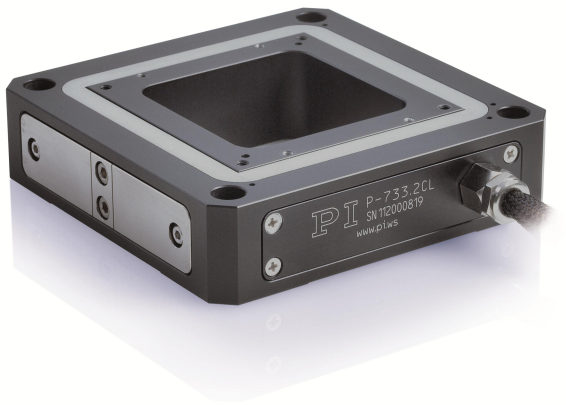
XY Piezo Nanopositioner

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 on request
- 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

Application fields

- 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 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.

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.

Motion	Unit	Tolerance	P-733.2CD	P-733.2CL	P-733.2DD
Active axes			X | Y	X | Y	X | Y
Travel range in X	µm		100	100	30
Travel range in Y	µm		100	100	30
Travel range in X, open loop, at -20 to 120 V	µm	+20 / -0 %	115	115	33
Travel range in Y, open loop, at -20 to +120 V	µm	+20 / -0 %	115	115	33
Linearity error in X	%	Typ.	0.03	0.03	0.03
Linearity error in Y	%	Typ.	0.03	0.03	0.03
Pitch (Rotational crosstalk in θX with motion in Y)	µrad	Typ.	±3	±3	±5
Pitch (Rotational crosstalk in θY with motion in X)	µrad	Typ.	±3	±3	±5
Yaw (Rotational crosstalk in θZ with motion in X)	µrad	Typ.	±10	±10	±10
Yaw (Rotational crosstalk in θZ with motion in Y)	µrad	Typ.	±10	±10	±10

Positioning	Unit	Tolerance	P-733.2CD	P-733.2CL	P-733.2DD
Unidirectional repeatability in X	nm	Typ.	±2	±2	±2
Unidirectional repeatability in Y	nm	Typ.	±2	±2	±2
Resolution in X, open loop	nm	Typ.	0.2	0.2	0.1
Resolution in Y, open loop	nm	Typ.	0.2	0.2	0.1
Integrated sensor			Capacitive, indirect position measuring	Capacitive, indirect position measuring	Capacitive, indirect position measuring
System resolution in X	nm	Typ.	0.3	0.3	0.1
System resolution in Y	nm	Typ.	0.3	0.3	0.1

