

# PIFOC Objective Scanner with Long Travel Range

High-Precision Positioner and Scanner for Microscope Objectives



## P-725

- Travel ranges to 460  $\mu\text{m}$
- Significantly faster response and higher lifetime than motorized drives
- Fine positioning of objectives with sub-nm resolution
- Direct position measuring with capacitive sensors: Highest linearity
- Zero-play, high-precision flexure guide system for better focus stability
- Compatible with MetaMorph imaging software
- Outstanding lifetime due to PICMA<sup>®</sup> piezo actuators
- Clear aperture up to  $\varnothing$  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<sup>®</sup> piezo actuators

The patented PICMA<sup>®</sup> piezo actuators are all-ceramic insulated. This protects them against humidity and failure resulting from an increase in leakage current. PICMA<sup>®</sup> 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 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.

## Specifications

	P-725.1CDE2* P-725.1CLE2*	P-725.1CL P-725.1CD P-725.1CA	P-725.2CL P-725.2CD P-725.2CA	P-725.4CL P-725.4CD P-725.4CA	P-725.x0L Open-loop version	Unit	Tolerance
Active axes	Z	Z	Z	Z	Z		
<b>Motion and positioning</b>							
Integrated sensor	Capacitive	Capacitive	Capacitive	Capacitive	-		
Travel range at -20 to +120 V, open loop	120	150	330	460	as P-725.xCL	µm	+20 % / -0 %
Travel range, closed loop	100	100	250	400	-	µm	
Resolution, open loop	0.2	0.3	0.4	0.5	as P-725.xCL	nm	typ.
Resolution, closed loop	0.2	0.65	0.75	1.25	-	nm	typ.
Linearity, closed loop	0.03	0.03	0.03	0.03	-	%	typ.
Repeatability	±5	±5	±5	±5	-	nm	typ.
Tilt $\theta_x$	1	1	6	10	as P-725.xCL	µrad	typ.
Tilt $\theta_y$	20	20	45	45	as P-725.xCL	µrad	typ.
Crosstalk in X	20	20	20	60	as P-725.xCL	nm	typ.
Crosstalk in Y	20	20	40	60	as P-725.xCL	nm	typ.
<b>Mechanical properties</b>							
Stiffness in motion direction	0.50	0.23	0.17	0.12	as P-725.xCL	N/µm	±20 %
Resonant frequency, unloaded	680	470	330	230	as P-725.xCL	Hz	±20 %
Resonant frequency, under load, 150 g	290	185	140	120	as P-725.xCL	Hz	±20 %
Push/pull force capacity in positioning direction	100 / 20	100 / 20	100 / 20	100 / 20	as P-725.xCL	N	max.
<b>Drive properties</b>							
Ceramic type	PICMA®	PICMA®	PICMA®	PICMA®	as P-725.xCL		
Electrical capacitance	3.2	4.2	6.2	6.2	as P-725.xCL	µF	±20 %
<b>Miscellaneous</b>							
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	°C	
Material	Stainless steel, aluminum	Aluminum	Aluminum	Aluminum	Aluminum		
Objective diameter	39	39	39	39	39	mm	max.
Assembly	Ring clamp	QuickLock	QuickLock	QuickLock	QuickLock		
Mass	0.28	0.215	0.23	0.23	as P-725.xCL	kg	±5 %
Sensor/voltage connection	CL version: LEMO CD version: D-sub 7W2 (m)	CL version: LEMO Other: D-sub 7W2 (m)	CL version: LEMO Other: D-sub 7W2 (m)	CL version: LEMO Other: D-sub 7W2 (m)	LEMO (no sensor)		
Cable length	1.5	1.5	1.5	1.5	1.5	m	+50 mm / -0 mm
Recommended electronics	E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-505, E-610, E-621, E-625, E-665, E-709, E-754		

\* Subject to minor changes in specifications.

