

# NanoCube® Nanopositioner

Compact Parallel-Kinematic Piezo System for Nanopositioning and Fiber Alignment



## P-616

- Parallel-kinematic design for the highest stiffness in all spatial directions
- Highly dynamic motion due to high resonant frequencies even with loads up to 100 g
- Innovative product design for flexible use due to single mounting platform
- Only nanopositioner available on the market with ID chip functionality
- Smallest and lightest NanoCube® with 100 µm travel range on the market

### Parallel kinematics

In a parallel-kinematic multi-axis system, all actuators act directly on a single motion platform. This means that all axes can be designed with identical dynamic properties, which reduces the moved mass considerably. Further advantages: It is possible to make the parallel-kinematic system more compact than serial stacked or nested systems. The errors and masses of each individual axis do not accumulate.

### PICMA® piezo actuators

PICMA® actuators have all-ceramic insulation and their performance and lifetime are therefore far superior to conventional actuators. The ceramic insulation layer protects the monolithic piezoceramic block against humidity or failure due to increased leakage current. In this way, an especially high reliability is achieved even under extreme ambient conditions. In contrast to motorized drives, there are no rotating parts or friction. The piezo actuators are therefore free of backlash, maintenance, and wear.

### Flexure guides

A flexure guide is an element which is free of static and sliding friction. It is based on the elastic deformation (bending) of a solid (e.g., steel) and does not have any rolling or sliding parts. Flexure elements have a high stiffness and load capacity. Flexure guides are maintenance and wear free. They are 100% vacuum compatible, function in a wide temperature range and do not require any lubricants.

### Capacitive sensors

Capacitive sensors measure the position directly on the motion platform (direct metrology) and work without contact. Neither friction nor hysteresis interferes with the measurement, which allows excellent linearity values to be achieved in combination with the high position resolution. Capacitive sensors achieve the best resolution, stability, and bandwidth.

### ID chip

An ID chip is located in the Sub-D connector. When the stage is calibrated at the factory with digital electronics, the calibration data is saved together with specific product information on the ID chip. When switched on, digital electronics read the data from the ID chip of the connected stage. Stages, whose ID chip contains the calibration data, can therefore be connected to any suitable digital electronics without renewed calibration.

## Fields of application

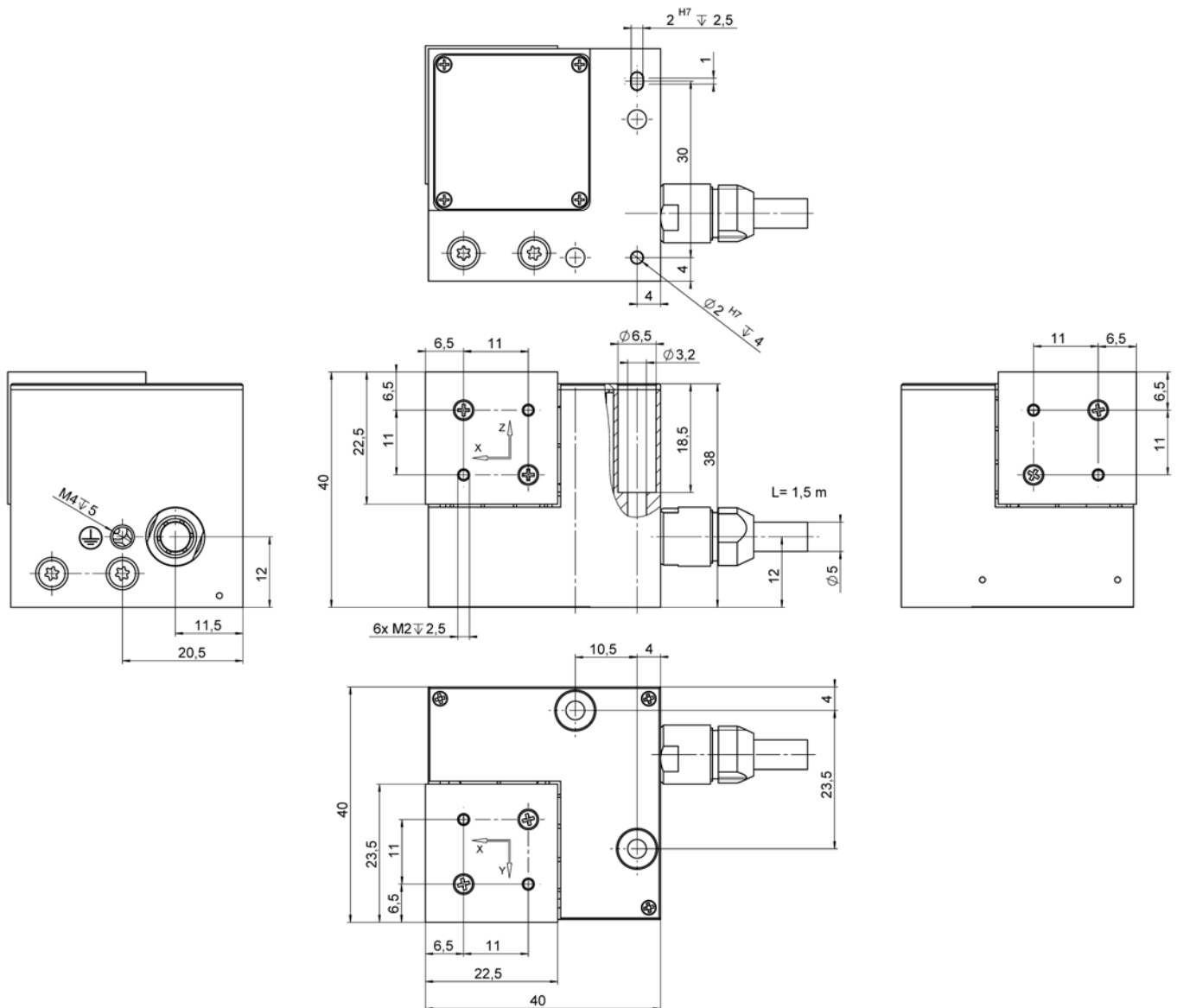
- Fiber alignment
- Microscopy applications
- 2-photon polymerization
- Nanotechnology and nanomanufacturing

