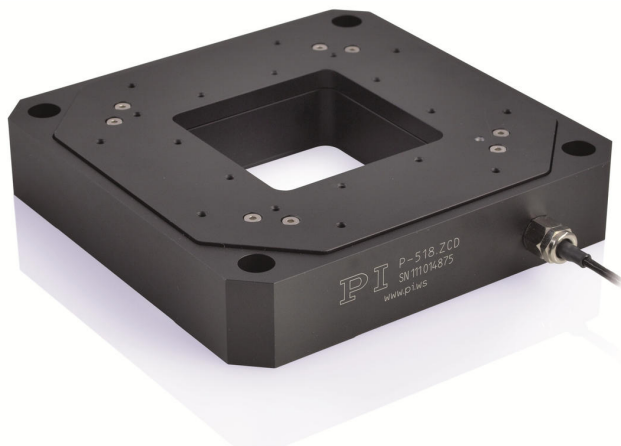


Piezo Z/Tip/Tilt Stage

High Dynamics with Large Aperture



P-518 • P-528

- Z and tip/tilt stages with 3 axes / Z stages with 1 axis
- Travel range in Z / tip/tilt angle to 200 μm / 2 mrad, closed loop (to 240 μm / 2.4 mrad open loop)
- Parallel kinematics for faster response times and higher multi-axis accuracy
- Zero-play, high-precision flexure guide system
- Outstanding lifetime due to PICMA® piezo actuators
- Clear aperture 66 mm $\times$ 66 mm
- Highest linearity due to capacitive sensors

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-518.TCD	P-518.ZCD	P-518.ZCL	P-528.TCD	P-528.ZCD	P-528.ZCL
Active axes			Z, θ X, θ Y	Z	Z	Z, θ X, θ Y	Z	Z
Travel range in Z	μ m		100	100	100	200	200	200
Travel range in Z, open loop	μ m	$\pm 20\%$	140	140	140	240	240	240
Rotation range in θ X	mrad		1			2		
Rotation range in θ Y	mrad		1			2		
Rotation range in θ X, open loop	mrad	$\pm 20\%$	1.4			2.4		
Rotation range in θ Y, open loop	mrad	$\pm 20\%$	1.4			2.4		
Linearity error in Z	%	Typ.	0.03	0.03	0.03	0.03	0.03	0.03
Linearity error in θ X	%	Typ.	0.15			0.15		
Linearity error in θ Y	%	Typ.	0.15			0.15		
Yaw (Rotational crosstalk in θ X with motion in Z)	μ rad	Max.	± 25	± 25	± 25	± 50	± 50	± 50
Pitch (Rotational crosstalk in θ Y with motion in Z)	μ rad	Max.	± 25	± 25	± 25	± 50	± 50	± 50
Roll (Rotational crosstalk in θ Z with motion in Z)	μ rad	Max.	± 5	± 5	± 5	± 10	± 10	± 10

Positioning	Unit	Tolerance	P-518.TCD	P-518.ZCD	P-518.ZCL	P-528.TCD	P-528.ZCD	P-528.ZCL
Bidirectional repeatability in Z	nm	Typ.	5	5	5	10	10	10
Bidirectional repeatability in θ X	μ rad	Typ.	0.05			0.1		
Bidirectional repeatability in θ Y	μ rad	Typ.	0.05			0.1		
Resolution in Z, open loop	nm	Typ.	0.4	0.2	0.2	0.6	0.6	0.6
Resolution in θ X, open loop	μ rad	Typ.	0.04			0.06		
Resolution in θ Y, open loop	μ rad	Typ.	0.04			0.06		
Integrated sensor			Capacitive, indirect position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring	Capacitive, indirect position measuring	Capacitive, direct position measuring	Capacitive, direct position measuring
System resolution in Z	nm		0.8	0.8	0.8	1	1	1
System resolution in θ X	μ rad		0.05			0.1		
System resolution in θ Y	μ rad		0.05			0.1		