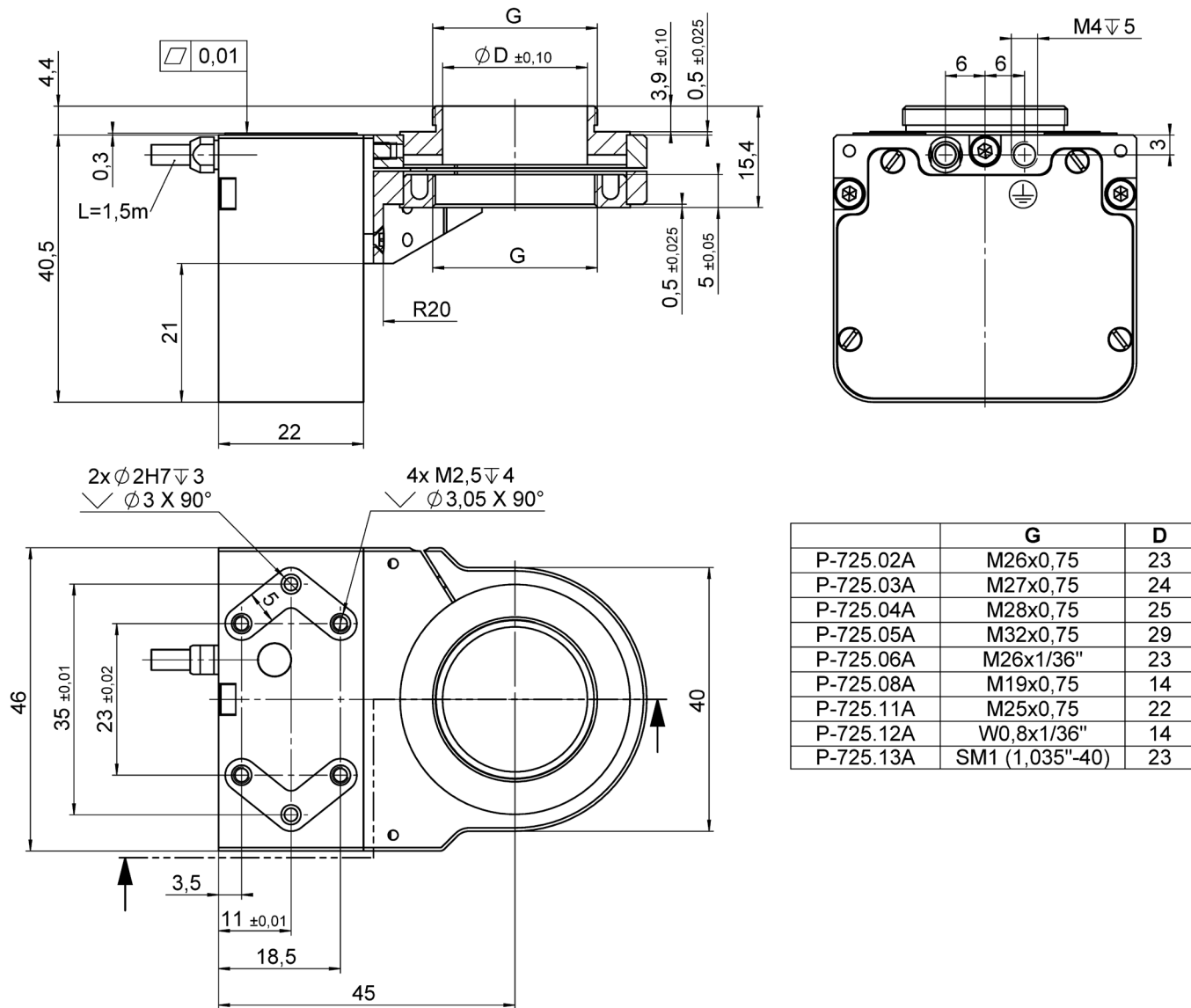
The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.

