

P-170 · P-178

Open- & Closed-Loop Piezo Translators (HVPZT)

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- Displacement to 80 µm
- Pushing Forces to 2000 N
- Pulling Forces to 50 N
- Sub-msec Response
- Sub-nm Resolution
- Options: Vacuum, Low Temperature, Choice of End Pieces

P-170 to 173 and P-178 piezo translators are high-resolution linear actuators for static and dynamic applications. They provide sub-millisecond response and sub-nanometer resolution.

High Accuracy in Closed-Loop Operation

Standard models are specifically designed for open-loop operation. For highest accuracy, select the P-177.10 closed-loop option with integrated ultra-high-resolution strain gauge position sensors and operate with PI servo-control electronics (see page 4-19 ff., and page 4-31 ff. for details).

Application Examples

- Static and dynamic positioning
- Optics
- Metrology
- Laser tuning
- Patch clamping

For more examples see page 1-5

Design

P-178 models are equipped with thinner PZT ceramic layers than P-170 to P-173 models, providing more displacement in the same package. On the other hand, the "maximum" operating voltage is limited to -1000 V.

Technical Data and Product Order Numbers

Models *	P-170.00	P-171.00	P-172.00	P-173.00
Open-loop travel @ 0 to -1000 V	5	10	20	40
* Closed-loop travel	-	10	20	40
* Integrated feedback sensor	-	* SGS	* SGS	* SGS
** Closed-loop / open-loop resolution	- / 0.05	0.2* / 0.1	0.4* / 0.2	0.8* / 0.4
*** Static large-signal stiffness	160	80	40	20
Push/pull force capacity	2000 / 50	2000 / 50	2000 / 50	2000 / 50
Torque limit (at tip)	0.5	0.5	0.5	0.5
Max. operating voltage	-1500	-1500	-1500	-1500
Electrical capacitance	14	25	47	89
Dynamic operating current coefficient (DOCC)	3.25	3.25	3.25	3.25
Unloaded resonant frequency (f ₀)	17	14	9	6
Standard operating temperature range	-40 to +80	-40 to +80	-40 to +80	-40 to +80
Voltage connection	VH	VH	VH	VH
* Sensor connection	-	L	L	L
Weight without cables	19	26	40	65
Material case / end pieces	Al / S	Al / S	Al / S	Al / S
Length of case w/o end pieces, L	14	22	38	68
Recommended amplifier/controller (codes explained see page 1-3)	B, I, J	B, I, J	B, I, J	B, I, J

Also, voltages in excess of -750 V should be applied to the P-178 models only for short durations.

The PZT ceramic stack is protected by an aluminum case. The standard top piece is a magnet and the standard bottom piece is a ferromagnetic steel flat. A variety of optional top and bottom pieces are available for easy mounting.

For push/pull forces up to 3 N, the translator can be mounted by clamping around the case. For larger forces, the translator must be mounted by the base. For more mounting guidelines see page 1-48.

Factory Installed Options*

P-177.10

Closed-Loop Option, (Strain Gauge Sensors, see page 1-44), not for P-170.00, P-178.10.

P-702.20

Low-Temperature Option (p. 1-44).

P-703.10

High-Vacuum Option (p. 1-44).

P-700.10

M4 Thread on Top Piece.

P-700.01

M4 Thread on Bottom Piece.

P-700.20

M5 Thread on Top Piece.

P-700.02

M5 Thread on Bottom Piece.

P-700.03

M8 Thread on Bottom Piece.

P-700.40

4/40 Thread on Top Piece.

P-700.04

4/40 Thread on Bottom Piece.

P-700.50

Flat Top Piece, Hardened Stainless Steel.

P-700.60

Flat Top Piece, Tungsten Carbide, Polished.

P-700.70

Ball Tip.

