

## PIFOC High-Precision Objective Scanner

Fast Nanopositioner and Scanner for Microscope Objectives



### P-721

- Fine positioning of objectives with subnanometer resolution
- Travel ranges to 140 µm, millisecond settling time
- Significantly faster response and higher lifetime than motorized drives
- Minimum objective shift due to parallel flexure guiding
- Highest linearity due to direct measuring technology with capacitive sensors
- Inexpensive version with strain gauge sensors
- Compatible with MetaMorph imaging software
- Outstanding lifetime due to PICMA® piezo actuators
- QuickLock thread adapter for easy installation
- Clear aperture up to Ø 29 mm

### Fields of application

- Super-resolution microscopy
- Light disc microscopy
- Confocal microscopy
- 3-D imaging
- Screening
- Interferometry
- Measuring technology
- Autofocus systems
- Biotechnology
- Semiconductor tests

### 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.

## 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 Sub-D 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.

## Specifications

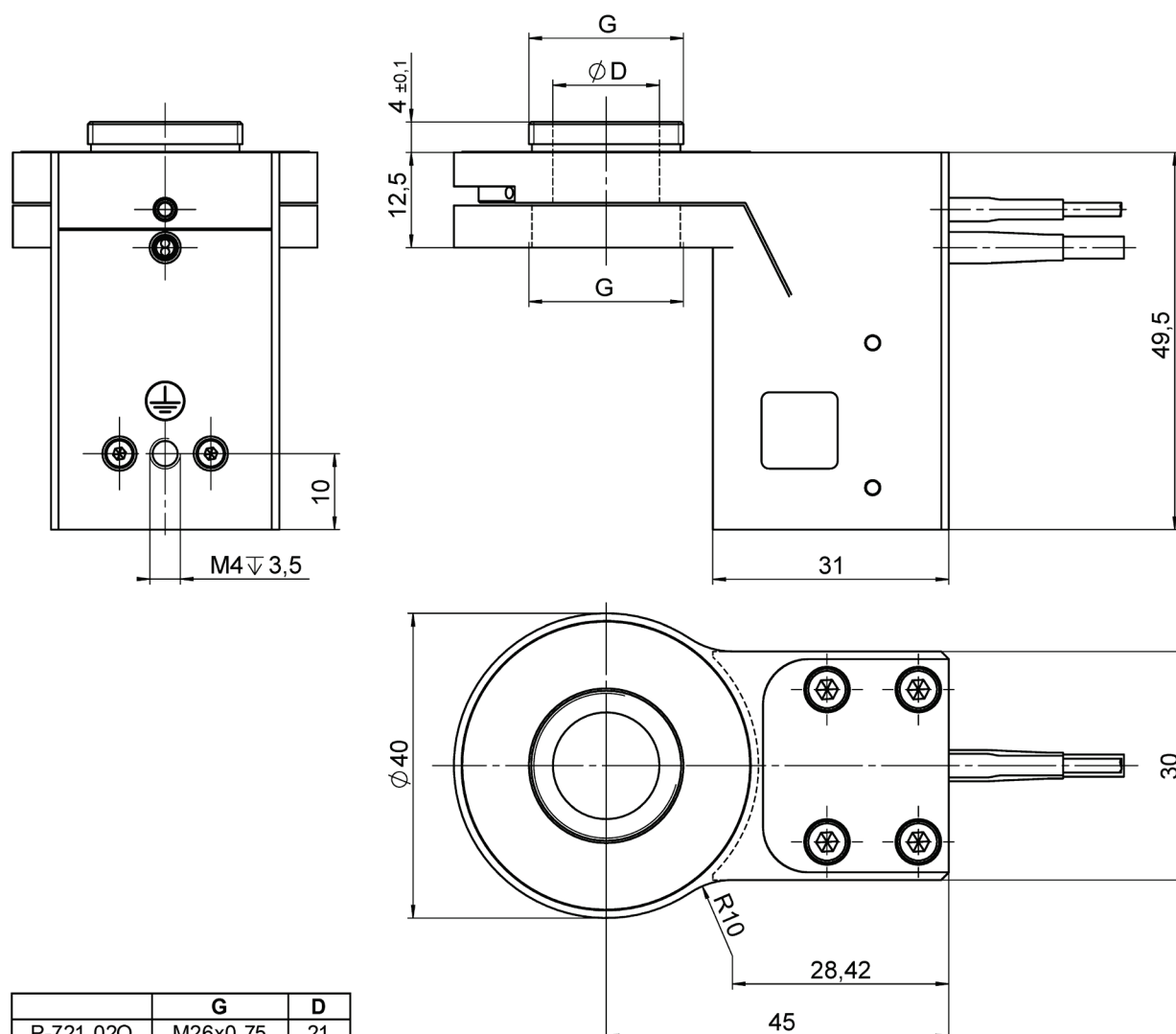
|                                              | P-721.CLQ                                                | P-721.CDQ<br>P-721.CDA                                   | P-721.SL2<br>P-721.SDA                                   | P-721.OLQ                                                | Unit | Tolerance    |
|----------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|------|--------------|
| Active axes                                  | Z                                                        | Z                                                        | Z                                                        | Z                                                        |      |              |
| <b>Motion and positioning</b>                |                                                          |                                                          |                                                          |                                                          |      |              |
| Integrated sensor                            | Capacitive                                               | Capacitive                                               | SGS                                                      | -                                                        |      |              |
| Travel range at -20 to +120 V, open loop     | 140                                                      | 140                                                      | 140                                                      | 140                                                      | µm   | +20 % / -0 % |
| Travel range, closed loop                    | 100                                                      | 100                                                      | 100                                                      | -                                                        | µm   |              |
| Resolution, open loop                        | 0.5                                                      | 0.5                                                      | 0.5                                                      | 0.5                                                      | nm   | typ.         |
| Resolution, closed loop                      | 0.7                                                      | 0.7                                                      | 5                                                        | -                                                        | nm   | typ.         |
| Linearity error, closed loop                 | 0.03                                                     | 0.03                                                     | 0.2                                                      | -                                                        | %    | typ.         |
| Repeatability                                | ±5                                                       | ±5                                                       | ±10                                                      | -                                                        | nm   | typ.         |
| Tilt $\theta_x$ , $\theta_y$                 | 13                                                       | 13                                                       | 13                                                       | 13                                                       | µrad | typ.         |
| Crosstalk X, Y                               | 100                                                      | 100                                                      | 100                                                      | 100                                                      | nm   | typ.         |
| <b>Mechanical properties</b>                 |                                                          |                                                          |                                                          |                                                          |      |              |