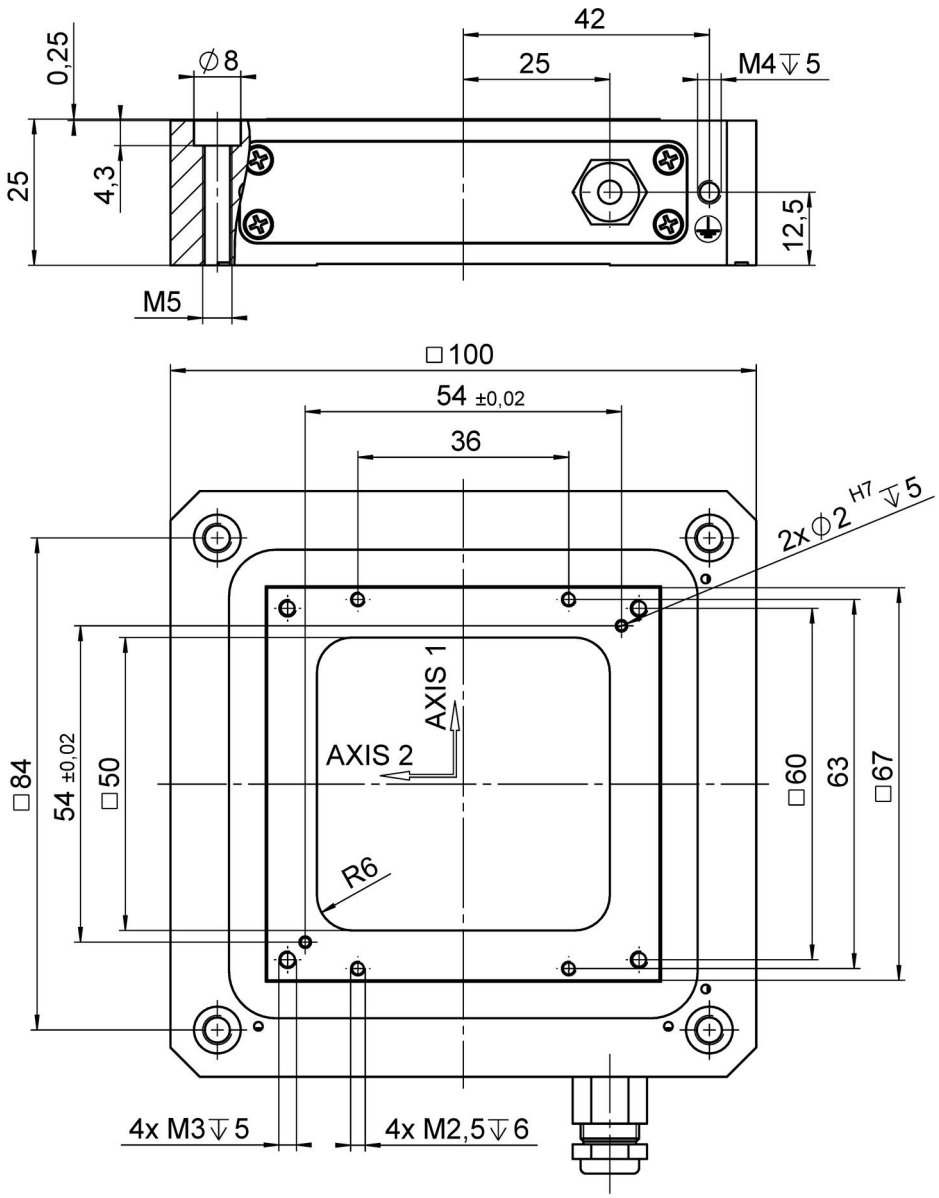
Drive Properties	Unit	Tolerance	P-733.2CD	P-733.2CL	P-733.2DD
Drive type			PICMA®	PICMA®	PICMA®
Electrical capacitance in X	µF	±20%	6	6	6.2
Electrical capacitance in Y	µF	±20%	6	6	6.2

Mechanical Properties	Unit	Tolerance	P-733.2CD	P-733.2CL	P-733.2DD
Stiffness in X	N/µm	±20%	1.5	1.5	20
Stiffness in Y	N/µm	±20%	1.5	1.5	20
Resonant frequency in X, unloaded	Hz	±20%	500	500	2230
Resonant frequency in X, under load with 120 g	Hz	±20%	370	370	–
Resonant frequency in X, under load with 200 g	Hz	±20%	340	340	1550
Resonant frequency in Y, unloaded	Hz	±20%	500	500	2230
Resonant frequency in Y, under load with 120 g	Hz	±20%	370	370	–
Resonant frequency in Y, under load with 200 g	Hz	±20%	340	340	1550
Permissible push force in X	N	Max.	50	50	50
Permissible push force in Y	N	Max.	50	50	50
Permissible push force in Z	N	Max.	50	50	50
Permissible pull force in X	N	Max.	20	20	20
Permissible pull force in Y	N	Max.	20	20	20
Permissible pull force in Z	N	Max.	20	20	20
Overall mass	g	±5%	580	580	580
Material			Aluminum	Aluminum	Aluminum

Miscellaneous	Unit	Tolerance	P-733.2CD	P-733.2CL	P-733.2DD
Operating temperature range	°C		-20 to 80	-20 to 80	-20 to 80
Connector			D-sub 25W3 (m)	LEMO FFS.00.250.CTCE24	D-sub 25W3 (m)
Sensor connector			–	LEMO FFA.00.250.CTLC31	–
Cable length	m	±10 mm	1.5	1.5	1.5
Recommended controllers / drivers			E-503, E-505, E-610, E-621, E-625, E-712, E-727	E-503, E-505, E-610, E-621, E-625, E-712, E-727	E-503, E-505, E-610, E-621, E-625, E-712, E-727

