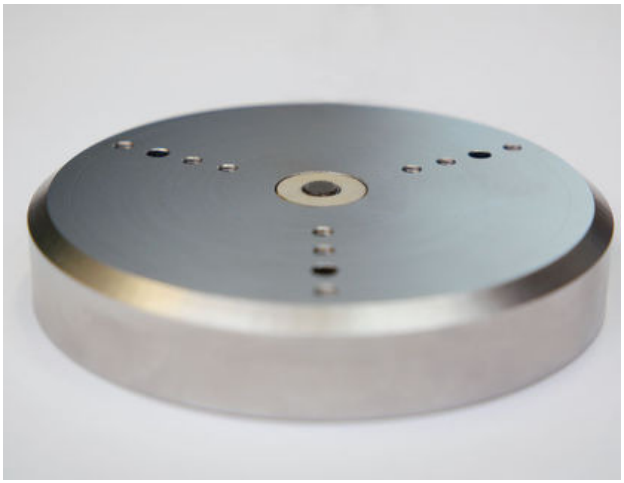
PICOSCALE Vibrometer Shaker Stage PV-SHK-V1.0



The shaker stage is intended for use with the **PICO**SCALE *Vibrometer*. It allows the mechanical excitation of samples at frequencies of up to 1.5 MHz. Applications include the excitation of motion sensors and micro-cantilevers in order to find their resonance frequencies and bending modes. The shaker stage can also be used as a stable passive mount for small samples.

SPECIFICATIONS

The heart of the shaker stage is a fast piezo actuator that is mounted in a solid stainless steel housing. The piezo actuator is driven by a power amplifier within the **PICO**SCALE *Vibrometer* stage controller. Frequency and amplitude of the drive signal can be set in the control software. Vibrations are only induced at the central 5 mm diameter titanium disc (Figure 1). Table 1 summarizes the specifications of the shaker stage.

SAMPLE MOUNTING

The shaker stage rests on three PTFE sliders such that it can be easily moved over the granite base of the **PICO**SCALE *Vibrometer*. This permits an easy positioning of the sample with respect to the measurement laser beam. Samples can be mounted on the shaker stage with a small amount of adhesive material such as vacuum grease, double sided sticky tape or blutack. The use of liquids should be avoided as these can enter the shaker stage and will damage the piezo actuator. Samples that are larger than the active area of the shaker stage can be mounted such that at least a part of the sample is in contact with the active area. The mass of the sample will affect the induced vibrations, especially at higher frequencies the amplitude will be reduced.

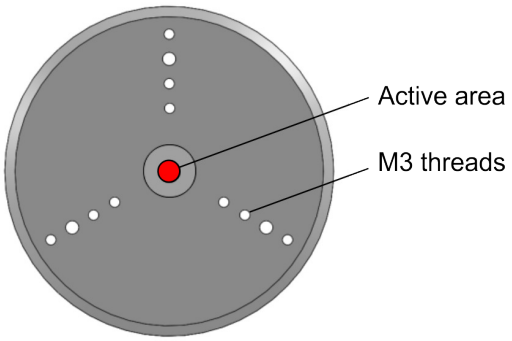


Figure 1. *Schematic drawing of the shaker stage. Vibrations are induced at the active area (shown in red).*

Table 1. *Specifications of the shaker stage.*

Property	Value
Vibration amplitude [μm_{RMS}]	<0.1
Typical drive signal[1] [V_{PP}]	5
Bandwidth[2] [MHz]	>1.5
Connector	FGG.0B.302.CLAD 2 pin Lemo
Noise level[3] [dB(A)]	<54
Active area ∅ [mm]	5.0
Material active area	Titanium
Housing ∅ x H [cm]	8.0 x 1.5
Material housing	Inox
Weight [kg]	0.8

[1] With a 7.5 V DC component.
[2] See Figure 2 for the amplitude spectrum.
[3] Measured at 50 cm distance.

OPEN-LOOP OPERATION

Due to its high bandwidth, the shaker stage operates in open-loop. This means that the amplitude depends on the driving voltage and frequency but also on the mass of the sample and its position on the active area of the shaker stage. As with any high-speed motion system, the dynamic behavior is a convolution of mechanical resonance frequencies of the individual components and of the electrical resonances in the electronic circuit. The shaker stage and driving electronics are optimized to deliver a smooth response by mini-

mizing pronounced peaks in its amplitude spectrum (Figure 2). Although the shaker stage operates in open-loop it is possible to obtain the quantitative response of a sample by performing differential measurements (vibrations measured on the sample are compared with those measured on the background).

