# XY Piezo Nanopositioner

## High-Precision XY Scanner with Aperture


## P-733.2

- Travel ranges to 100 µm × 100 µm in X and Y
- Resolution to 0.1 nm due to capacitive sensors
- High velocity versions with direct drive
- Vacuum-compatible and nonmagnetic versions available
- Parallel kinematics for higher accuracy and dynamics
- Parallel metrology for active compensation of guiding errors
- Zero-play, high-precision flexure guide system
- Clear aperture 50 mm × 50 mm for transmitted-light applications

### Fields of application

- Scanning microscopy
- Confocal microscopy
- Mask/wafer positioning
- Surface measuring technology
- Nanoimprinting
- Micromanipulation
- Image processing / stabilization
- Nanopositioning with high flatness and straightness of motion

### 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 are 100 % vacuum compatible and work in a wide temperature range.

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### 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.

### High dynamics multi-axis operation due to parallel kinematics

In a parallel-kinematic multi-axis system, all actuators act on a common platform. The minimum mass inertia and the identical design of all axes allow fast, dynamic, and nevertheless precision motion.

### Suitable for sophisticated vacuum applications

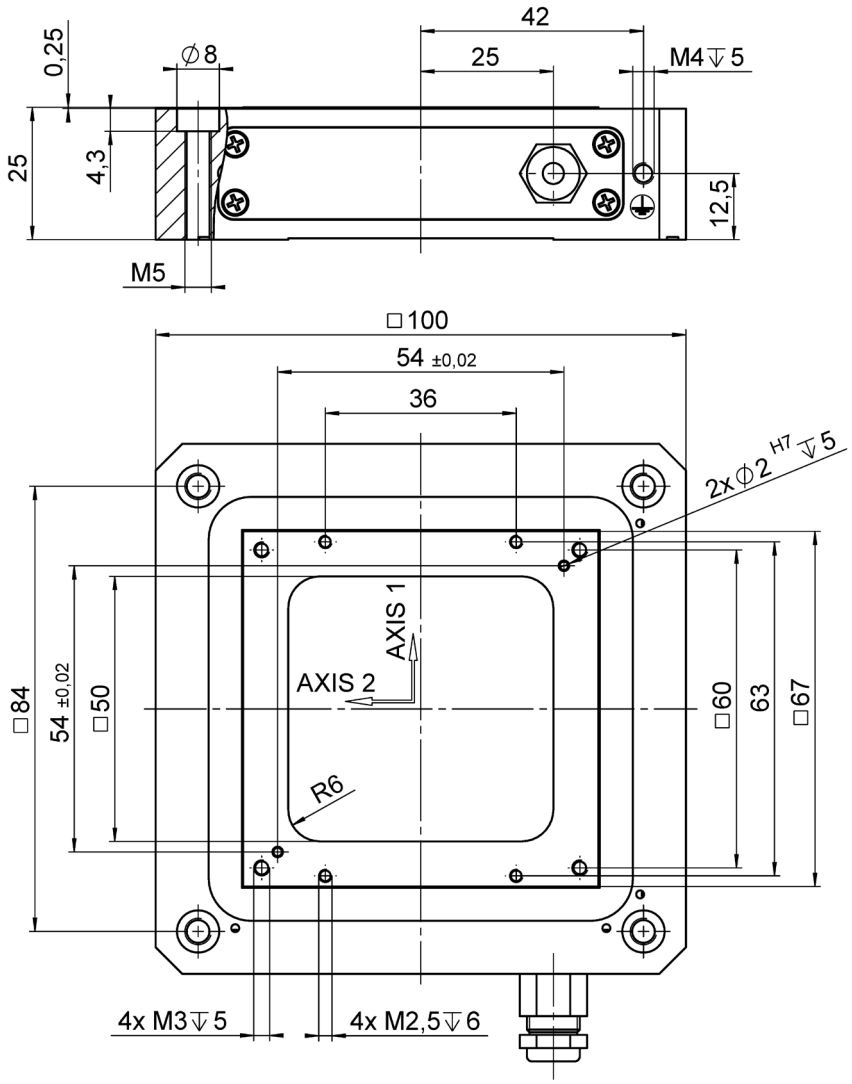
All components used in the piezo systems are excellently suited for use in vacuum. No lubricant or grease is necessary for operating. Polymer-free piezo systems allow particularly low outgas rates.

