

P-620.2 · P-621.2 · P-622.2 · P-625.2

PIHera® Long-Range XY Piezo Nanopositioning Stages with Direct Metrology

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P-621.2CD, P-622.2CD and P-625.2CD PIHera® XY piezo nano-translation stages, from left to right (CD for size comparison).

- XY-Travel to 600 µm
- Compact Design
- Resolution <1 nm
- Frictionless Precision Flexure Guiding System
- PICMA® High-Performance Piezo Drives
- Direct Metrology with Capacitive Sensors for Highest Precision
- Up to 0.02 % Position Accuracy
- X, XY, Z, XYZ Versions
- Vacuum-Compatible Versions

P-620.2CD – P-625.2CD PIHera® systems are XY piezo-nanopositioning stages featuring travel ranges from 60 to 600 µm. Despite the increased travel ranges, the units are extremely compact and provide sub-nanometer resolution. The long travel range is achieved with a newly designed, friction-free and extremely stiff flexure system, which also offers rapid response and excellent guiding accuracy (typically less than 5 µrad pitch/yaw over the full travel range).

Application Examples

- (Dynamic) interferometry
- Microscopy
- Nanopositioning
- Biotechnology
- Quality assurance
- Semiconductor technology

Superior Accuracy Through Direct-Motion Metrology with Capacitive Sensors

The capacitive-sensor-equipped versions provide motion linearity to 0.02 % with effective resolution in the sub-nanometer range. PI capacitive sensors are absolute-measuring, direct-metrology devices that boast very high bandwidth and exhibit no periodic errors.

Unlike conventional sensors, capacitive sensors measure the actual distance between the fixed frame and the moving part of the stage. They detect errors contributed by all components in the drive train—from the actuator through the flexures to the platform. This results in higher motion linearity, long-term stability, phase fidelity, and—because external disturbances are seen by the sensor immediately—a stiffer,

faster-responding servo-loop. See p. 2-4 *ff.* and p. 5-2 *ff.* for more information.

Nanometer Precision in Milliseconds

One of the advantages of PIHera® stages over motor-driven positioning stages is the rapid response input changes and fast and precise settling behavior. Furthermore our new digital control electronics with DDL (Dynamic Digital Linearization) can be used to increase linearity and effective bandwidth in scanning applications by up to 1000-fold (see p. 6-16).

Working Principle / Reliability

PIHera® stages are equipped with the award winning PICMA® piezo drives, integrated into a sophisticated flexure guiding system. The flexures are FEA-modeled for zero-friction and exceptional guiding precision. The ceramic-encapsulated PICMA® drives are more robust than conventional piezo actuators, featuring superior lifetime and performance in both dynamic and static applications. Because guidance, actuators and sensors are all frictionless and maintenance-free, these nanopositioning systems achieve outstanding levels of reliability.

Single-Axis Versions

See page 2-40 and page 2-42 for X and Z versions. Multi-axis combinations can be assembled without adapters.

Notes

See the “Selection Guide” on p. 2-14 *ff.* for comparison with other nanopositioning systems.

Ordering Information

P-620.2CD
PIHera® XY Nanopositioning System, 50 µm, Capacitive Sensors, Sub-D Connectors

P-620.2CL
PIHera® XY Nanopositioning System, 50 µm, Capacitive Sensors, LEMO Connectors

P-620.20L
PIHera® XY Nanopositioning System, 60 µm, Open-Loop, LEMO Connectors

P-621.2CD
PIHera® XY Nanopositioning System, 100 µm, Capacitive Sensors, Sub-D Connector

P-621.2CL
PIHera® XY Nanopositioning System, 100 µm, Capacitive Sensors, LEMO Connectors

P-621.20L
PIHera® XY Nanopositioning System, 120 µm, Open-Loop, LEMO Connectors

P-622.2CD
PIHera® XY Nanopositioning System, 250 µm, Capacitive Sensors, Sub-D Connector

P-622.2CL
PIHera® XY Nanopositioning System, 250 µm, Capacitive Sensors, LEMO Connectors