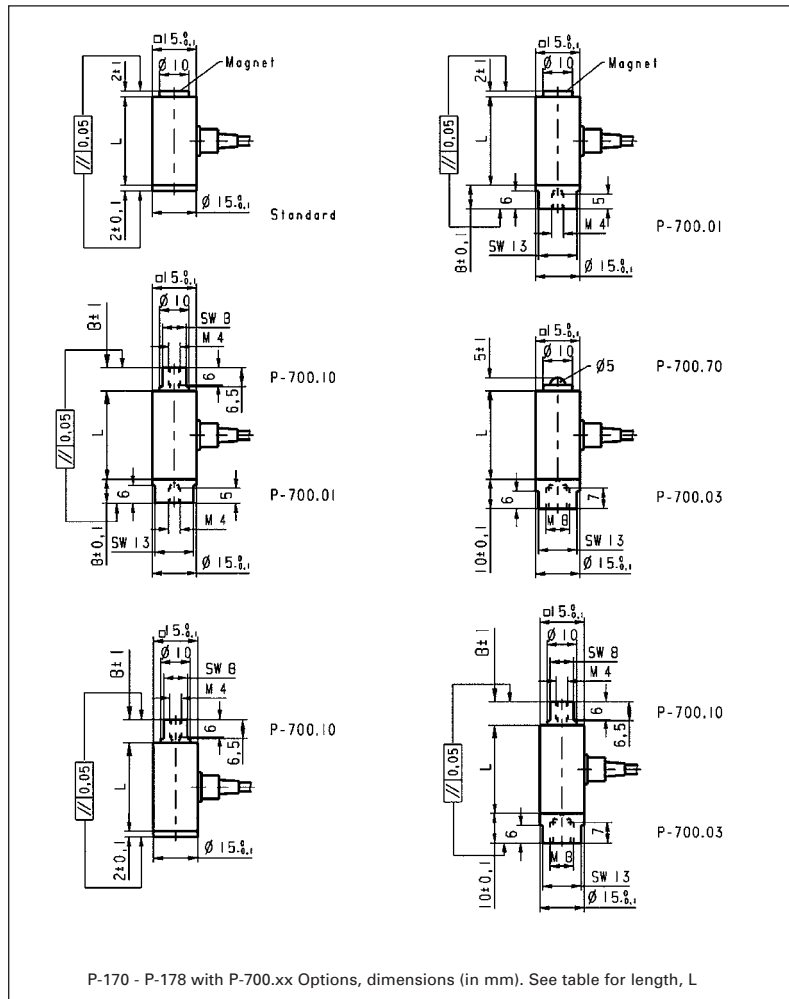
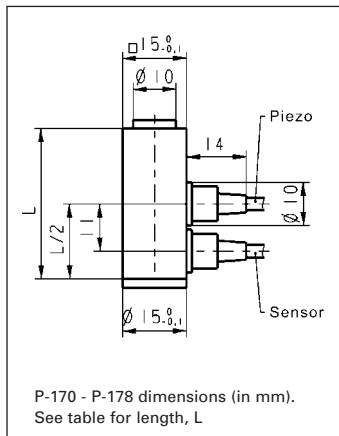
* When ordering these options, change the last digit to 7, e.g. P-170.00 to P-170.07, and list options separately.

Accessories

Extension cables & connectors: see page 6-56 in the “Piezo Drivers & Nanopositioning Controllers” section.

Notes

See page 6-8 in the “Piezo Drivers & Nanopositioning Controllers” section for our comprehensive line of low-noise modular and OEM control electronics for computer and manual control.



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

P-178.10	P-178.20	P-178.30	P-178.50	Units	Notes see page 1-46
10	20	40	80	$\mu\text{m} \pm 20\%$	A4
-	20	40	80	μm	A6
-	* SGS	* SGS	* SGS		B
- / 0.1	0.4* / 0.2	0.8* / 0.4	1.6* / 0.8	nm	C2
180	90	45	22	$\text{N}/\mu\text{m} \pm 20\%$	D1
2000 / 50	2000 / 50	2000 / 50	2000 / 50	N	D3
0.5	0.5	0.5	0.5	Nm	D6
-1000	-1000	-1000	-1000	V	A7
50	95	180	340	$\text{nF} \pm 20\%$	F1
6	6	6	6	$\mu\text{A}/ (\text{Hz} \times \mu\text{m})$	F2
17	14	9	6	$\text{kHz} \pm 20\%$	G2
-40 to +80	-40 to +80	-40 to +80	-40 to +80	$^{\circ}\text{C}$	H2
VH	VH	VH	VH		J1
-	L	L	L		J2
19	26	40	65	$\text{g} \pm 5\%$	K
Al / S	Al / S	Al / S	Al / S		L
14	22	38	68	$\text{mm} \pm 0.5$	
B, I, J	B, I, J	B, I, J	B, I, J		

* Closed-loop models can attain linearity to 0.2 %. They require the P-177.10 option (strain gauge sensor) and are supplied with calibration data sheets.
 ** Resolution of piezo actuators is not limited by friction or stiction. Noise equivalent motion with E-507 amplifier.
 *** Dynamic small-signal stiffness ~50% higher.