

P-762

Family of Piezo Flexure NanoPositioners and Scanners

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P-762.1L, Flexure NanoPositioner

Application Examples

- Photonics packaging & alignment
- Integrated optics
- Fiber alignment
- Semiconductor test equipment
- Scanning interferometry
- Disk drive testing
- Surface structure analysis
- Confocal microscopy
- Biotechnology
- Micromanipulation

Ordering Information

- P-762.1L**
PZT Flexure Stage, 100 μ m, LVDT Sensor
- P-762.2L**
XY PZT Flexure Stage, 100 \times 100 μ m, LVDT Sensor
- P-762.3L**
XYZ PZT Flexure Stage, 100 \times 100 \times 100 μ m, LVDT Sensor
- P-762.2L**
Vertical PZT Flexure Stage, 100 μ m, LVDT Sensor
- P-762.TL**
Z $\theta_x\theta_y$ PZT Flexure Stage, 100 μ m, ± 1.7 mrad, ± 2.6 mrad, LVDT Sensor
- P-762.5L**
XYZ $\theta_x\theta_y$ PZT Flexure Stage, 100 \times 100 \times 100 μ m, ± 1.7 mrad, ± 2.6 mrad, LVDT Sensor
- Custom Designs for Volume Buyers**

- 1-, 2-, 3- and 5-Axis Versions
- Compact Design
- 20 \times 20 mm Clear Aperture
- Travel 100 μ m, Tilt to 3.4 mrad

P-762 series piezo flexure stages are compact sensor-equipped multi-axis flexure positioners and scanners. The following versions are available: X, Z, XY, XYZ, Z $\theta_x\theta_y$ and XYZ $\theta_x\theta_y$.

All versions not containing a Z module have a 20 \times 20 mm clear aperture.

The XY version consists of an X module and a slightly modified Y module.

The Z module is equipped with 3 PZT stacks located at the corners of a triangle. The stacks are individually matched for equal displacement and electrically connected in parallel. A displacement sensor, mounted in the center of the triangle, provides optimum stability at the expense of an aperture.

The Z $\theta_x\theta_y$ module allows individual control of the three Z-direction PZTs. The displacements are measured by three sensors. (See separate equation for tip and tilt calculation).

The XYZ version consists of an XY module stacked together with a Z module.

The XYZ $\theta_x\theta_y$ version consists of the XY module stacked together with a Z $\theta_x\theta_y$ module.

motion amplifier. The wire-EDM-cut flexures are FEA modeled for zero stiction, zero friction, ultra-high resolution and exceptional guiding precision. Integrated LVDT (linear variable differential transformer) position feedback sensors provide nanometer-scale resolution and stability in closed-loop operation (with PI electronics).

Working Principle

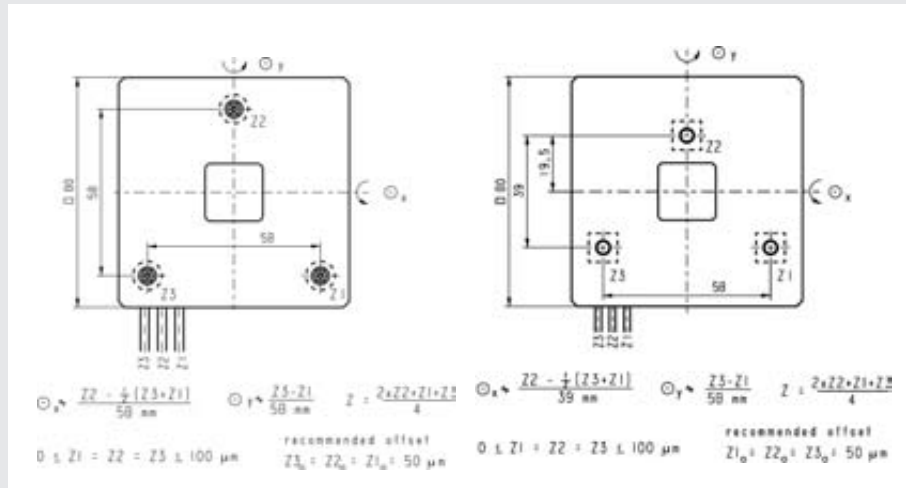
P-762 positioners are equipped with low-voltage piezoelectric drives (0 to 100 V) integrated into a sophisticated flexure guiding system. The force exerted by the piezo drive pushes a multi-flexure parallelogram via an integrated



