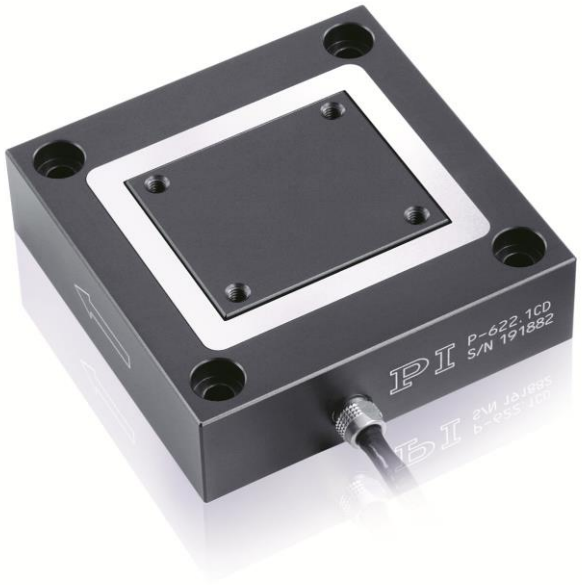
PIHera Piezo Linear Precision Positioner

Variable Travel Ranges and Axis Configuration



P-620.1 – P-629.1

- Travel ranges 50 to 1800 µm
- Resolution to 0.1 nm
- Linearity error 0.02 %
- X, XY, Z versions; XYZ combination possible
- Vacuum-compatible versions to 10^{-9} hPa

Fields of application

- Interferometry
- Microscopy
- Nanopositioning
- Biotechnology
- Test applications
- Semiconductor technology
- Photonics
- Fiber positioning

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.

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.

Suitable for sophisticated vacuum applications

All components used in the piezo systems are are excellently suited for use in vacuum. No lubricant or grease is necessary for operating. Polymer-free piezo systems allow particularly low outgas rates.

Specifications

	P-620.1CD P-620.1CL	P-621.1CD P-621.1CL	P-622.1CD P-622.1CL	P-625.1CD P-625.1CL	P-628.1CD P-628.1CL	P-629.1CD P-629.1CL	Unit	Tolerance
Active axes	X	X	X	X	X	X		

Motion and positioning	P-620.1CD P-620.1CL	P-621.1CD P-621.1CL	P-622.1CD P-622.1CL	P-625.1CD P-625.1CL	P-628.1CD P-628.1CL	P-629.1CD P-629.1CL	Unit	Tolerance
Integrated sensor	Capacitive	Capacitive	Capacitive	Capacitive	Capacitive	Capacitive		
Travel range at -20 to 120 V, open loop	60	120	300	600	950	1800	µm	+20 % / -0 %
Travel range, closed loop	50	100	250	500	800	1500	µm	
Resolution, closed loop / open loop	0.2 / 0.1	0.4 / 0.2	0.7 / 0.4	1.4 / 0.5	1.8 / 0.5	3 / 2	nm	typ.
Linearity error, closed loop	0.02	0.02	0.02	0.03	0.03*	0.03**	%	typ.
Repeatability	±1	±1	±1	±5	±10	±14	nm	typ.
Pitch / yaw	±3	±3	±3	±6	±6	±30 / ±10	µrad	typ.

Mechanical properties	P-620.1CD P-620.1CL	P-621.1CD P-621.1CL	P-622.1CD P-622.1CL	P-625.1CD P-625.1CL	P-628.1CD P-628.1CL	P-629.1CD P-629.1CL	Unit	Tolerance
Stiffness in motion direction	0.42	0.35	0.2	0.1	0.12	0.13	N/µm	±20 %
Resonant frequency, no load	1100	800	400	215	125	125	Hz	±20 %
Resonant frequency, under load, 20 g	550	520	340	180	115	120	Hz	±20 %
Resonant frequency, under load, 120 g	260	240	185	110	90	110	Hz	±20 %
Push/pull force capacity in motion direction	10	10	10	10	10	10	N	max.
Load capacity	10	10	10	10	10	10	N	max.
Lateral force	10	10	10	10	10	8	N	max.