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

## Drawings / Images

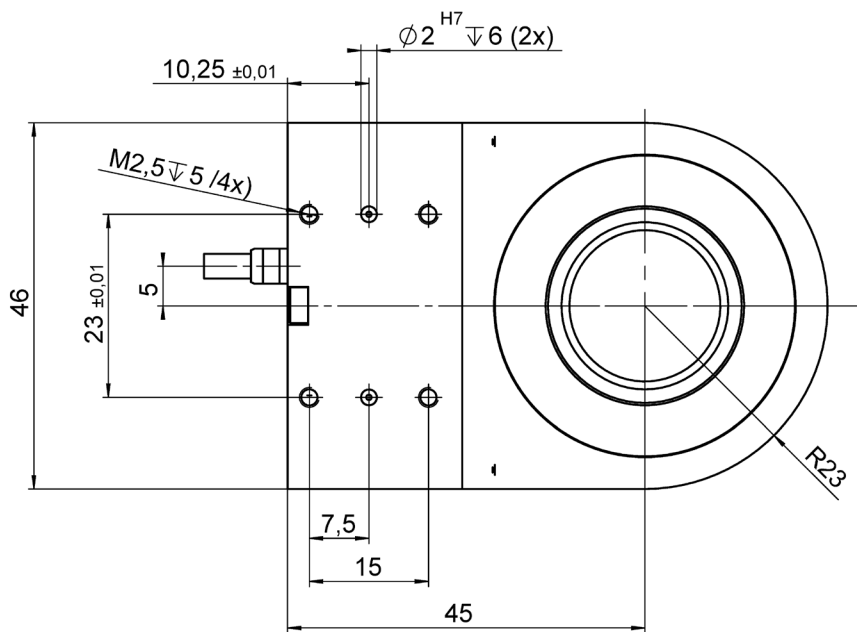
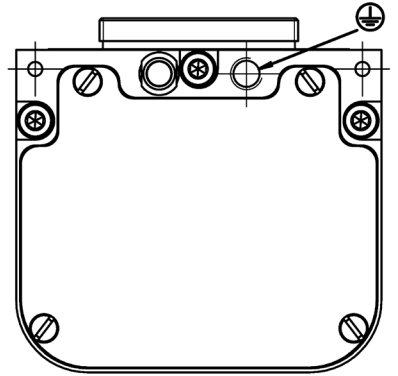
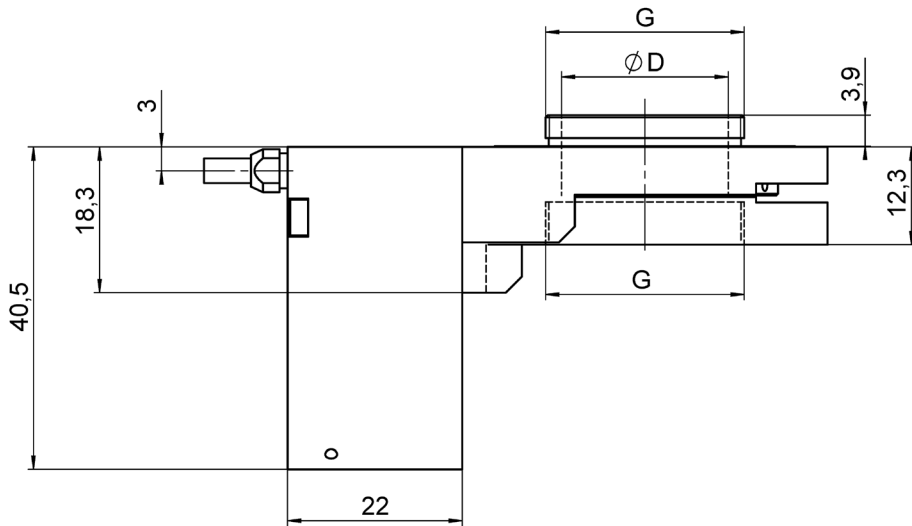


*P-725.1CDE2/.1CLE2 PIFOC piezo nanofocusing system for long travel ranges and fast step-and-settle*