Drive Properties	Unit	Tolerance	P-518.TCD	P-518.ZCD	P-518.ZCL	P-528.TCD	P-528.ZCD	P-528.ZCL
Drive type			Piezo actuator/ PICMA®	Piezo actuator/ PICMA®	Piezo actuator/ PICMA®	Piezo actuator/ PICMA®	Piezo actuator/ PICMA®	Piezo actuator/ PICMA®
Electrical capacitance in Z	μ F	$\pm 20\%$	2.1	8.4	8.4	3.7	14.8	14.8

Mechanical Properties	Unit	Tolerance	P-518.TCD	P-518.ZCD	P-518.ZCL	P-528.TCD	P-528.ZCD	P-528.ZCL
Stiffness in Z	N/μm	±20%	2.7	2.7	2.7	1.5	1.5	1.5
Resonant frequency in Z, unloaded	Hz	±20%	500	500	500	350	350	350
Resonant frequency in Z, under load with 500 g	Hz	±20%	350	350	350	210	210	210
Resonant frequency in Z, under load with 2500 g	Hz	±20%	200	200	200	130	130	130
Resonant frequency in θX, unloaded	Hz	±20%	530			390		
Resonant frequency in θX, under load with 500 g	Hz	±20%	370			250		
Resonant frequency in θX, under load with 2500 g	Hz	±20%	190			115		
Resonant frequency in θY, unloaded	Hz	±20%	530			390		
Resonant frequency in θY, under load with 500 g	Hz	±20%	370			250		
Resonant frequency in θY, under load with 2500 g	Hz	±20%	190			115		
Permissible push force in Z	N	Max.	50	50	50	50	50	50
Permissible pull force in Z	N	Max.	40	40	40	40	40	40
Guide			Flexure guide/ Flexure guide with lever am- plification	Flexure guide/ Flexure guide with lever am- plification	Flexure guide/ Flexure guide with lever am- plification	Flexure guide/ Flexure guide with lever am- plification	Flexure guide/ Flexure guide with lever am- plification	Flexure guide/ Flexure guide with lever am- plification
Overall mass	g		1400	1400	1400	1420	1420	1420
Material			Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum

Miscellaneous	Unit		P-518.TCD	P-518.ZCD	P-518.ZCL	P-528.TCD	P-528.ZCD	P-528.ZCL
Operating temperature range	°C		-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80
Connector			D-sub 25W3 (m)	D-sub 7W2 (m)	LEMO LVPZT	D-sub 25W3 (m)	D-sub 7W2 (m)	LEMO LVPZT
Cable length	m		1.5	1.5	1.5	1.5	1.5	1.5
Recommended controllers / drivers			E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754	E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754	E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754	E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754	E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754	E-503, E-505, E-610, E-621, E-625, E-712, E-727, E-754