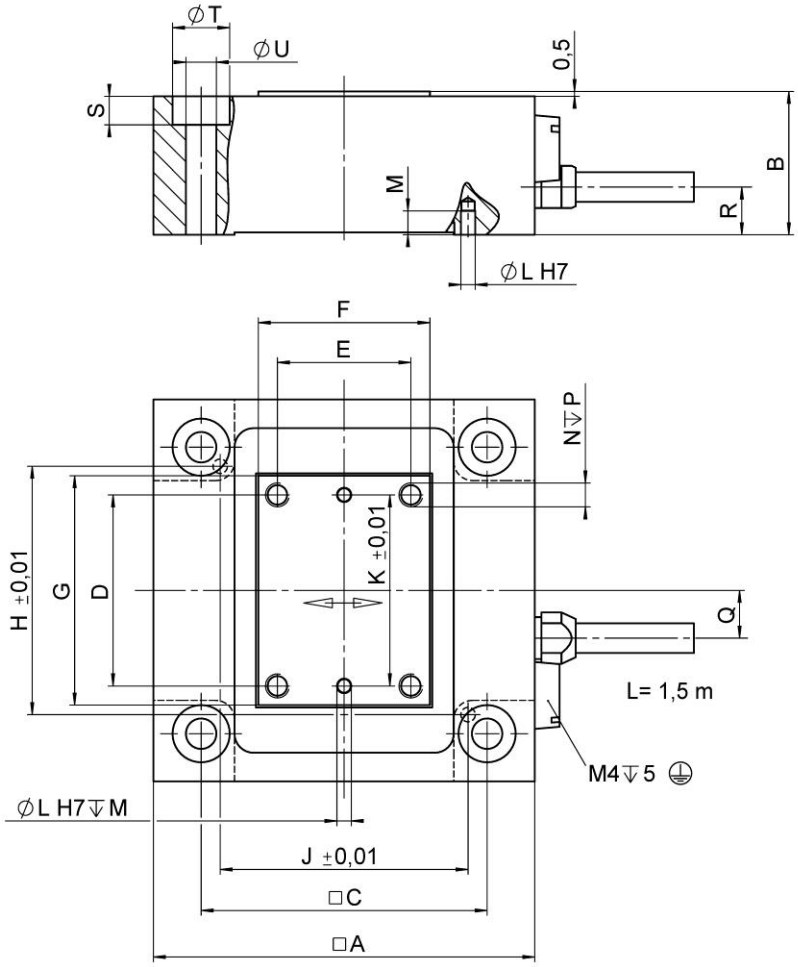
Drive properties	P-620.1CD P-620.1CL	P-621.1CD P-621.1CL	P-622.1CD P-622.1CL	P-625.1CD P-625.1CL	P-628.1CD P-628.1CL	P-629.1CD P-629.1CL	Unit	Tolerance
Piezo ceramic	PICMA® P-883	PICMA® P-885	PICMA® P-885	PICMA® P-885	PICMA® P-887	PICMA® P-888		
Electrical capacitance	0.35	1.5	3.1	6.2	19	52	µF	±20 %

Miscellaneous	P-620.1CD P-620.1CL	P-621.1CD P-621.1CL	P-622.1CD P-622.1CL	P-625.1CD P-625.1CL	P-628.1CD P-628.1CL	P-629.1CD P-629.1CL	Unit	Tolerance
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	°C	
Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum		
Dimensions	30 mm × 30 mm × 12 mm	40 mm × 40 mm × 15 mm	50 mm × 50 mm × 15 mm	60 mm × 60 mm × 15 mm	80 mm × 80 mm × 17 mm	100 mm × 100 mm × 22.5 mm		
Mass	0.11	0.16	0.2	0.24	0.38	0.72	kg	±5 %
Cable length	1.5	1.5	1.5	1.5	1.5	1.5	m	±10 mm
Sensor/voltage connection	CD versions: Sub-D 7W2 CL versions: LEMO	CD versions: Sub-D 7W2 CL versions: LEMO	CD versions: Sub-D 7W2 CL versions: LEMO	CD versions: Sub-D 7W2 CL versions: LEMO	CD versions: Sub-D 7W2 CL versions: LEMO	CD versions: Sub-D 7W2 CL versions: LEMO		
Recommended electronics	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754	E-503, E-505, E-610, E-621, E-625, E-665, E-709, E-754		