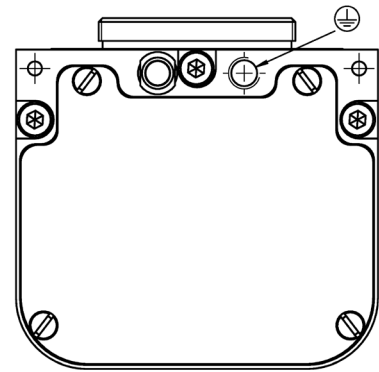
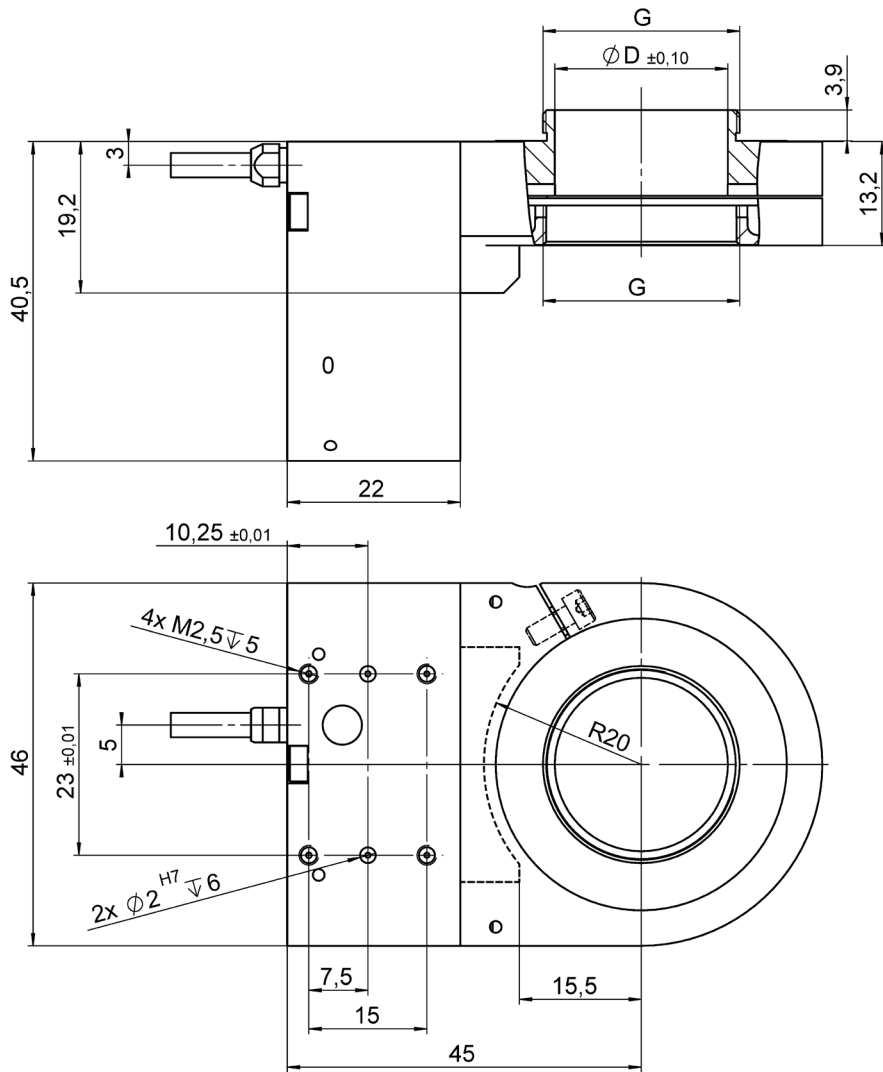
	G	D
P-725.02A	M26x0,75	23
P-725.03A	M27x0,75	24
P-725.04A	M28x0,75	25
P-725.05A	M32x0,75	29
P-725.06A	M26x1/36"	23
P-725.08A	M19x0,75	14
P-725.11A	M25x0,75	22
P-725.12A	W0,8x1/36"	14
P-725.13A	SM1 (1,035"-40)	23

P-725.1CDE2/.1CLE2, dimensions in mm (please order adapter separately)



	G	D
P-721.02Q	M26x0,75	21
P-721.03Q	M27x0,75	21
P-721.04Q	M28x0,75	21
P-721.05Q	M32x0,75	21
P-721.06Q	M26x1/36"	21
P-721.08Q	M19x0,75	14
P-721.11Q	M25x0,75	21
P-721.12Q	W0,8x1/36"	14

