

PIHera[®] XY Stage and XYZ Stage with Piezo Flexure Drive

High-Precision Nanopositioner Family—Compact and Long Travel Ranges



PIHera[®] XY nanopositioning systems provide travel ranges from 50 x 50 μm to 1800 x 1800 μm

- Travel Ranges 50 to 1800 μm
- High-Precision, Cost-Efficient
- Resolution to 0.1 nm
- Frictionless, High-Precision Flexure Guiding System
- 0,02 % Positioning Accuracy
- Outstanding Lifetime Due to PICMA[®] Piezo Actuators
- X-, XY-, Z- and XYZ-Versions
- Vacuum-Compatible Versions Available

Two-axis (XY) PIHera[®] systems are piezo-nanopositioning stages featuring travel ranges from 50 to 1800 μm . Despite the increased travel ranges, the units are extremely compact and provide rapid response and high guiding precision. This, and the long travel range is achieved with a friction-free and extremely stiff flexure system nanometer resolution. The PI-

Hera[®] piezo nanopositioning series also includes Z and X stages (see p. 2-22 and p. 2-40).

Nanometer Precision in Milliseconds

One of the advantages of PIHera[®] stages over motor-driven positioning stages is the rapid response to input changes and the fast and precise settling behavior. The P-622.1CD, for example, can settle to an accuracy of 10 nm in only 30 msec (other PI stages provide even faster response)!

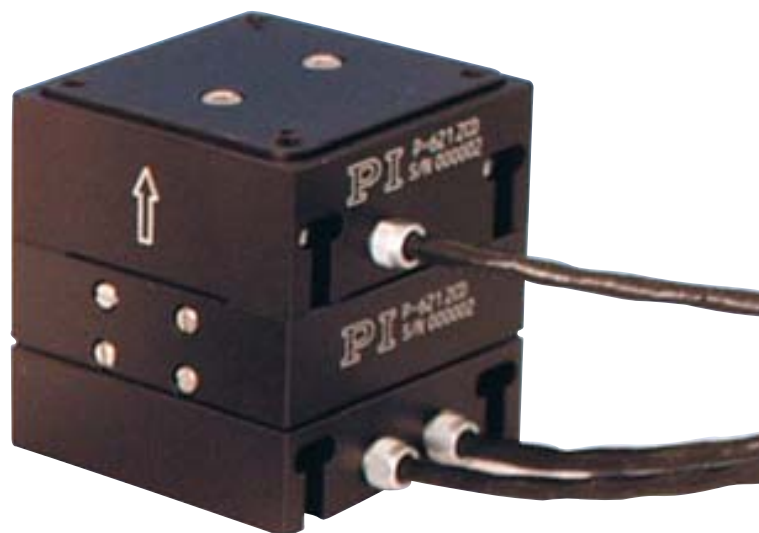
Superior Accuracy With Direct-Metrology Capacitive Sensors

A choice of tasks such as optical path adjustment in interferometry, sample positioning in microscopy, precision align-

ment or optical tracking require the relatively long scanning ranges and nanometer precision offered by PIHera[®] nanopositioning stages. PI's proprietary capacitive sensors measure position directly and without physical contact. They are free of friction and hysteresis, a fact which, in combination with the positioning resolution of well under 1 nm, makes it possible to achieve very high levels of linearity. A further advantage of direct metrology with capacitive sensors is the high phase fidelity and the high bandwidth of up to 10 kHz.

Designed for Precision

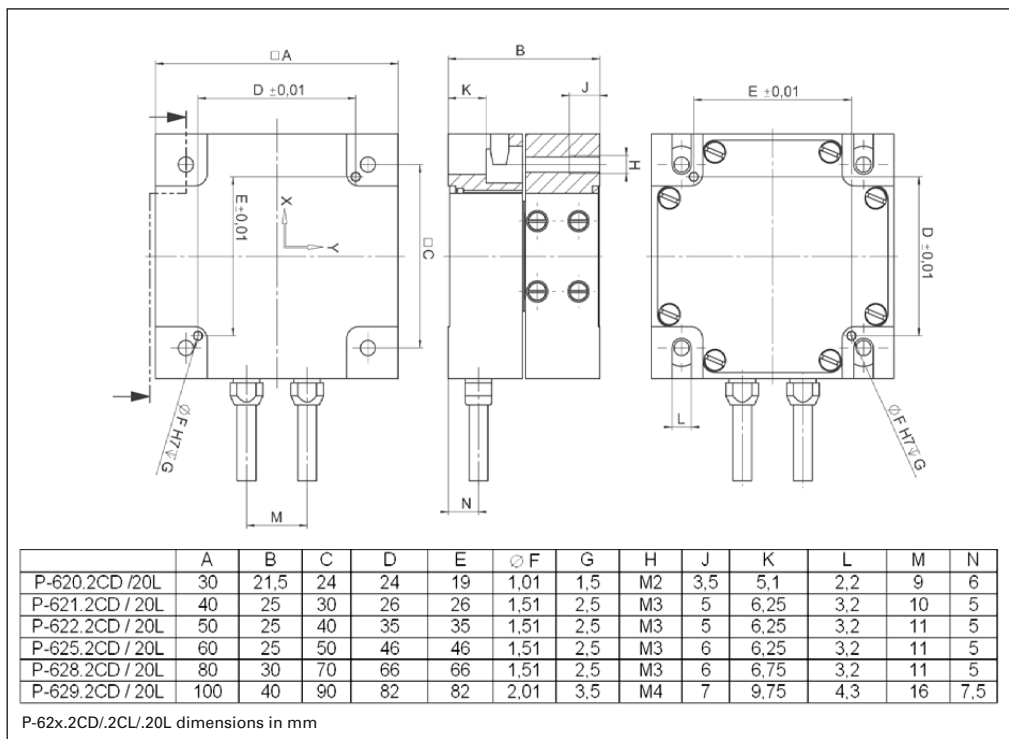
High stiffness is achieved with the FEA-optimized design of the frictionless flexure elements, which assure excellent guiding accuracy and dynamics. A straightness and flatness in the nanometer range is achieved.