P-762.2L, XY Flexure NanoPositioner



P-762.5L, XYZ₀_θ, Flexure NanoPositioner

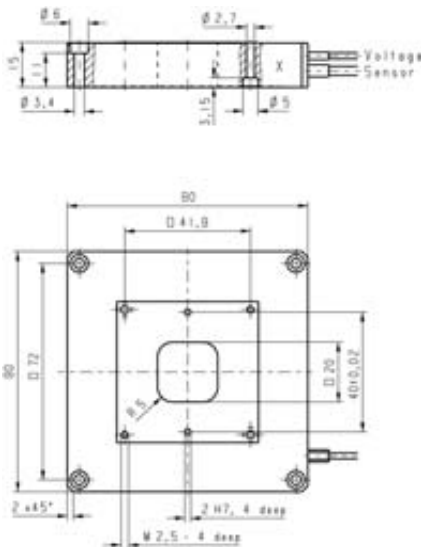


Sensor Positions in P-762.TL, P-762.5L

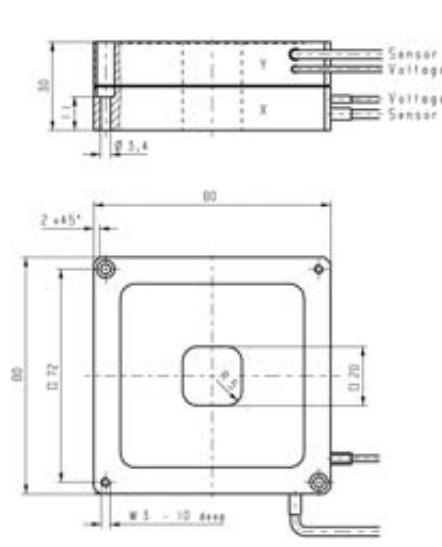
PZT Positions in P-762.TL, P-762.5L, P-762.ZL, P-762.3L. P-762.ZL and P-762.3L w/o 20 × 20 aperture (special version with aperture available on request), one common voltage cable.

Notes

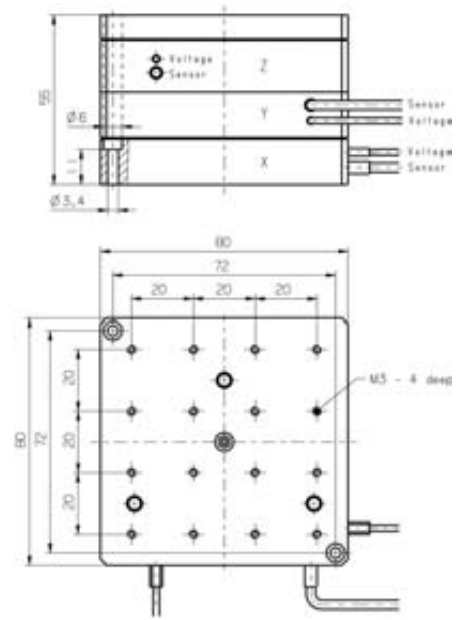
See the "PZT Control Electronics" section for our comprehensive line of low-noise modular and OEM control electronics for computer and manual control.



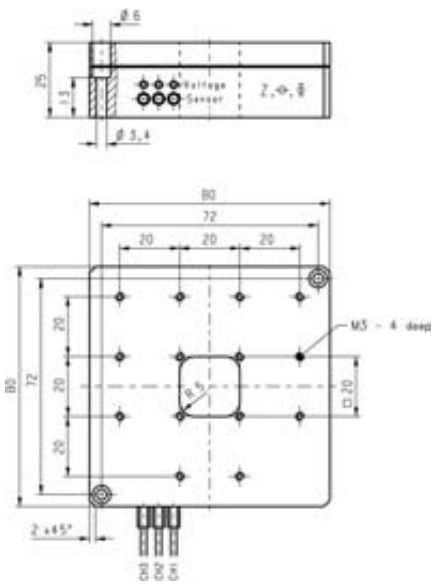
P-762.1L dimensions (in mm; inner frame moves).



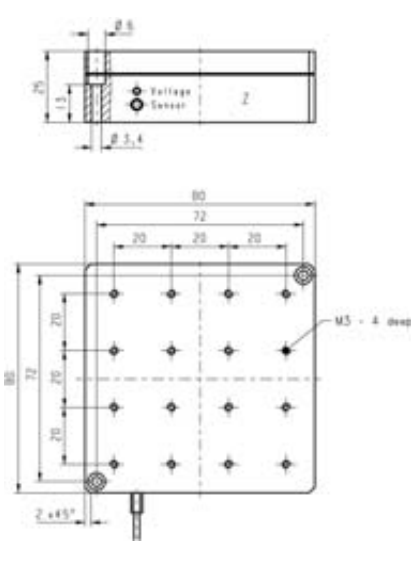
P-762.2L dimensions (in mm; outer frame moves).



