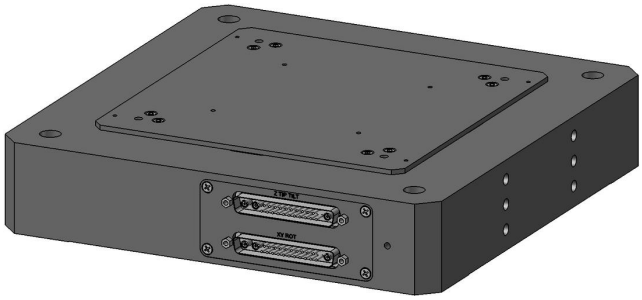
6-Axis Piezo Nanopositioner

Long Travel Ranges, Direct Position Measuring



P-587

- For scanning and positioning in X, Y, Z, θ_X, θ_Y, θ_Z
- 800 µm × 800 µm × 200 µm linear travel range
- Up to 1 mrad rotational angle
- Parallel kinematics for faster response times and higher multi-axis accuracy
- Capacitive sensors for highest linearity
- Outstanding lifetime due to PICMA® piezo actuators
- Zero-play, high-precision flexure guide system
- Active compensation in all 6 degrees of freedom

Application fields

- Interferometry
- Metrology
- Nanoimprinting
- Semiconductor tests
- Semiconductor manufacturing

Outstanding lifetime thanks to PICMA® piezo actuators

The patented 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.

Maximum accuracy due to direct position measuring

Motion is measured directly at the motion platform without any influence from the drive or guide elements. This allows optimum repeatability, outstanding stability, and stiff, fast-responding control.

Motion	Unit	Toleran-ce	P-587.6CD
Active axes			X, Y, Z, θX, θY, θZ
Travel range in X	µm		800
Travel range in Y	µm		800
Travel range in Z	µm		200
Rotation range in θX	mrad		1
Rotation range in θY	mrad		1
Rotation range in θZ	mrad		1
Linearity error in X	%	Typ.	0.01
Linearity error in Y	%	Typ.	0.01
Linearity error in Z	%	Typ.	0.01
Linearity error in θX	%	Typ.	0.1
Linearity error in θY	%	Typ.	0.1
Linearity error in θZ	%	Typ.	0.1
Flatness	nm	Typ.	<15

Positioning	Unit	Toleran-ce	P-587.6CD
Repeatability in X	nm	Typ.	±3
Repeatability in Y	nm	Typ.	±3
Repeatability in Z	nm	Typ.	±2
Repeatability in θX	µrad	Typ.	±0.1
Repeatability in θY	µrad	Typ.	±0.1
Repeatability in θZ	µrad	Typ.	±0.15
Resolution in X, open loop	nm	Typ.	0.9
Resolution in Y, open loop	nm	Typ.	0.9
Resolution in Z, open loop	nm	Typ.	0.4
Resolution in θX, open loop	µrad	Typ.	0.05
Resolution in θY, open loop	µrad	Typ.	0.05
Resolution in θZ, open loop	µrad	Typ.	0.1
Integrated sensor			Capacitive, indirect position measuring
System resolution in X	nm		2.2
System resolution in Y	nm		2.2
System resolution in Z	nm		0.7
System resolution in θX	µrad		0.1
System resolution in θY	µrad		0.1
System resolution in θZ	µrad		0.3