## Specifications

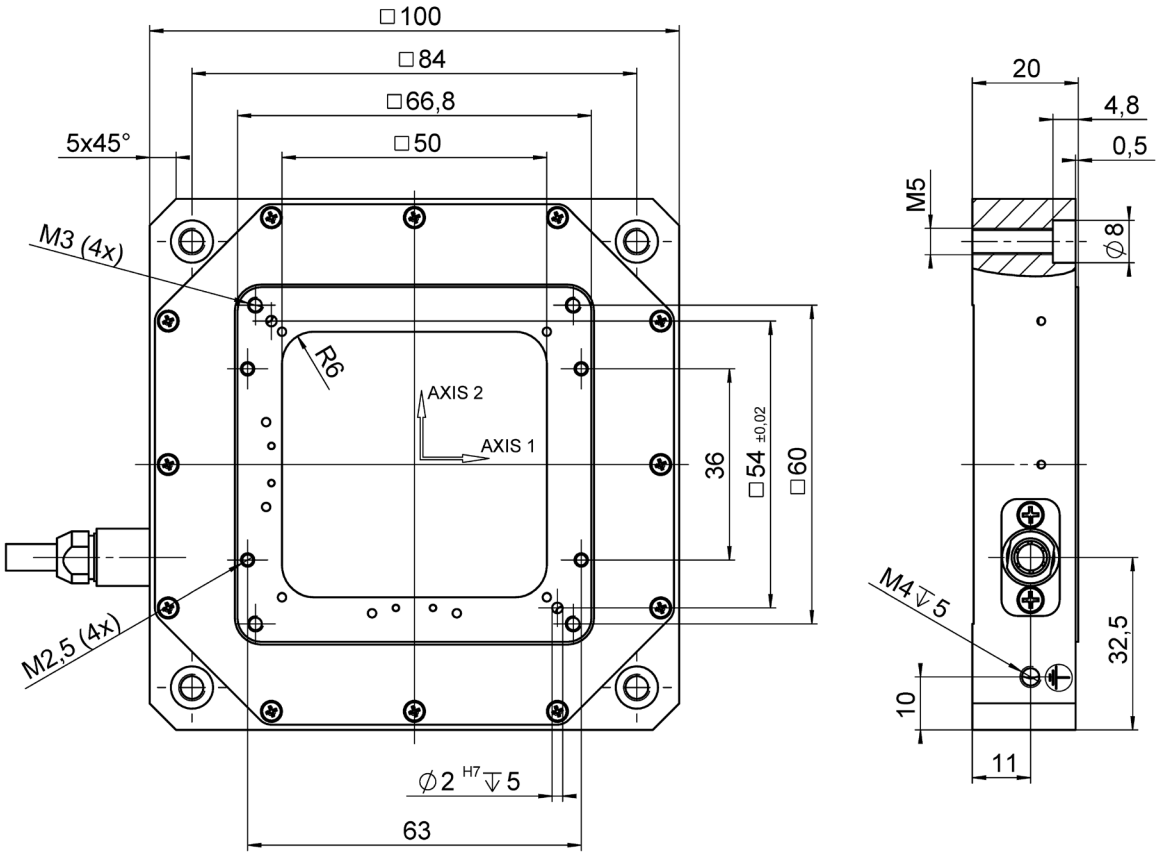
| | P-733.2CD<br>P-733.2CL | P-733.2DD | Unit | Tolerance |
|---|---|---|---|---|
| Active axes | X, Y | X, Y | | |
| **Motion and positioning** | | | | |
| Integrated sensor | Capacitive | Capacitive | | |
| Travel range at -20 to 120 V, open loop | 115 µm × 115 µm | 33 µm × 33 µm | | +20 % / -0 % |
| Travel range, closed loop | 100 µm × 100 µm | 30 µm × 30 µm | | |
| Resolution, open loop | 0.2 | 0.1 | nm | typ. |
| Resolution, closed loop | 0.3 | 0.1 | nm | typ. |
| Linearity error (X, Y) | 0.03 | 0.03* | % | typ. |
| Repeatability (X, Y) | <2 | <2 | nm | typ. |
| Pitch (X,Y) | ±3 | ±5 | µrad | typ. |
| Yaw (X, Y) | ±10 | ±10 | µrad | typ. |
| **Mechanical properties** | | | | |
| Stiffness | 1.5 | 20 | N/µm | ±20 % |
| Resonant frequency, no load | 500 | 2230 | Hz | ±20 % |
| Resonant frequency, under load, 120 g | 370 | – | Hz | ±20 % |
| Resonant frequency, under load, 200 g | 340 | 1550 | Hz | ±20 % |
| Push/pull force capacity in motion direction | 50 / 20 | 50 / 20 | N | max. |
| **Drive properties** | | | | |
| Piezo ceramic | PICMA® P-885 | PICMA® P-885 | | |
| Electrical capacitance | 6 (per axis) | 6.2 (per axis) | µF | ±20 % |
| **Miscellaneous** | | | | |
| Operating temperature range | -20 to 80 | -20 to 80 | °C | |
| Material | Aluminum | Aluminum | | |
| Mass | 0.58 | 0.58 | kg | ±5 % |
| Cable length | 1.5 | 1.5 | m | ±10 mm |
| Sensor/voltage connection | CD version: D-sub 25W3 (m)<br>CL version: LEMO | D-sub 25W3 (m) | | |
| Recommended electronics | E-503, E-505, E-610, E-621, E-625, E-712 | E-503, E-505, E-610, E-621, E-625, E-712 | | |

* With digital controller. Nonlinearity of direct drive stages measured with analog controllers is typically up to 0.1 %.
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).
Ask about customized versions.

## Drawings / Images




*P-733.2CD / .2CL, dimensions in mm*




*P-733.2DD, dimensions in mm*

## Ordering Information

### Versions with direct drive

**P-733.2DD**
High dynamics, high-precision XY nanopositioning system, 30 µm × 30 µm, direct drive, capacitive sensors, parallel metrology, D-sub connector

### Versions with D-sub connector (m)

**P-733.2CD**
High-precision XY nanopositioning system, 100 µm × 100 µm, capacitive sensors, parallel metrology, D-sub connector

### Versions with LEMO connector

**P-733.2CL**
High-precision XY nanopositioning system, 100 µm × 100 µm, capacitive sensors, parallel metrology, LEMO connectors

### Vacuum-compatible versions to $10^{-9}$ hPa

**P-733.2UD**
High-precision XY nanopositioning system, 100 µm × 100 µm, capacitive sensors, parallel metrology, D-sub connector, vacuum compatible to $10^{-9}$ hPa

### Accessories

**P-733.AP1**
Adapter plate for mounting P-733 piezo stages onto M-545 XY stages