in θ Z	%	Typ.					0.15			

Positioning	Unit	Tolerance	P-517.2CD	P-517.2CL	P-517.3CD	P-517.3CL	P-517.RCD	P-527.2CD	P-527.2CL	P-527.3CD
Bidirectional repeatability in X	nm	Typ.	5	5	5	5	5	10	10	10
Bidirectional repeatability in Y	nm	Typ.	5	5	5	5	5	10	10	10
Bidirectional repeatability in Z	nm	Typ.			1	1				1
Bidirectional repeatability in θ Z	μrad	Typ.					0.5			
Resolution in X, open loop	nm	Typ.	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5
Resolution in Y, open loop	nm	Typ.	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5
Resolution in Z, open loop	nm	Typ.			0.1	0.1				0.1
Resolution in θ Z, open loop	μrad	Typ.					0.1			
Integrated sensor			Capacitive, direct position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring	Capacitive, indirect position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring
System resolution in X	nm		1	1	1	1	1	2	2	2
System resolution in Y	nm		1	1	1	1	1	2	2	2
System resolution in Z	nm				0.1	0.1				0.1
System resolution in θ Z	μrad						0.3			

Drive Properties	Unit	Tolerance	P-517.2CD	P-517.2CL	P-517.3CD	P-517.3CL	P-517.RCD	P-527.2CD	P-527.2CL	P-527.3CD
Drive type			Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®	Piezo actuator/PICMA®
Maximum power consumption	W									
Electrical capacitance in X	μF	$\pm 20\%$	9.2	9.2	9.2	9.2	4.6	9.2	9.2	9.2
Electrical capacitance in Y	μF	$\pm 20\%$	9.2	9.2	9.2	9.2	4.6	9.2	9.2	9.2
Electrical capacitance in Z	μF	$\pm 20\%$			6	6				6

Mechanical Properties	Unit	Tolerance	P-517.2CD	P-517.2CL	P-517.3CD	P-517.3CL	P-517.RCD	P-527.2CD	P-527.2CL	P-527.3CD
Stiffness in X	N/μm	±20%	2	2	2	2	2	1	1	1
Stiffness in Y	N/μm	±20%	2	2	2	2	2	1	1	1
Stiffness in Z	N/μm	±20%			15	15				15
Stiffness in θZ	N·m/μrad	±20%					2			
Resonant frequency in X, unloaded	Hz	±20%	450	450	450	450	450	350	350	350
Resonant frequency in X, under load with 500 g	Hz	±20%	250	250	250	250	250	190	190	190
Resonant frequency in X, under load with 2500 g	Hz	±20%	140	140	140	140	140	110	110	110
Resonant frequency in Y, unloaded	Hz	±20%	450	450	450	450	450	350	350	350
Resonant frequency in Y, under load with 500 g	Hz	±20%	250	250	250	250	250	190	190	190
Resonant frequency in Y, under load with 2500 g	Hz	±20%	140	140	140	140	140	110	110	110
Resonant frequency in Z, unloaded	Hz	±20%			1100	1100				1100
Resonant frequency in θZ, unloaded	Hz	±20%					400			
Permissible push force in Z	N	Max.	50	50	50	50	50	50	50	50
Permissible pull force in Z	N	Max.	20	20	20	20	20	20	20	20
Guide			Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification
Overall mass	g		1400	1400	1450	1450	1400	1400	1400	1450
Material			Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum

Miscellaneous	Unit		P-517.2CD	P-517.2CL	P-517.3CD	P-517.3CL	P-517.RCD	P-527.2CD	P-527.2CL	P-527.3CD
Operating temperature range	°C		-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80
Connector			D-sub 25W3 (m)	LEMO LV-PZT	D-sub 25W3 (m)	LEMO LV-PZT	D-sub 25W3 (m)	D-sub 25W3 (m)	LEMO LV-PZT	D-sub 25W3 (m)
Cable length	m		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Recommended controllers / drivers			E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727	E-503, E-505, E-621, E-712, E-727

Motion	Unit	Tolerance	P-527.3CL	P-527.RCD
Active axes			X, Y, Z	X, Y, θZ
Travel range in X	μm		200	200
Travel range in Y	μm		200	200
Travel range in Z	μm		20	
Travel range in X, open loop	μm	±20%	250	250
Travel range in Y, open loop	μm	±20%	250	250
Travel range in Z, open loop	μm	±20%	25	
Rotation range in θZ	mrاد			2
Rotation range in θZ, open loop	mrاد	±20%		5
Linearity error in X	%	Typ.	0.03	0.03
Linearity error in Y	%	Typ.	0.03	0.03
Linearity error in Z	%	Typ.	0.03	
Linearity error in θZ	%	Typ.		0.15