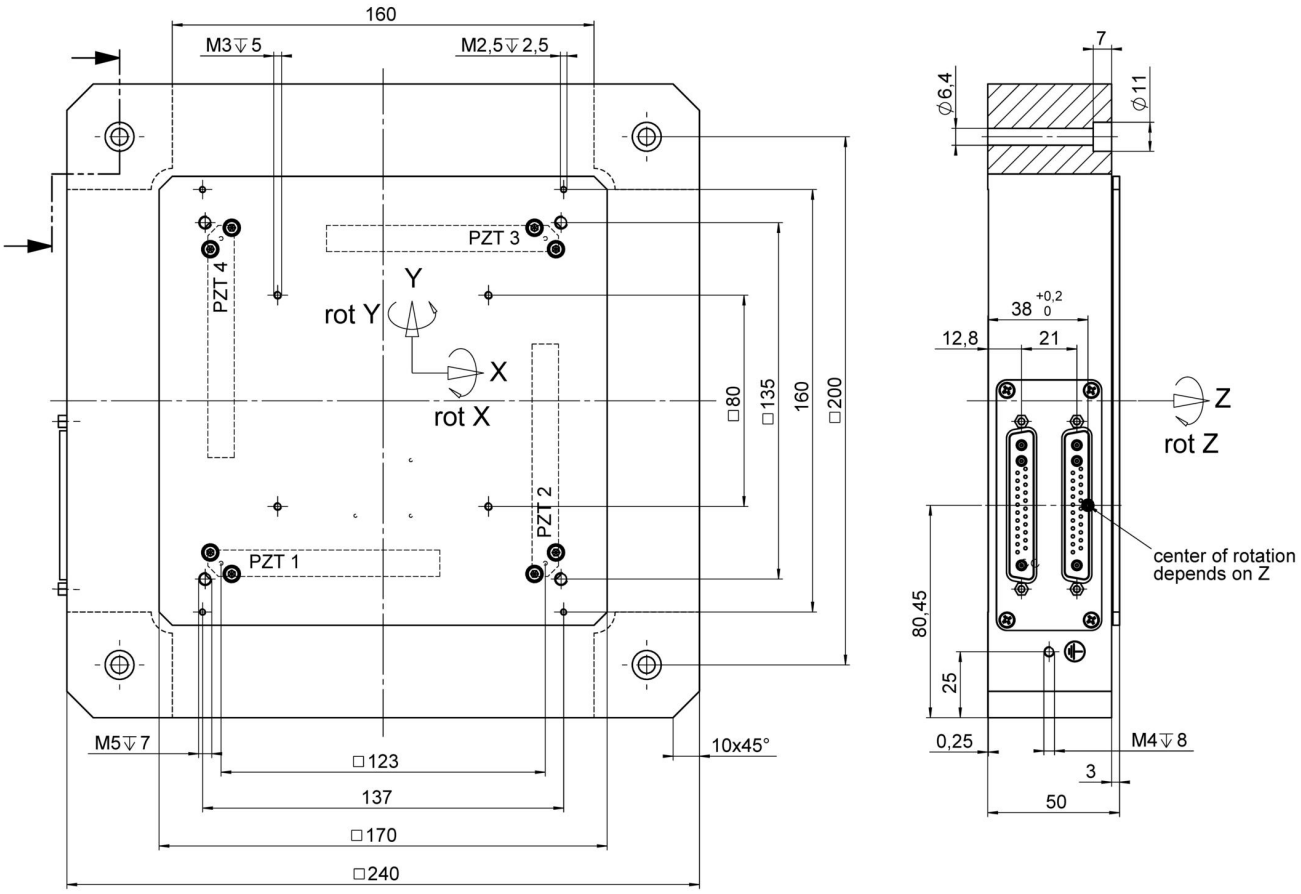
Drive Properties	Unit	Toleran-ce	P-587.6CD
Drive type			PICMA®
Electrical capacitance in X	µF	±20%	81
Electrical capacitance in Y	µF	±20%	81
Electrical capacitance in Z	µF	±20%	18.4

Mechanical Properties	Unit	Toleran-ce	P-587.6CD
Stiffness in X	N/µm		0.55
Stiffness in Y	N/µm		0.55
Stiffness in Z	N/µm		1.35
Resonant frequency in X, unloaded	Hz	±20%	103
Resonant frequency in X, under load with 500 g	Hz	±20%	88
Resonant frequency in X, under load with 2000 g	Hz	±20%	65
Resonant frequency in Y, unloaded	Hz	±20%	103
Resonant frequency in Y, under load with 500 g	Hz	±20%	88
Resonant frequency in Y, under load with 2000 g	Hz	±20%	65
Resonant frequency in Z, unloaded	Hz	±20%	235
Resonant frequency in Z, under load with 500 g	Hz	±20%	175
Resonant frequency in Z, under load with 2000 g	Hz	±20%	118
Permissible push force in Z	N	Max.	50
Guide			Flexure guide with lever amplification
Overall mass	g	±5%	7200
Material			Aluminum

Miscellaneous	Unit	Toleran-ce	P-587.6CD
Operating temperature range	°C		-20 to 80
Connector			2 × D-sub 25W3 (m)
Cable length	m	+50 / -0 mm	3
Recommended controllers / drivers			E-712.6CD digital controller

The maximum rotational angle in θ_Z is 8 mrad, the tip/tilt angles in X and Y are 3 mrad.
Due to the parallel kinematics design, simultaneous linear motion in X or Y is not possible when the stage is at an extreme tip/tilt angle.
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.

Drawings / Images



P-587, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

P-587.6CD
6-axis piezo nanopositioner; 800 µm × 800 µm × 200 µm travel range (X × Y × Z); 1 mrad × 1 mrad × 1 mrad rotational angle (θX × θY × θZ); capacitive, indirect position measuring; 2 × D-sub 25W3 (m); 3 m cable length