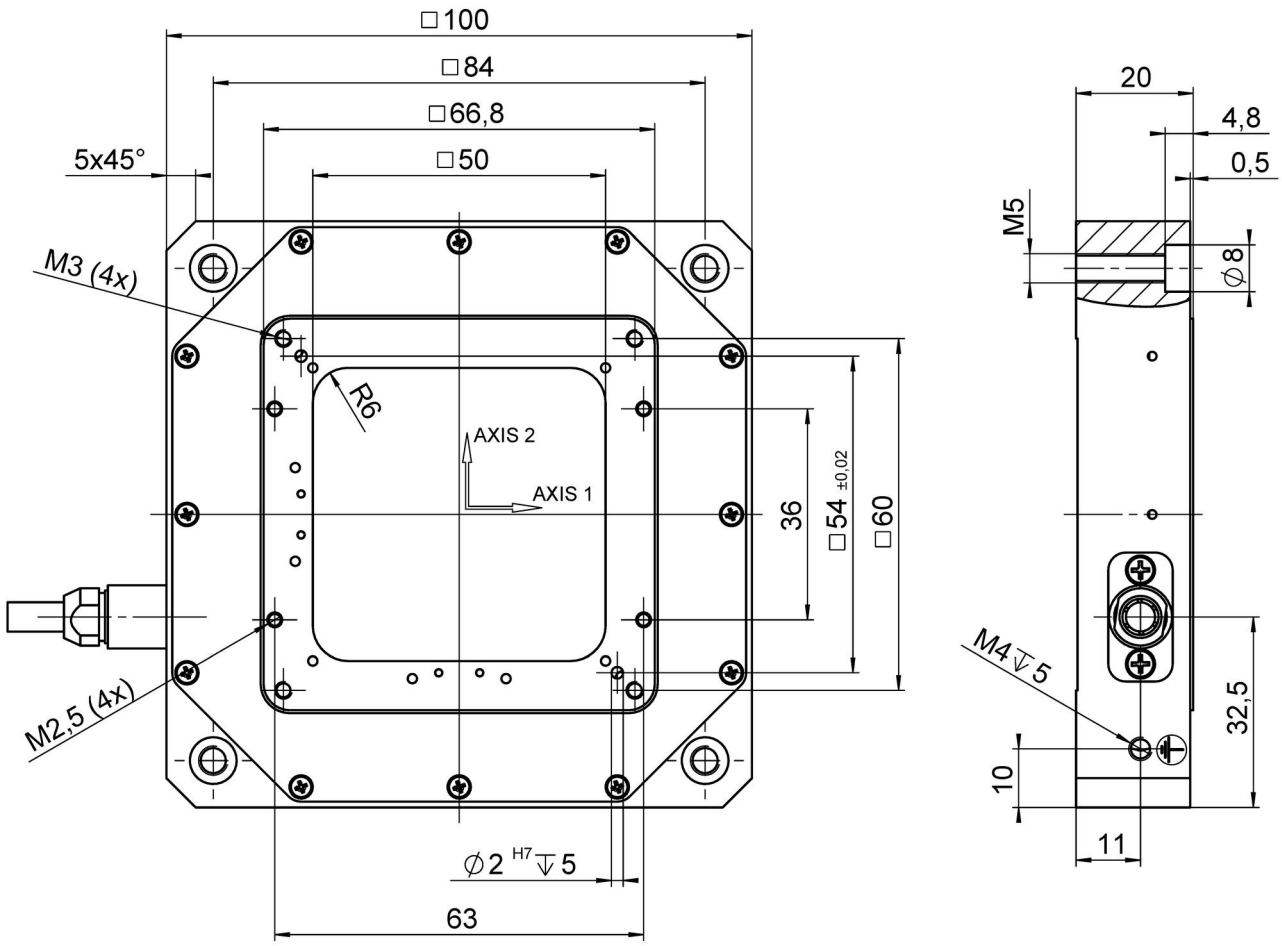
P-733.2DD: Linearity error with digital controller. With analog controllers, the typical linearity error for direct drive positioners can be up to 0.1 %.
The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.

Drawings / Images



P-733.2CD / .2CL, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Drawings / Images



P-733.2DD, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

P-733.2CD
XY piezo nanopositioner; 100 µm × 100 µm travel range (X × Y); capacitive, indirect position measuring; D-sub 25W3 (m); 1.5 m cable length

P-733.2CL
XY piezo nanopositioner; 100 µm × 100 µm travel range (X × Y); capacitive, indirect position measuring; LEMO connectors; 1.5 m cable length

P-733.2DD
XY piezo nanopositioner; 30 µm × 30 µm travel range (X × Y); capacitive, indirect position measuring; D-sub 25W3 (m); 1.5 m cable length