

## PSH 1 to PSH 4 series

### Multi-axes mirror tip/tilting platform

#### Concept:

The PSH 1 to PSH 4 series is based on piezo direct actuating systems. The systems are built like a tripod configuration. The PSH 1 through PSH 4 systems can be operated with the control of all three actuators simultaneously. A z-axis piston movement through a range of 33  $\mu\text{m}$  can be achieved.

Two different top plate sizes are available. The dimensions of type "A" are 25 x 25mm<sup>2</sup>. Top plate Type "B", which offers 38 x 38mm<sup>2</sup>, is mainly designed for 1½" mirrors.

As an option, integrated feedback sensors provide absolute, repeatable position measurement under closed loop control.

#### Specials:

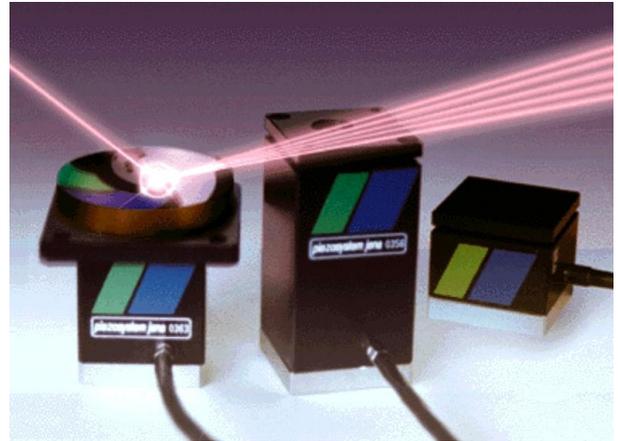
The tilting mirror mounts are pre-loaded, thus PSH systems are extremely well suited for dynamic applications. One of their most significant parameters is a high resonant frequency in the kHz range. The PSH 1 through PSH 4 systems can be operated with the control of all three actuators simultaneously. A z-axis movement through a range of 33  $\mu\text{m}$  can be achieved.

The shortest response times and lowest settling times are available after signal changing based on the direct actuating system.

#### Mounting:

The PSH 1 to PSH 4 series can be easily mounted by using the M3 tapped holes on the bottom plate. Mirror mounts are pre-loaded and are able to work under pulling and pushing forces. Because of their construction, they are very sensitive to lateral forces between the housing and the top plate.

We recommend the use of our mounting clamp (part no.: K-190-00) during mounting. This part protects the housing and the top plate while the mirror is being affixed.



Imagine: PSH series

#### Product highlights:

- fast triple-actuator tip/tilting platform
- supports mirrors, other components
- tilting angles up to 4 mrad
- kHz resonant frequency
- sub- $\mu\text{rad}$  resolution
- feedback sensors available

#### Applications:

- laser tuning
- laser beam stabilization
- fine adjustment of mirrors, other optical components
- Fiber Bragg Grating Technology
- beam alignment

## PSH 1 to PSH 4z SG series

### series PSH 1 up to PSH 4 without closed loop feedback sensor

	unit	PSH 1z	PSH 1	PSH 2z	PSH 2	PSH 3z	PSH 3	PSH 4z	PSH 4
axes	-	X Y Z	X Z	X Y Z	X Z	X Y Z	X Z	X Y Z	X Z
tilting range open loop ( $\pm 10\%$ )*	mrad	1	1	2	2	3	3	4	4
linear z-motion open loop	$\mu\text{m}$	8	-	16	-	26	-	33	-
capacitance per axis ( $\pm 20\%$ **)	$\mu\text{F}$	0.7	0.7	1.8	1.8	2.5	2.5	3.6	3.6
typ. resolution***	$\mu\text{rad}$	0.002	0.002	0.004	0.004	0.006	0.006	0.008	0.008
resonant frequency (unloaded)	Hz	5800	5800	5400	5400	3900	3900	2700	2700
typ. scan frequency incl.mirror 5g	Hz	920	920	362	362	295	295	210	210
stiffness in z	N/ $\mu\text{m}$	100	100	50	50	30	30	25	25
control signal	V	-20...130V							
cable length	m	1							
material	-	Stainless Steel/Aluminium							
dimension (lxwxh)	mm	25x25x24	25x25x24	25x25x33	25x25x33	25x25x42	25x25x42	25x25x51	25x25x51
weight	g	48	48	58	58	68	68	83	83
tilting axis position	mm	5mm below the top plate							
part no. top plate Typ „A“ 25x25mm 1“		<b>K-201-10</b>	<b>K-201-30</b>	<b>K-202-10</b>	<b>K-202-30</b>	<b>K-203-10</b>	<b>K-203-30</b>	<b>K-204-10</b>	<b>K-204-30</b>
part no. top plate Typ „B“ 38x38mm 1½“		<b>K-201-20</b>	<b>K-201-40</b>	<b>K-202-20</b>	<b>K-202-40</b>	<b>K-203-20</b>	<b>K-203-40</b>	<b>K-204-20</b>	<b>K-204-40</b>