| Stiffness in motion direction                | 0.3                                                      | 0.3                                                      | 0.3                                                      | 0.3                                                      | N/µm | ±20 %        |
| Resonant frequency, no load                  | 580                                                      | 580                                                      | 580                                                      | 550                                                      | Hz   | ±20 %        |
| Resonant frequency under load, 120 g         | 235                                                      | 235                                                      | 235                                                      | 235                                                      | Hz   | ±20 %        |
| Resonant frequency under load, 200 g         | 180                                                      | 180                                                      | 180                                                      | 180                                                      | Hz   | ±20 %        |
| Push/pull force capacity in motion direction | 100 / 20                                                 | 100 / 20                                                 | 100 / 20                                                 | 100 / 20                                                 | N    | max.         |
| <b>Drive properties</b>                      |                                                          |                                                          |                                                          |                                                          |      |              |
| Ceramic type                                 | PICMA® P-885                                             | PICMA® P-885                                             | PICMA® P-885                                             | PICMA® P-885                                             |      |              |
| Electrical capacitance                       | 3.1                                                      | 3.1                                                      | 3.1                                                      | 3.1                                                      | µF   | ±20 %        |
| <b>Miscellaneous</b>                         |                                                          |                                                          |                                                          |                                                          |      |              |
| Operating temperature range                  | -20 to 80                                                | -20 to 80                                                | -20 to 80                                                | -20 to 80                                                | °C   |              |
| Material                                     | Aluminum                                                 | Aluminum                                                 | Aluminum                                                 | Aluminum                                                 |      |              |
| Mass                                         | 0.24                                                     | 0.24                                                     | 0.22                                                     | 0.22                                                     | kg   | ±5 %         |
| Objective diameter                           | 39                                                       | 39                                                       | 39                                                       | 39                                                       | mm   | max.         |
| Cable length                                 | 1                                                        | 1                                                        | 1                                                        | 1                                                        | m    | ±10 mm       |
| Sensor/voltage connection                    | LEMO                                                     | Sub-D 7W2 (m)                                            | LEMO / Sub-D 9 (m)                                       | LEMO (no sensor)                                         |      |              |
| Recommended electronics                      | E-505, E-610,<br>E-621, E-625,<br>E-665, E-709,<br>E-754 | E-505, E-610,<br>E-621, E-625,<br>E-665, E-709,<br>E-754 | E-505, E-610,<br>E-621, E-625,<br>E-665, E-709,<br>E-754 | E-505, E-610,<br>E-621, E-625,<br>E-665, E-709,<br>E-754 |      |              |

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.