Positioning	Unit	Tolerance	P-527.3CL	P-527.RCD
Bidirectional repeatability in X	nm	Typ.	10	10
Bidirectional repeatability in Y	nm	Typ.	10	10
Bidirectional repeatability in Z	nm	Typ.	1	
Bidirectional repeatability in θZ	μrad	Typ.		1
Resolution in X, open loop	nm	Typ.	0.5	0.5
Resolution in Y, open loop	nm	Typ.	0.5	0.5
Resolution in Z, open loop	nm	Typ.	0.1	
Resolution in θZ , open loop	μrad	Typ.		0.1
Integrated sensor			Capacitive, direct position measuring	Capacitive, indirect position measuring
System resolution in X	nm		2	2
System resolution in Y	nm		2	2
System resolution in Z	nm		0.1	
System resolution in θZ	μrad			0.3

Drive Properties	Unit	Tolerance	P-527.3CL	P-527.RCD
Drive type			Piezo actuator/PICMA®	Piezo actuator/PICMA®
Maximum power consumption	W			
Electrical capacitance in X	μF	$\pm 20\%$	9.2	4.6
Electrical capacitance in Y	μF	$\pm 20\%$	9.2	4.6
Electrical capacitance in Z	μF	$\pm 20\%$	6	

Mechanical Properties	Unit	Tolerance	P-527.3CL	P-527.RCD
Stiffness in X	N/ μm	$\pm 20\%$	1	1
Stiffness in Y	N/ μm	$\pm 20\%$	1	1
Stiffness in Z	N/ μm	$\pm 20\%$	15	
Stiffness in θZ	N·m/ μrad	$\pm 20\%$		1
Resonant frequency in X, unloaded	Hz	$\pm 20\%$	350	350
Resonant frequency in X, under load with 500 g	Hz	$\pm 20\%$	190	190
Resonant frequency in X, under load with 2500 g	Hz	$\pm 20\%$	110	110
Resonant frequency in Y, unloaded	Hz	$\pm 20\%$	350	350
Resonant frequency in Y, under load with 500 g	Hz	$\pm 20\%$	190	190
Resonant frequency in Y, under load with 2500 g	Hz	$\pm 20\%$	110	110
Resonant frequency in Z, unloaded	Hz	$\pm 20\%$	1100	
Resonant frequency in θZ , unloaded	Hz	$\pm 20\%$		300
Permissible push force in Z	N	Max.	50	50
Permissible pull force in Z	N	Max.	20	20
Guide			Flexure guide/Flexure guide with lever amplification	Flexure guide/Flexure guide with lever amplification
Overall mass	g		1450	1400
Material			Aluminum	Aluminum

Permissible push/pull force in Z: When mounted horizontally (standing on a surface, not suspended).
Electrical capacitance: Specified per channel (refer to pin assignment in user manual).
The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.
All specifications based on room temperature (22 °C ± 3 °C).

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P-517 / P-527, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

P-517.2CD

Precision XY nanopositioner, 100 μm $\times$ 100 μm , capacitive sensors, parallel metrology, D-sub connector

P-517.2CL

Precision XY nanopositioner, 100 μm $\times$ 100 μm , capacitive sensors, parallel metrology, LEMO connectors

P-517.3CD

Precision XYZ nanopositioner, 100 μm $\times$ 100 μm $\times$ 20 μm , capacitive sensors, parallel metrology, D-sub connector

P-517.3CL

Precision XYZ nanopositioner, 100 μm $\times$ 100 μm $\times$ 20 μm , capacitive sensors, parallel metrology, LEMO connectors

P-517.RCD

Precision XY / rotation nanopositioner, 100 μm $\times$ 100 μm , 2 mrad, capacitive sensors, parallel metrology, D-sub connector

P-527.2CD

Precision XY nanopositioner, 200 μm $\times$ 200 μm , capacitive sensors, parallel metrology, D-sub connector

P-527.2CL

Precision XY nanopositioner, 200 μm $\times$ 200 μm , capacitive sensors, parallel metrology, LEMO connectors

P-527.3CD

Precision XYZ nanopositioner, 200 μm $\times$ 200 μm $\times$ 20 μm , capacitive sensors, parallel metrology, D-sub connector

P-527.3CL

Precision XYZ nanopositioner, 200 μm $\times$ 200 μm $\times$ 20 μm , capacitive sensors, parallel metrology, LEMO connectors

P-527.RCD

Precision XY / rotation nanopositioner, 200 μm $\times$ 200 μm , 4 mrad, capacitive sensors, parallel metrology, D-sub connector