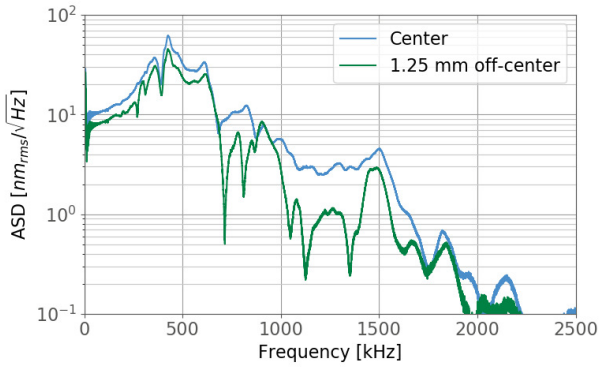


Figure 2. *Typical response of the shaker stage measured with the* ***PICO****SCALE Vibrometer. The 5* V_{PP} *drive signal was generated by the stage controller, no sample was mounted. At the vertical axis the actual amplitude spectral density is shown at each frequency. The blue curve was recorded at the center of the active area, up to 1.6 MHz the induced amplitude is more than 1* $nm_{rms}/\sqrt{Hz}$*. The green curve was recorded 1.25 mm towards the periphery.*

ORDER CODES

The order code of the **PICO**SCALE *Vibrometer* shaker stage is given in Table 2.

Table 2. *Order code of the **PICO**SCALE Vibrometer shaker stage.*

Order code	Description
PV-SHK-V1.0	**PICO**SCALE *Vibrometer* shaker stage

Contact

Germany

SmarAct Metrology GmbH & Co. KG
Rohdenweg 4
D-26135 Oldenburg
Germany

T: +49 (0) 441 - 800879-0
Email: metrology@smaract.com
www.smaract.com

France

SmarAct GmbH
Schuette-Lanz-Strasse 9
26135 Oldenburg
Germany

T: +49 441 - 800 879 956
Email: info-fr@smaract.com
www.smaract.com

USA

SmarAct Inc.
2140 Shattuck Ave. Suite 302
Berkeley, CA 94704
United States of America

T: +1 415 - 766 9006
Email: info-us@smaract.com
www.smaract.com

China

Dynasense Photonics
6 Taiping Street
Xi Cheng District,
Beijing, China

T: +86 10 - 835 038 53
Email: info@dyna-sense.com
www.dyna-sense.com

Natsu Precision Tech
Room 515, Floor 5, Building 7,
No.18 East Qinghe Anning
Zhuang Road,
Haidian District
Beijing, China

T: +86 18 - 616 715 058
Email: chenye@nano-stage.com
www.nano-stage.com

Shanghai Kingway Optech Co.Ltd
Room 1212, T1 Building
Zhonggeng Global Creative Center
Lane 166, Yuhong Road
Minhang District
Shanghai, China

Tel: +86 21 - 548 469 66
Email: sales@kingway-optech.com
www.kingway-optech.com

Japan

Physix Technology Inc.
Ichikawa-Business-Plaza
4-2-5 Minami-yawata,
Ichikawa-shi
272-0023 Chiba
Japan

T/F: +81 47 - 370 86 00
Email: info-jp@smaract.com
www.physix-tech.com

South Korea

SEUM Tronics
1109, 1, Gasan digital 1-ro
Geumcheon-gu
Seoul, 08594,
Korea

T: +82 2 - 868 10 02
Email: info-kr@smaract.com
www.seumtronics.com

Israel

Optics & Motion Ltd.
P.O.Box 6172
46150 Herzeliya
Israel

T: +972 9 - 950 60 74
Email: info-il@smaract.com
www.opticsmotion.com

SmarAct Metrology GmbH & Co. KG develops sophisticated equipment to serve high accuracy positioning and metrology applications in research and industry within fields such as optics, semiconductors and life sciences. Our broad product portfolio – from miniaturized interferometers and optical encoders for displacement measurements to powerful electrical nanoprobers for the characterization of smallest semiconductor technology nodes – is completed by turnkey scanning microscopes which can be used in vacuum, cryogenic or other harsh environments.
We maintain the complete production in house for a high level of customization so that we can always provide you the optimal individual or OEM solution. We also offer feasibility studies, measurement services and comprehensive support to accompany you along your projects.

Headquarters

SmarAct GmbH
Schuette-Lanz-Strasse 9
26135 Oldenburg
Germany

T: +49 441 - 800 879 0
Email: info-de@smaract.com
www.smaract.com

USA

SmarAct Inc.
2140 Shattuck Ave. Suite 302
Berkeley, CA 94704
United States of America

T: +1 415 - 766 9006
Email: info-us@smaract.com
www.smaract.com