## Specifications

	P-616.3C	Unit	Tolerance
<b>Motion and positioning</b>			
Active axes	X, Y, Z		
Travel range at -20 to 120 V, open loop	110 / axis	μm	+20 % / -0 %
Closed-loop travel range	100 / axis	μm	+20 % / -0 %
Resolution, 1 σ, open loop*	0.3	nm	typ.
Resolution, 1 σ, closed loop*	0.4	nm	typ.
Linearity error, for the entire travel range, with digital controller (E-727.3CD)	0.03	%	typ.
Bidirectional repeatability, 1 σ, 10 % travel range	<10	nm	typ.
Bidirectional repeatability, 1 σ, 100 % travel range	<15	nm	typ.
<b>Sensor</b>			
Sensor type	Capacitive sensors		
<b>Mechanical properties</b>			
Stiffness	0.5	N/μm	±10 %
Resonant frequency X / Y / Z, no load	700	Hz	±10 %
Resonant frequency with 38 g load X / Y / Z	380	Hz	±20 %
Resonant frequency with 100 g load X / Y / Z	250	Hz	±20 %
Push/pull force capacity	15	N	max.
Maximum permissible torque	0.4	Nm	max.
Recommended maximum load	300	g	max.
<b>Drive properties</b>			
Ceramic type	PICMA® P-885.50		
Electrical capacitance	1.5 / axis	μF	±20 %
<b>Miscellaneous</b>			
Operating temperature range	-20 to 80	°C	
Material	Aluminum, steel		
Dimensions	40 × 40 × 40	mm	
Moved mass without load	0.021	kg	
Mass without cable	0.125	kg	
Mass with cable	0.4	kg	
Cable length	1.5	m	±10 mm
Connection	Sub-D 25W3 (m)		
Recommended electronics	E-503, E-663, E-712, E-727		

\* The resolution of PI piezo nanopositioning systems is not limited by friction. Specification as position noise with E-727 controller.  
All specifications based on room temperature (22 °C ±3 °C).

## Drawings and Images



*P-616.3C, Dimensions in mm. Note that the decimal places are separated by a comma in the drawings.*

## Ordering Information

### **P-616.3C**

Parallel-kinematic NanoCube® XYZ nanopositioner, 100 µm × 100 µm × 100 µm travel range, capacitive sensors

Ask about custom designs!