

Straightness measurements of translation stages

INTRODUCTION

The **PICOSCALE Interferometer** is a versatile and easy-to-use interferometric displacement sensor with three measurement channels. It allows to measure displacements with picometer resolution and nanometer accuracy. The firmware module *Calculation System* allows for **real-time** processing of the position signals so that measurements of angles can be directly performed (without the need of a user PC to perform these calculations). In this application note, straightness measurement of a translation stage is demonstrated. As compact and light targets such as thin mirrors can be used, the stages can be characterized without the need of high loads, which may deteriorate the sample unnecessarily.

SETUP

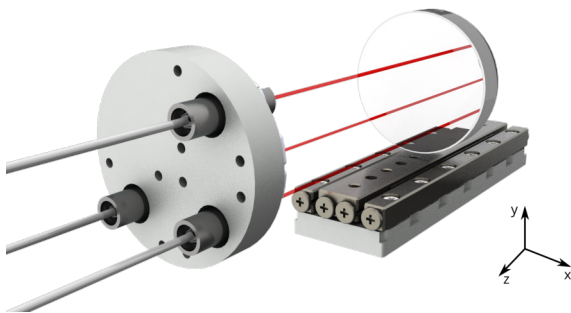


Figure 1. Artistic view of the experimental setup. A **PICOSCALE** sensor head assembly is aligned to a 1 inch mirror, which is mounted on a translation stage.

The setup without mounting aids is shown in an artistic view in Figure 1. A **PICOSCALE** sensor head assembly (PS-ACC-HA-3A-C01) with three sensor heads in a pre-aligned mount is aligned to a light-weight 1 inch mirror. The mirror is fixed on a translation stage with an appropriate adapter.¹ In the **PICOSCALE Calculation System** the signals of the three sensor heads are processed to directly output the pitch and yaw of the mirror while the stage is moved by 20 mm.

¹SmarAct offers individual and customized adapters. Please contact us for more info.

RESULTS

An exemplary straightness measurement of a translation stage is shown in Figure 2. Over a stroke of 20 mm the stage shows a pitch (R_x) of about 140 μrad and a yaw (R_y) of 80 μrad .

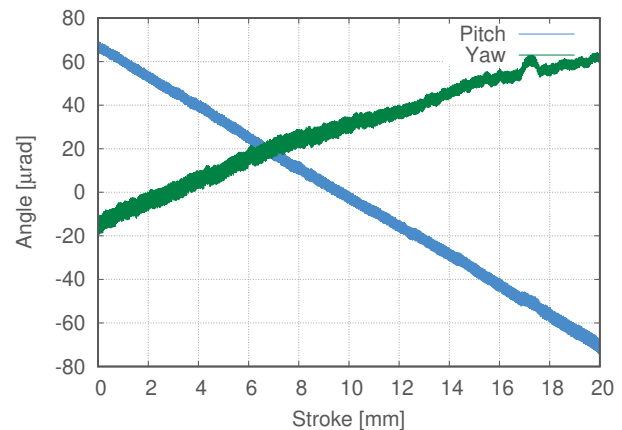


Figure 2. Pitch and yaw measurement of a translation stage over a stroke of 20 mm. The limited straightness of the bearing leads to a tip and tilt of the mirror, which is attached to the slide.

CONCLUSION

Straightness measurements of translation stages are one of the typical applications for the **PICOSCALE Interferometer**. Compact and easy-to-align sensor heads and the possibility to use lightweight targets enable performance characterization even of small stages without high load.

FEEDBACK

*"The **PICOSCALE Interferometer** is used to qualify the stages that we integrate in our nanoindentation products. The automatized analysis is very fast and accurate so that we can highly recommend the product."*

Dr. Felix Beyeler, FemtoTools AG, Switzerland

*"We are using the **PICOSCALE Interferometer** in our quality assurance center to guarantee every stage meets its specifications. We programmed a set of measurement protocols for high throughput. My colleagues appreciate the easy and fast alignment procedure."*

Max Meessen, Quality Assurance Manager at SmarAct

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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.

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