PIHera[®] XYZ combination.

Application Examples

- Interferometry
- Microscopy
- Nanopositioning
- Biotechnology
- Quality assurance testing
- Semiconductor technology



Technical Data

Model	P-620.2CD/ P-620.2CL	P-621.2CD/ P-621.2CL	P-622.2CD/ P-622.2CL	P-625.2CD/ P-625.2CL	P-628.2CD/ P-628.2CL	P-629.2CD P-629.2CL	P-62x.20L open-loop versions	Units	Tolerance	
Active axes	X, Y	X, Y	X, Y	X, Y	X, Y	X, Y	X, Y			
Motion and positioning										
Integrated sensor	Capacitive	Capacitive	Capacitive	Capacitive	Capacitive	Capacitive	–			
Open-loop travel X, Y, -20 to +120 V	60	120	300	600	950	1800	as P-62x.2CD	µm	min. (+20%/-0%)	
Closed-loop travel	50	100	250	500	800	1500	–	µm		
Open-loop resolution	0.1	0.2	0.4	0.5	0.5	2	as P-62x.2CD	nm	typ.	
Closed-loop resolution	0.2	0.4	0.7	1.4	3.5	3.5	–	nm	typ.	
Linearity	0.02	0.02	0.02	0.03	0.03	0.03	–	%	typ.	
Repeatability	±2	±2	±2	±5	±10	±14	as P-62x.2CD	nm	typ.	
Pitch / yaw	±3	±3	±3	±3	±20	±30	as P-62x.2CD	µrad	typ.	
Mechanical properties										
Stiffness	0.22	0.25	0.2	0.1	0.05	0.1	as P-62x.2CD	N/µm	±20%	
Unloaded resonant frequency in X,	575	420	225	135	75	60	as P-62x.2CD	Hz	±20%	
Unloaded resonant frequency in Y	800	535	300	195	105	100	as P-62x.2CD	Hz	±20%	
Resonant frequency in X @ 50 g	270	285	180	120	60	55	as P-62x.2CD	Hz	±20%	
Resonant frequency in Y @ 50 g	395	365	215	150	85	85	as P-62x.2CD	Hz	±20%	
Resonant frequency in X @ 100 g	285	220	160	105	55	50	as P-62x.2CD	Hz	±20%	
Resonant frequency in Y @ 100 g	300	285	175	125	75	80	as P-62x.2CD	Hz	±20%	
Push/pull force capacity in motion direction	10 / 5	10 / 8	10 / 8	10 / 8	10 / 8	10 / 8	as P-62x.2CD	N	Max.	
Load capacity	10	10	10	10	10	10	as P-62x.2CD	N	Max.	
Lateral Force	10	10	10	10	10	10	as P-62x.2CD	N	Max.	
Drive properties										
Ceramic type	PICMA® P-883	PICMA® P-885	PICMA® P-885	PICMA® P-885	PICMA® P-887	PICMA® P-888	as P-62x.2CD			
Electrical Capacitance	0.35	1.5	3.1	6.2	19	52	as P-62x.2CD	µF	±20%	
Dynamic operating current coefficient	0.9	1.9	1.9	1.6	3	4.3	as P-62x.2CD	µA/(Hz*µm)	±20%	
Miscellaneous										
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 150	°C		
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum			
Mass	0.195	0.295	0.348	0.43	0.7	1.37	as P-62x.2CD	kg	±5%	
Cable length	1.5	1.5	1.5	1.5	1.5	1.5	1.5	m	±10 mm	
Sensor / voltage connection	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	CD version: 2x Sub-D special CL version: LEMO	2x LEMO (no sensor)		

Lower axis: X; upper axis: Y.
 Resolution of PI Piezo Nanopositioners is not limited by friction or stiction. The value given is noise equivalent motion with E-710 controller (p. 2-128)
 Recommended controller
 CD version: E-610 servo controller / amplifier (p. 2-110), E-625 servo controller, bench-top (p. 2-114), E-665 powerful servo controller, bench-top (p. 2-116)
 Multi-channel digital controllers: E-710 bench-top (p. 2-128), E-712 modular (p. 2-140), E-725 high-power (p. 2-126), E-761 PCI board (p. 2-140)
 CL version: E-500 modular piezo controller system (p. 2-142) with E-505 amplifier module (1 per axis, high power) (p. 2-147) and E-509 controller (p. 2-152)
 Open-loop versions: E-500 modular piezo controller system (p. 2-142) with E-505 amplifier module (1 per axis, high power) (p. 2-147)