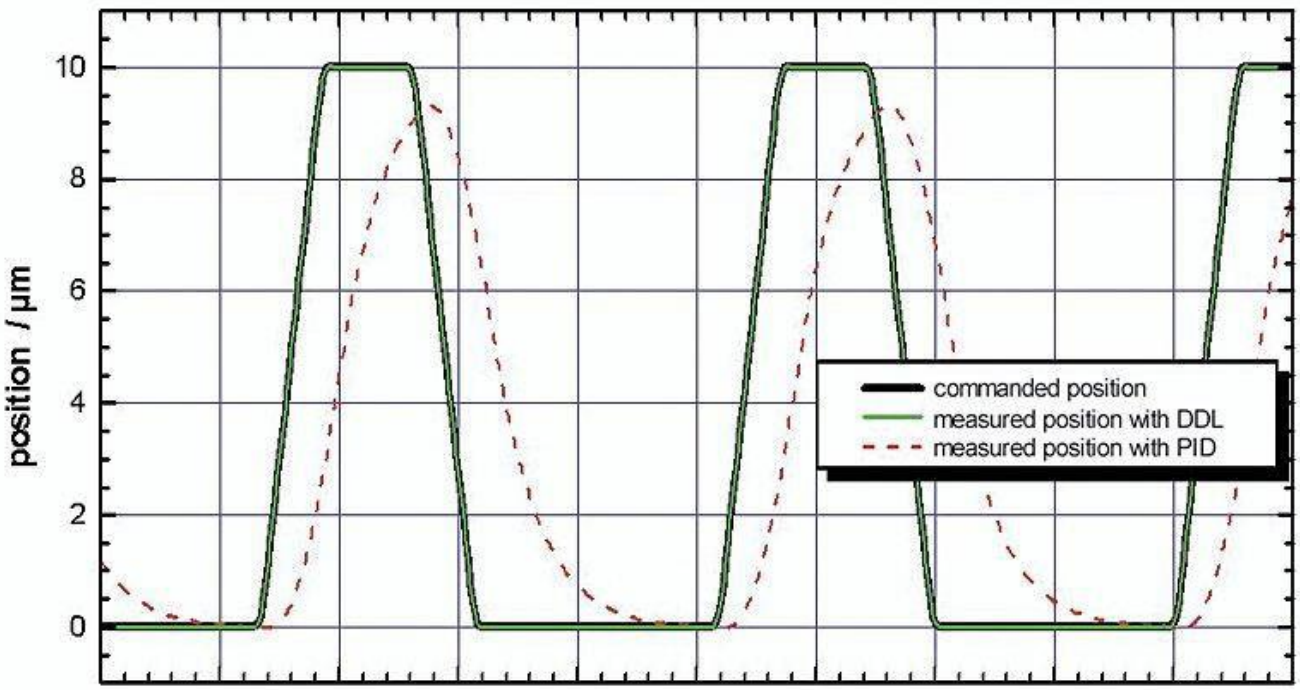
* With digital controller. With analog controllers 0.05 %.
** With digital controller. With analog controllers 0.08 %.
The resolution of the system is limited only by the noise of the amplifier and the measuring technology because PI piezo nanopositioning systems are free of friction.
Versions without sensor are available under the P-62x.Z0L order numbers; operating temperature range -20 to 150 °C; LEMO voltage connection.
Vacuum versions to 10^{-9} hPa are available under the P-62x.1UD order numbers.
All specifications based on room temperature (22 °C ±3 °C).