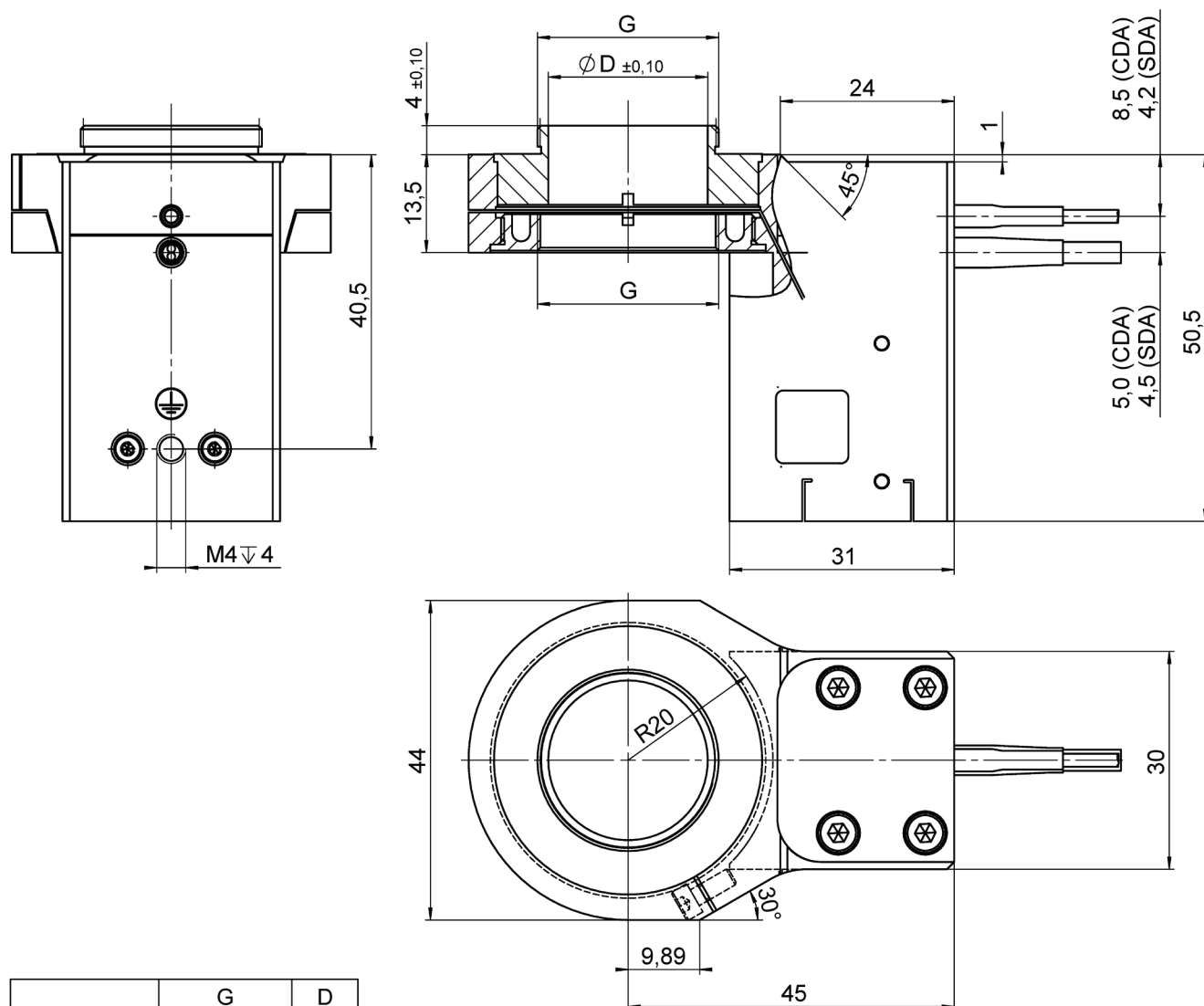
All specifications based on room temperature (22 °C ±3 °C).

Ask about customized versions.

## Drawings / Images



*P-721.xxQ, .SL2, dimensions in mm (please order adapter separately)*



|           | G         | D  |
|-----------|-----------|----|
| P-721.02A | M26x0,75  | 23 |
| P-721.03A | M27x0,75  | 24 |
| P-721.04A | M28x0,75  | 25 |
| P-721.05A | M32x0,75  | 29 |
| P-721.06A | M26x1/36" | 23 |
| P-721.11A | M25x0,75  | 22 |

*P-721.CDA, .SDA, dimensions in mm (please order adapter separately)*

## Ordering Information

### P-721.CLQ

Fast PIFOC piezo nanofocusing system, 100 µm, direct position measuring, capacitive sensor, LEMO connector(s), for QuickLock adapter

### P-721.CDQ

Fast PIFOC piezo nanofocusing system, 100 µm, direct position measuring, capacitive sensor, Sub-D connector, for QuickLock adapter

**P-721.CDA**

Fast PIFOC piezo nanofocusing system, 100  $\mu\text{m}$ , direct position measuring, capacitive sensor, Sub-D connector, for QuickLock thread adapter with large aperture

**P-721.SL2**

Fast PIFOC piezo nanofocusing system, 100  $\mu\text{m}$ , strain gauge sensor, LEMO connector(s), for QuickLock adapter

**P-721.SDA**

Fast PIFOC piezo nanofocusing system, 100  $\mu\text{m}$ , strain gauge sensor, Sub-D connector, for QuickLock thread adapter with large aperture

**P-721.0LQ**

Fast PIFOC piezo nanofocusing system, 100  $\mu\text{m}$ , without sensor, LEMO connector(s), for QuickLock adapter