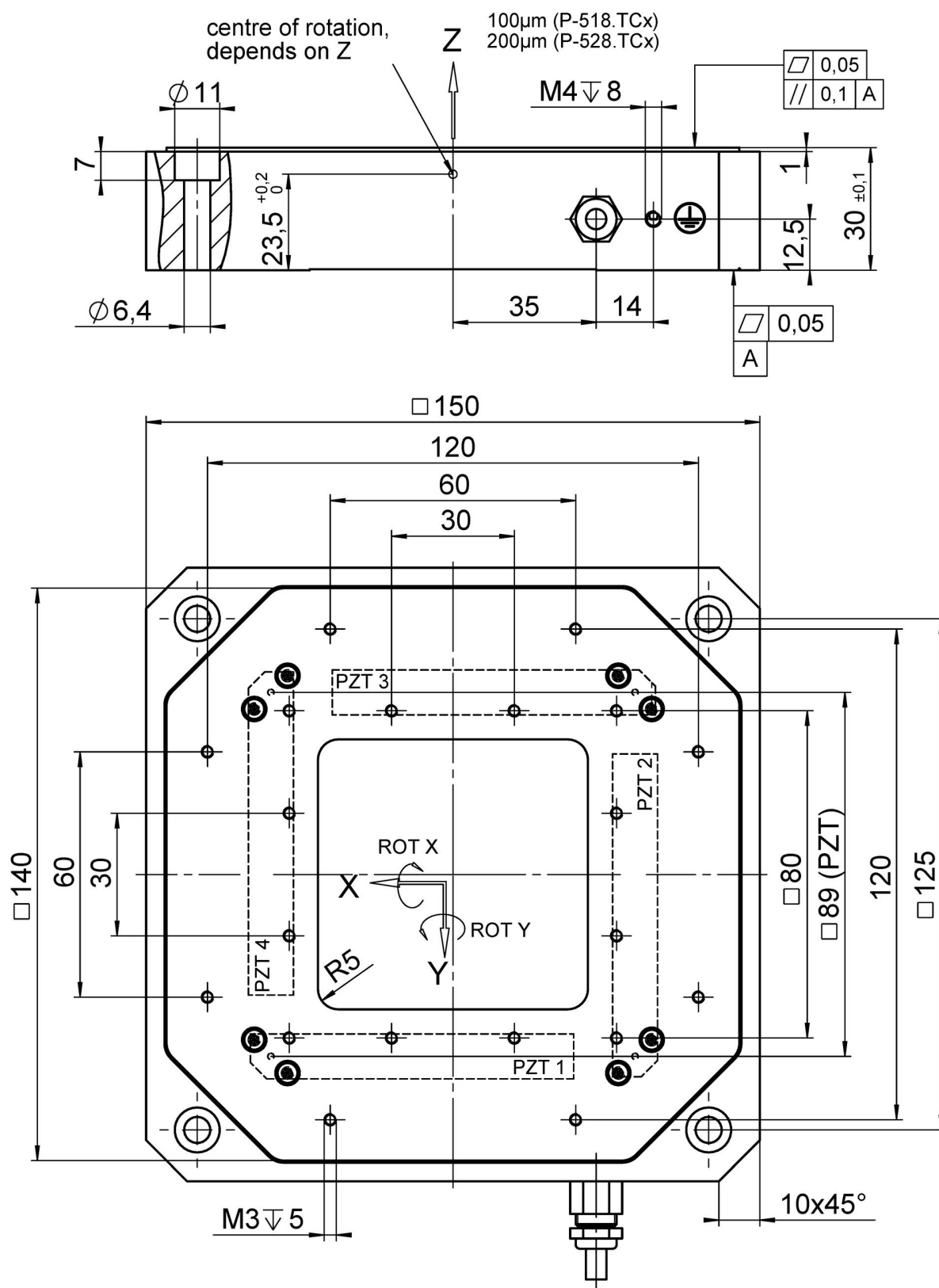
Permissible push/pull force in Z: When mounted horizontally (standing on a surface, not suspended).

Electrical capacitance: Specified per channel (refer to pin assignment in user manual).