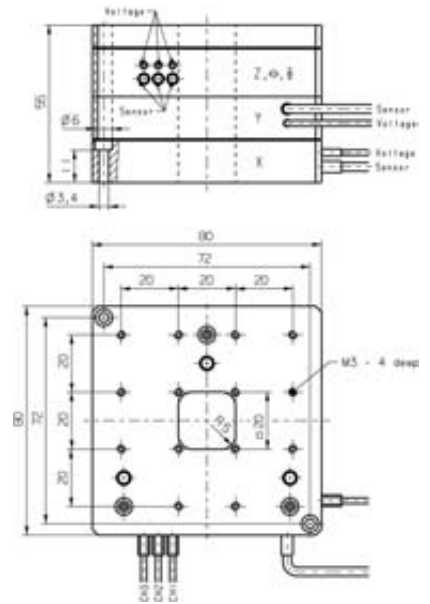
P-762.3L dimensions (in mm)



P-762.TL dimensions (in mm)



P-762.ZL dimensions (in mm)



P-762.5L dimensions (in mm)

Technical Data

Models	P-762.1L	P-762.2L	P-762.3L	P-762.ZL	P-762.TL	P-762.5L	Units	Notes see p. 2-44
Active axes	X	X,Y	X,Y,Z	Z	Z, θ_x, θ_y	X,Y,Z, θ_x, θ_y		
Open-loop travel @ 0 to 100 V	100	100 × 100	100 × 100 × 100	100	100, ($\pm 2.6, \pm 1.7$)	100 × 100 × 100, ($\pm 2.6, \pm 1.7$)	μm (mrad) $\pm 20\%$	A2
Closed-loop travel \geq	100	100 × 100	100 × 100 × 100	100	100, ($\pm 2.6, \pm 1.7$)	100 × 100 × 100, ($\pm 2.6, \pm 1.7$)	μm (mrad)	A5
Integrated feedback sensor	1 x LVDT	2 x LVDT	3 x LVDT	1x LVDT	3 x LVDT	5 x LVDT		B
Closed-loop / open-loop ** resolution \leq	10 / 1	10 / 1	10 / 1	10 / 1	10 / 1 (0.5 / 0.1)	10 / 1 (0.5 / 0.1)	nm (μrad)	C1
Closed-loop linearity (typ.)	0.1	0.1	0.1	0.1	0.1	0.1	%	
Full-range repeatability (typ.)	± 20	± 20	± 20	± 20	± 20 ($\pm 1 \mu\text{rad}$)	± 20 ($\pm 1 \mu\text{rad}$)	nm	C3
Max. (+/-) normal load	5	5	2	2	2	2	kg	D4
Tilt (θ_x, θ_z) (typ.)	10	10	10				μrad	E1
Lateral runout (Y) \leq	10						nm	E2
Electrical capacitance	11	11 / axis	11 / axis	11	2.8 (ch1), 5.5 (ch2), 2.8 (ch3), see dwg.	2 x 11 (X,Y), 2.8, 5.5, 2.8 (Z), see dwg.	$\mu\text{F} \pm 20\%$	F1
* Dynamic operating current coefficient (DOCC)	14	14 / axis	14 / axis	14	3.5 (ch1,3) 7 (ch2) see dwg.	14 (X,Y) 3.5 (ch1,3) 7 (ch2) see dwg.	$\mu\text{A}/(\text{Hz} \times \mu\text{m})$	F2
Unloaded resonant frequency	700	350	X,Y: 200 Z: 450	450	Z: 450	X,Y: 200 Z: 450	Hz $\pm 20\%$	G2
Operating temperature range	- 20 to 80	- 20 to 80	- 20 to 80	- 20 to 80	- 20 to 80	- 20 to 80	$^{\circ}\text{C}$	H2
Voltage connection	VL	2 x VL	3 x VL	VL	3 x VL	5 x VL		J1
Sensor connection	L	2 x L	3 x L	L	3 x L	5 x L		J2
Weight (with cables)	230	460	850	370	390	870	g $\pm 5\%$	
Body material	Al	Al	Al	Al	Al	Al		L
Recommended Amplifier/ Controller (codes explained p. 6-46)	H, E	H, E	H, E	H, E	H, E	H, E		

* Dynamic Operating Current Coefficient in μA per hertz and μm .

Example (P-762.1L): Sinusoidal scan of $30 \mu\text{m}$ at 10 Hz requires approximately 4.2 mA drive current.

** Resolution of PZT NanoPositioners is not limited by friction or stiction. Noise equivalent motion with E-503 amplifier.