### series PSH with closed loop feedback sensors (in addition to the parameters above)

		PSH 1z SG	PSH 1 SG	PSH 2z SG	PSH 2 SG	PSH 3z SG	PSG 3 SG	PSH 4z SG	PSH 4 SG
tilting range closed loop ( $\pm 0,2\%$ )	mrad	0.8	0.8	1.6	1.6	2.4	2.4	3.2	3.2
linear z motion cl ( $\pm 0,2\%$ )	$\mu\text{m}$	6.4	-	12.8	-	20	-	26	-
positioning feedback	-	strain gage							
typ. resolution closed loop***	$\mu\text{rad}$	0.02	0.02	0.04	0.04	0.06	0.06	0.08	0.08
typ. repeatability*	$\mu\text{rad}$	0.8	0.8	1.1	1.1	2.1	2.1	3.2	3.2
typ. non-linearity*	%	0.8	0.8	0.5	0.5	0.5	0.54	0.5	0.5
cable length	m	1.2							
dimensions (lxwxh)	mm	25x25x32	25x25x32	25x25x41	25x25x41	25x25x50	25x25x50	25x25x59	25x25x59
weight	g	80	80	90	90	100	100	115	115
part no. top plate Typ „A“ 25x25mm 1“		<b>K-201-11</b>	<b>K-201-31</b>	<b>K-202-11</b>	<b>K-202-31</b>	<b>K-203-11</b>	<b>K-203-31</b>	<b>K-204-11</b>	<b>K-204-31</b>
part no. top plate Typ „B“ 38x38mm 1½“		<b>K-201-21</b>	<b>K-201-41</b>	<b>K-202-21</b>	<b>K-202-41</b>	<b>K-203-21</b>	<b>K-203-41</b>	<b>K-204-21</b>	<b>K-204-41</b>

### series PSH – overview variations of connectors and top plates

connector voltage standard	LEMO 05.302
connector feedback sensor standard	LEMO 05.304
connector feedback sensor in conjunction	with mirror tilting system with external sensor pre-amplifier box and part no. suffix „E“ = ODU Serie L 4pin
connector sensor & voltage in conjunction	with mirror tilting system for digital and NV40/3 & 3CLE control with part no. suffix „D“ = Sub-D 9pin
top plate typ „A“ 25x25mm for 1“ mirror	suffix A is added to the product name: e.g. PSH 1z <b>A (K-201-10)</b>
top plate typ „B“ 38x38mm for 1½“ mirror	suffix B is added to the product name: e.g. PSH 1z <b>B (K-201-20)</b>

\* typical value measured with NV 40/3 controller (closed loop: NV 40/3 CLE)

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology.

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## PSH 1 to PSH 4z SG series

### Accessories for mounting

Mirror mounting tool for top plate type "A" and type "B". The mounting tool prevents a twisted top plate during mirror mounting or mirror holder mounting



**Fig:** Using of the mounting tool (part. no. K-190-00) with top plate type "A" (size: 25x25mm<sup>2</sup>)



**Fig:** Using of the mounting tool (part. no. K-190-00) with top plate type "B" (size: 38x38mm<sup>2</sup>)

### Recommended controller unit

The NV40/3 controller unit (part no.: Nr.: E-101-20) is recommended for use with the PSH 1 up to PSH 4 series without feedback sensors

The NV40/3 CLE controller unit (part no.: Nr.: E-101-23) is recommended for the use with the PSH 1 up to PSH 4 series equipped with feedback sensors.



picture: NV40/3CLE

#### Example

PSH 3 A Digital (part. no.: K-203-30D)

- PSH with 2 axes
- 3mrad tilting range XZ (mechanically)
- without feedback sensors, top plate type "A"

#### Example

PSH 2z A SG Digital (part no.: K-202-31D)

- PSH with 3 axes
- 2mrad tilting range XYZ (mechanically)
- with feedback sensors control, top plate type "A"

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