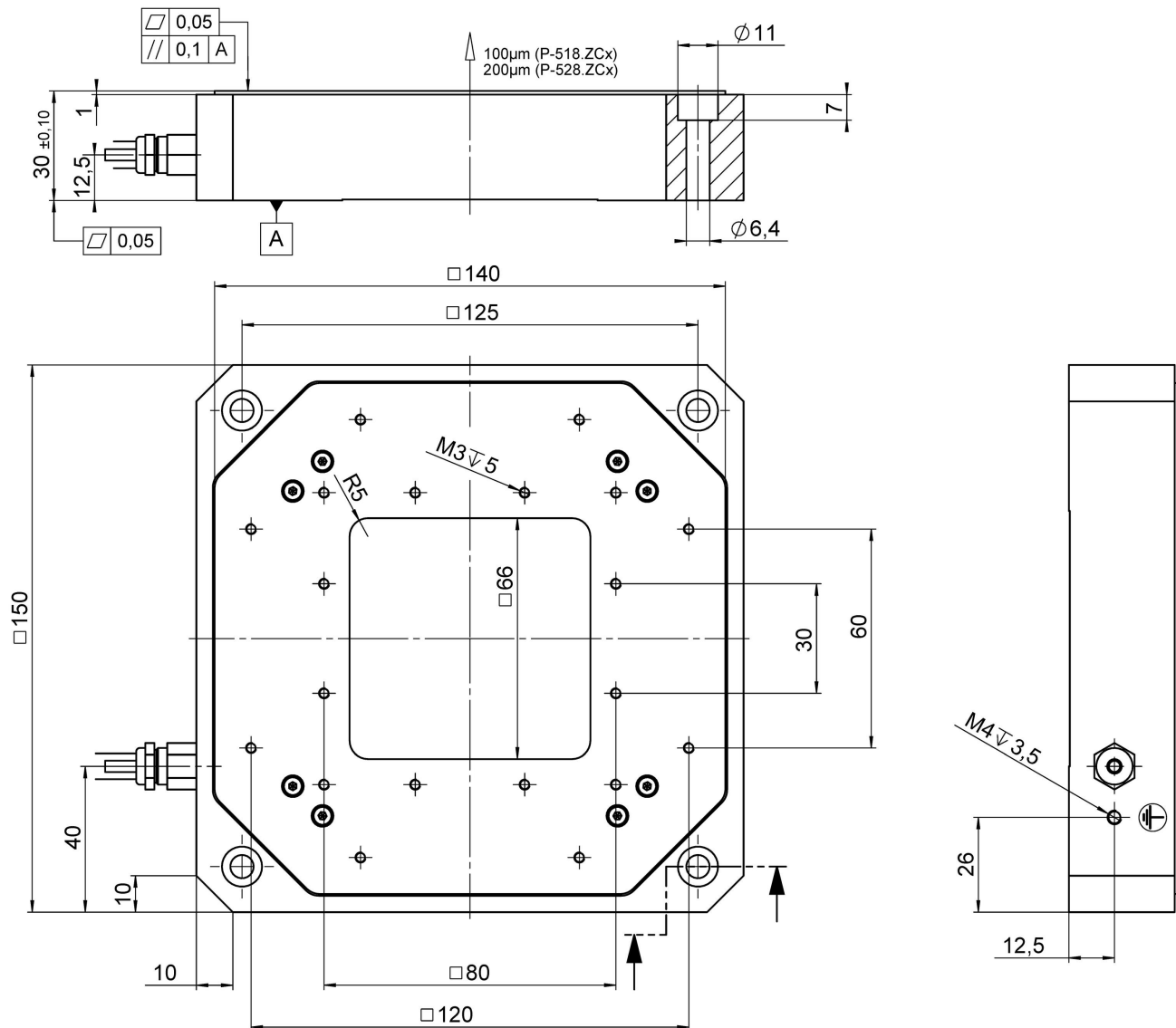
The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.

All specifications based on room temperature (22 °C ±3 °C).

Drawings / Images



P-518 • P-528 Z and tip/tilt stage, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.



P-518 • P-528 Z stage, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

P-518.TCD

Precision nanopositioning Z and tip/tilt stage, 100 μm , 1.4 mrad, parallel metrology, capacitive sensors, D-sub connector

P-518.ZCD

Precision nanopositioning Z stage, 100 μm , direct position measuring, capacitive sensors, D-sub connector

Order Information

P-518.ZCL

Precision nanopositioning Z stage, 100 μm , direct position measuring, capacitive sensors, LEMO connectors

P-528.TCD

Precision nanopositioning Z and tip/tilt stage, 200 μm , 2.4 mrad, parallel metrology, capacitive sensors, D-sub connector

P-528.ZCD

Precision nanopositioning Z stage, 200 μm , direct position measuring, capacitive sensors, D-sub connector

P-528.ZCL

Precision nanopositioning Z stage, 200 μm , direct position measuring, capacitive sensors, LEMO connectors