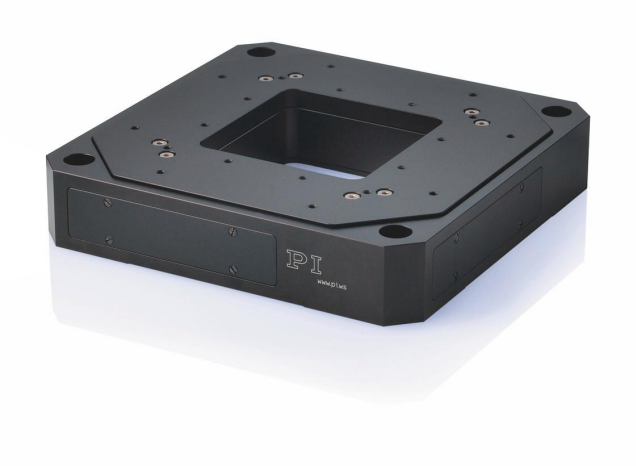
PIMars 6-Axis Nanopositioning Stage

High-Precision Nanopositioner with 6 Degrees of Freedom



P-562.6CD

- 6 motion axes: 3 × linear, 3 × rotational
- Travel ranges to 200 µm linear and to 1 mrad tip/tilt angle
- Parallel kinematics for faster response times and higher multi-axis accuracy
- Highest linearity due to capacitive sensors
- Zero-play, high-precision flexure guide system
- Excellent scanning flatness
- Clear aperture 66 mm × 66 mm
- Outstanding lifetime due to PICMA® piezo actuators

Application fields

- Scanning microscopy
- Super-resolution microscopy
- Biotechnology
- Mask/wafer positioning
- Sample positioning
- Interferometry
- Metrology

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-562.6CD
Active axes			X | Y | Z | θX | θY | θZ
Travel range in X	µm		200
Travel range in Y	µm		200
Travel range in Z	µm		200
Rotation range in θX	mrad		±0.5
Rotation range in θY	mrad		±0.5
Rotation range in θZ	mrad		±0.5
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	Tolerance	P-562.6CD
Unidirectional repeatability in X	nm	Typ.	±2
Unidirectional repeatability in Y	nm	Typ.	±2
Unidirectional repeatability in Z	nm	Typ.	±3
Unidirectional repeatability in θX	µrad	Typ.	±0.1
Unidirectional repeatability in θY	µrad	Typ.	±0.1
Unidirectional repeatability in θZ	µrad	Typ.	±0.15
Integrated sensor			Capacitive, indirect position measuring
System resolution in X	nm	Typ.	1
System resolution in Y	nm	Typ.	1
System resolution in Z	nm	Typ.	1
System resolution in θX	µrad	Typ.	0.1
System resolution in θY	µrad	Typ.	0.1
System resolution in θZ	µrad	Typ.	0.1

Drive Properties	Unit	Tolerance	P-562.6CD
Drive type			PICMA®
Electrical capacitance in X	µF	±20%	7.4
Electrical capacitance in Y	µF	±20%	7.4
Electrical capacitance in Z	µF	±20%	14.8

Mechanical Properties	Unit	Tolerance	P-562.6CD
Resonant frequency in X, unloaded	Hz	±20%	110
Resonant frequency in Y, unloaded	Hz	±20%	110
Resonant frequency in Z, unloaded	Hz	±20%	190
Permissible push force in X	N	Max.	50
Permissible push force in Y	N	Max.	50
Permissible push force in Z	N	Max.	60
Permissible pull force in X	N	Max.	40
Permissible pull force in Y	N	Max.	40
Permissible pull force in Z	N	Max.	60
Guide			Flexure guide with lever amplification
Overall mass	g	±5%	1450
Material			Aluminum