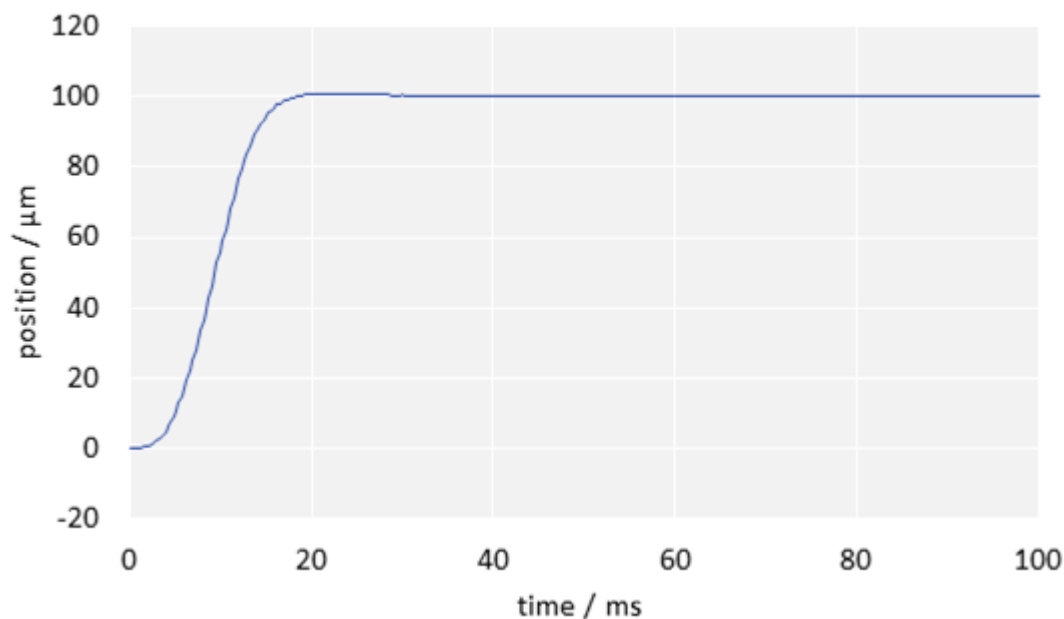
P-725.xCD/.xCL, dimensions in mm (please order adapter separately)



	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-725.xCA, dimensions in mm (please order adapter separately)

## Step-and-settle: 100 $\mu\text{m}$ step



*Fast step-and-settle: Due to its stiff design, the P-725.1CDE2 PIFOC can make a 100- $\mu\text{m}$  step with an error band of 1 % in only 17 ms (without load, with E-709.CHG controller).*

## Ordering Information

### **P-725.1CDE2**

PIFOC piezo nanofocusing system for long travel ranges and fast step-and-settle, 100  $\mu\text{m}$ , capacitive sensors, D-sub connector

### **P-725.1CD**

PIFOC piezo nanofocusing system for long travel ranges, 100  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter

### **P-725.2CD**

PIFOC piezo nanofocusing system for long travel ranges, 250  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter

### **P-725.4CD**

PIFOC piezo nanofocusing system for long travel ranges, 400  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter

### **P-725.1CLE2**

PIFOC piezo nanofocusing system for long travel ranges and fast step-and-settle, 100  $\mu\text{m}$ , capacitive sensors, LEMO connectors

### **P-725.1CL**

PIFOC piezo nanofocusing system for long travel ranges, 100  $\mu\text{m}$ , capacitive sensors, LEMO connectors, for QuickLock adapter

### **P-725.2CL**

PIFOC piezo nanofocusing system for long travel ranges, 250  $\mu\text{m}$ , capacitive sensors, LEMO connectors, for QuickLock adapter

### **P-725.4CL**

PIFOC piezo nanofocusing system for long travel ranges, 400  $\mu\text{m}$ , capacitive sensors, LEMO connectors, for QuickLock adapter

### **P-725.1CA**

PIFOC piezo nanofocusing system for long travel ranges, 100  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter with large aperture



**P-725.2CA**

PIFOC piezo nanofocusing system for long travel ranges, 250  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter with large aperture

**P-725.4CA**

PIFOC piezo nanofocusing system for long travel ranges, 400  $\mu\text{m}$ , capacitive sensors, D-sub connector, for QuickLock adapter with large aperture

**P-725.10L**

PIFOC piezo nanofocusing system for long travel ranges, 150  $\mu\text{m}$ , without sensor, LEMO connectors, for QuickLock adapter

**P-725.20L**

PIFOC piezo nanofocusing system for long travel ranges, 330  $\mu\text{m}$ , without sensor, LEMO connectors, for QuickLock adapter

**P-725.40L**

PIFOC piezo nanofocusing system for long travel ranges, 460  $\mu\text{m}$ , without sensor, LEMO connectors, for QuickLock adapter