P-622.20L
PIHera® XY Nanopositioning System, 300 µm, Open-Loop, LEMO Connectors

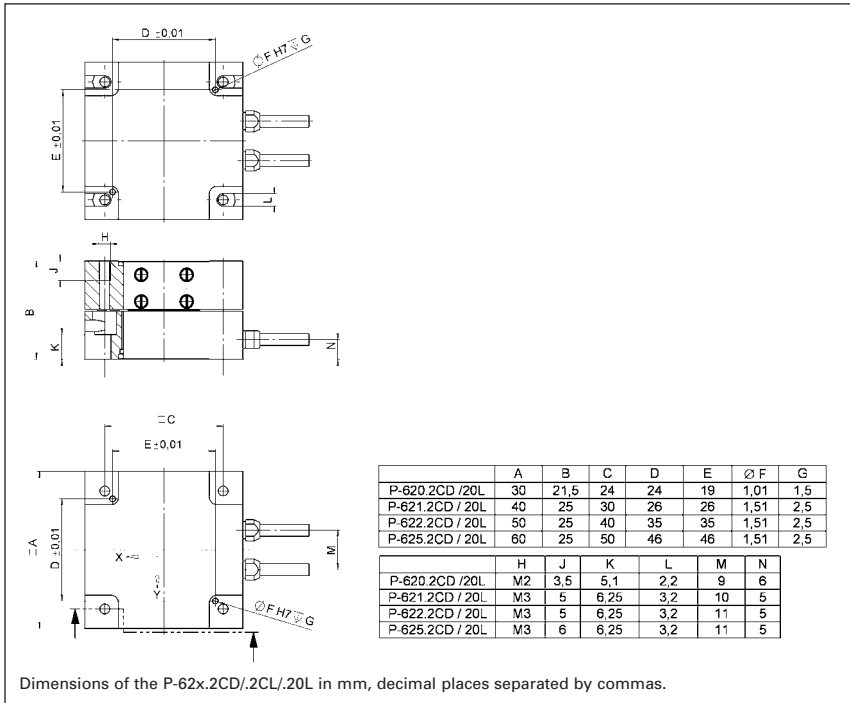
P-625.2CD
PIHera® XY Nanopositioning System, 500 µm, Capacitive Sensors, Sub-D Connector

P-625.2CL
PIHera® XY Nanopositioning System, 600 µm, Capacitive Sensors, LEMO Connectors

P-625.20L
PIHera® XY Nanopositioning System, 600 µm, Open-Loop, LEMO Connectors

Vacuum versions to 10⁻³ hPa are available as part numbers P-62x.2UD
X & Z Versions:
See separate datasheets.

Custom sizes & specifications available!



Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

Hexapods / Micropositioning

Photonics Alignment Solutions

Motion Controllers

Ceramic Linear Motors & Stages

Index

Technical Data

Models	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-62x.20L	Units	Notes see p. 2-84
Active axes	X, Y	X, Y	X, Y	X, Y	X, Y		
Min. open-loop travel -20 to 120 V per axis	60	120	300	600	see P-62x.2CD	µm	A2
Closed-loop travel per axis	50	100	250	500	-	µm	A5
Integrated feedback sensor	capacitive	capacitive	capacitive	capacitive	-		B
* Closed-loop / open-loop resolution	0.2 / 0.1	0.4 / 0.2	0.7 / 0.4	1.4 / 0.5	- / see P-62x.2CD	nm	C1
Closed-loop linearity (typ.)	0.02	0.02	0.02	0.03	-	%	
Stiffness	0.40	0.25	0.20	0.10	see P-62x.2CD	N/µm	D1
Push / pull force capacity (in X and Y)	10/5	10/8	10/8	10/8	see P-62x.2CD	N	D3
Max. load	10	10	10	10	see P-62x.2CD	N	D4
Lateral force limit	10	10	10	10	see P-62x.2CD	N	D5
Tilt (θ _x , θ _y) (typ.)	3	3	3		see P-62x.2CD	µrad	E1
Electrical capacitance per axis	0.75	1.5	3	6	see P-62x.2CD	µF ±20%	F1
Dynamic operating current coefficient (DOCC)	1.9	1.9	1.5	1.5	see P-62x.2CD	µA/(Hz x µm)	F2
Unloaded resonant frequency (upper / lower axis)	800/600	535/420	300/225	195/135	see P-62x.2CD	Hz ±20%	G2
Resonant frequency @ 50 g load (upper / lower axis)	395/270	365/285	215/180	150/120	see P-62x.2CD	Hz ±20%	G3
Resonant frequency @ 100 g load (upper / lower axis)	300/285	285/220	175/160	125/105	see P-62x.2CD	Hz ±20%	G3
Operating temperature range	-40 - 120	-40 - 120	-40 - 120	-40 - 120	-40 - 150	°C	H2
Voltage Connection	D **	D **	D **	D **	VL		J1
Sensor Connection	D **	D **	D **	D **	-		J2
Weight (with cables)	195	295	348	430		g ±5%	
Body material	Al	Al	Al	Al	Al		L
Recommended amplifier/controller (codes explained p. 2-17)	F, M, L, H	F, M, L, H	F, M, L, H	F, M, L, H	C, G		

* For calibration information see p. 2-8. Resolution of PI piezo nanopositioners is not limited by friction or stiction. The value given is noise equivalent motion with E-710 controller.
 ** Version .2CL with Lemo connectors.