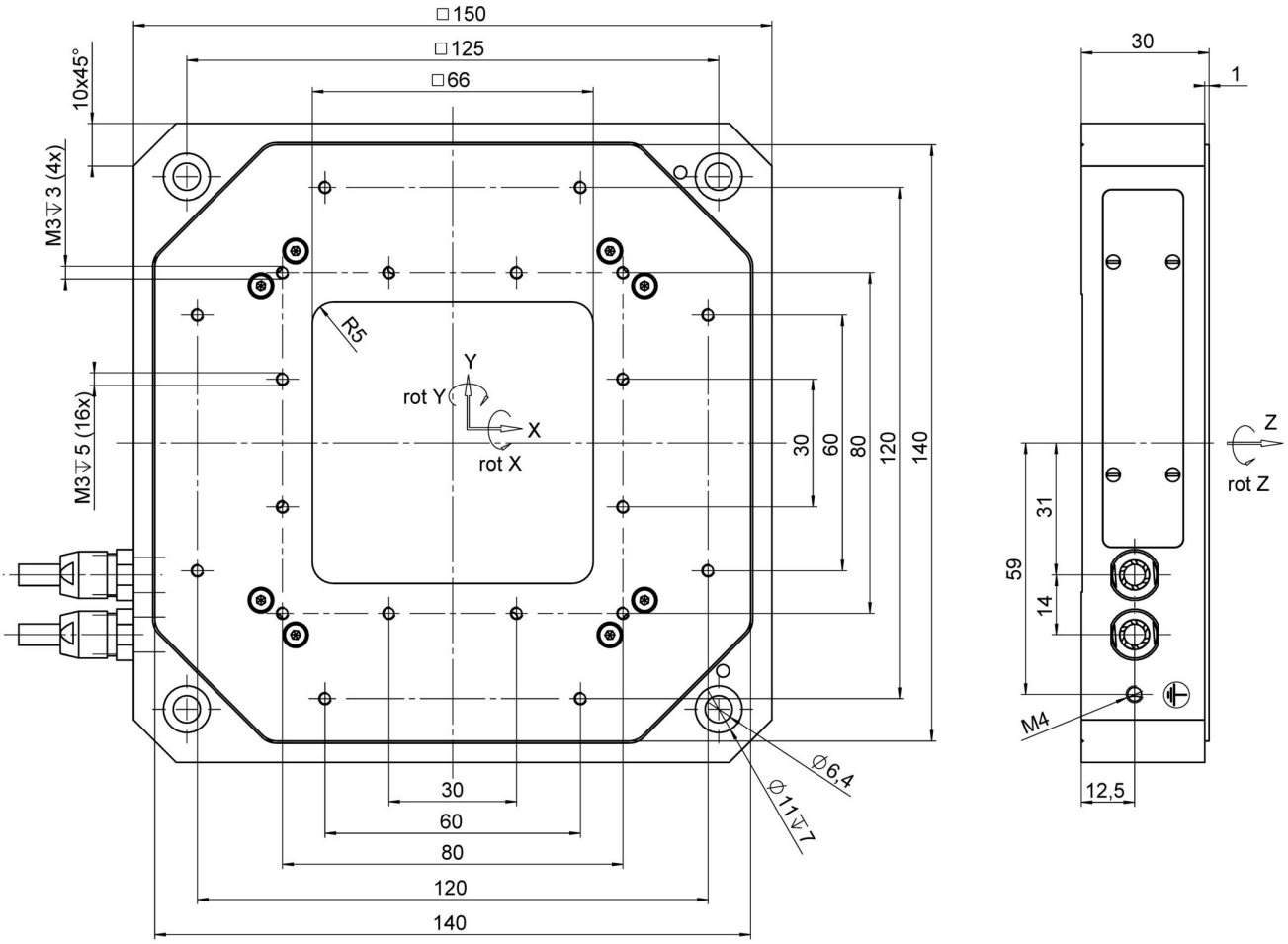
Miscellaneous	Unit	Tolerance	P-562.6CD
Operating temperature range	°C		-20 to 80
Connector			2 × D-sub 25W3 (m)
Cable length	m	±10 mm	1.5
Recommended controllers / drivers			E-712

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.

UHV-compatible versions up to 10^{-9} hPa and versions with other travel ranges available on request.

At PI, technical data is specified at 22 ±3 °C. Unless otherwise stated, the values are for unloaded conditions. Some properties are interdependent. The designation "typ." indicates a statistical average for a property; it does not indicate a guaranteed value for every product supplied. During the final inspection of a product, only selected properties are analyzed, not all. Please note that some product characteristics may deteriorate with increasing operating time.

Drawings / Images



P-562.6CD, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

P-562.6CD
PIMars 6-axis nanopositioning stage; 200 µm × 200 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) connector; 1.5 m cable length