Drawings / Images

	A	B	C	D	E	F	G	H	J	K	∅L	M	N	P	Q	R	S	∅T	∅U
P-620.1CD / 10L	30	12	24	15	12	15	18	19	24	15	1,01	1,5	M2	4	4,5	6	2	4,4	2,2
P-621.1CD / 10L	40	15	30	20	14	18	24	26	26	20	1,51	2,5	M2,5	5	5	5	3	6	3,2
P-622.1CD / 10L	50	15	40	24	20	25	30	35	35	24	1,51	2,5	M2,5	5	5,5	5	3	6	3,2
P-625.1CD / 10L	60	15	50	40	27	32	44,5	46	46	40	1,51	2,5	M2,5	5	5,5	5	3	6	3,2
P-628.1CD / 10L	80	17	70	58	41	45	63	66	66	58	1,51	2,5	M2,5	5	5,5	5	3	6	3,2
P-629.1CD / 10L	100	22,5	90	60	40	60	84	82	82	60	2,01	3,5	M2,5	5	10	7,5	4	8	4,3



P-62x.1CD/.1CL/.10L/.1UD, dimensions in mm



Fast scanning motion of a P-621.1CD (specified rise time: 5 ms) with a digital controller with 16-bit sensor resolution and DDL option. The digital dynamic linearization reduces the tracking error during scanning to <20 nm. The improvement over a standard PID controller is up to 3 orders of magnitude and increases with the frequency.

Ordering Information

Versions with Sub-D connector (m)

P-620.1CD
PIHera precision linear nanopositioning system, 50 µm, direct position measuring, capacitive sensor, Sub-D connector

P-621.1CD
PIHera precision linear nanopositioning system, 100 µm, direct position measuring, capacitive sensor, Sub-D connector

P-622.1CD
PIHera precision linear nanopositioning system, 250 µm, direct position measuring, capacitive sensor, Sub-D connector

P-625.1CD
PIHera precision linear nanopositioning system, 500 µm, direct position measuring, capacitive sensor, Sub-D connector

P-628.1CD
PIHera precision linear nanopositioning system, 800 µm, direct position measuring, capacitive sensor, Sub-D connector

P-629.1CD
PIHera precision linear nanopositioning system, 1500 µm, direct position measuring, capacitive sensor, Sub-D connector

Versions with LEMO connector

P-620.1CL
PIHera precision linear nanopositioning system, 50 µm, direct position measuring, capacitive sensor, LEMO connector(s)

P-621.1CL
PIHera precision linear nanopositioning system, 100 µm, direct position measuring, capacitive sensor, LEMO connector(s)

P-622.1CL
PIHera precision linear nanopositioning system, 250 µm, direct position measuring, capacitive sensor, LEMO connector(s)

P-625.1CL
PIHera precision linear nanopositioning system, 500 µm, direct position measuring, capacitive sensor, LEMO connector(s)

P-628.1CL
PIHera precision linear nanopositioning system, 800 µm, direct position measuring, capacitive sensor, LEMO connector(s)

P-629.1CL
PIHera precision linear nanopositioning system, 1500 µm, direct position measuring, capacitive sensor, LEMO connector(s)

Linear positioners without position sensor

P-620.10L
PIHera precision linear nanopositioning system, 60 µm, without sensor, LEMO connector(s)

P-621.10L
PIHera precision linear nanopositioning system, 120 µm, without sensor, LEMO connector(s)

P-622.10L
PIHera precision linear nanopositioning system, 300 µm, without sensor, LEMO connector(s)

P-625.10L
PIHera precision linear nanopositioning system, 600 µm, without sensor, LEMO connector(s)

P-628.10L
PIHera precision linear nanopositioning system, 950 µm, without sensor, LEMO connector(s)

P-629.10L
PIHera precision linear nanopositioning system, 1800 µm, without sensor, LEMO connector(s)

Linear positioners, vacuum compatible to 10^{-9} hPa

P-620.1UD
PIHera precision linear nanopositioning system, 50 µm, direct position measuring, capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa

P-621.1UD
PIHera precision linear nanopositioning system, 100 µm, direct position measuring, capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa

P-622.1UD
PIHera precision linear nanopositioning system, 250 µm, direct position measuring, capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa

P-625.1UD
PIHera precision linear nanopositioning system, 500 µm, direct position measuring,capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa

P-628.1UD
PIHera precision linear nanopositioning system, 800 µm, direct position measuring, capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa

P-629.1UD
PIHera precision linear nanopositioning system, 1500 µm, direct position measuring, capacitive sensor, Sub-D connector, vacuum compatible to 10^{-9} hPa