

PicoScale Angular Measurement Assembly

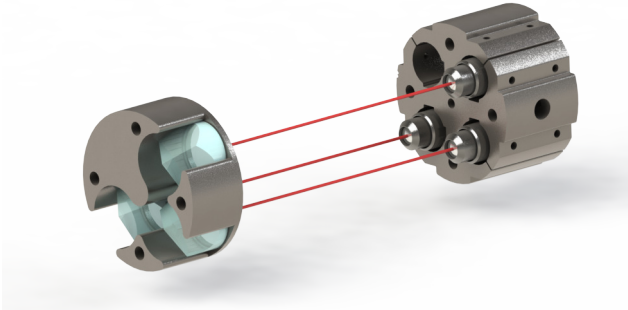


Figure 1. Sensor Head Assembly.

The **PICOSCALE** Angular Measurement Assembly (AMA) consists of a sensor head holder with three **PICOSCALE** C03 sensor heads in an L-shaped configuration (Figure 1). The three sensor heads are pre-aligned for maximum parallelism. In order to allow a large angular working range, a matching target assembly consisting of three retro reflectors is supplied. Optionally a fourth sensor head can be mounted to the sensor head assembly and a flat surface mirror to the retro reflector assembly, in order to allow a reliable zeroing by adjusting to the maximum intensity of the fourth beam. The sensor and the retro reflector assembly can be mounted using standard opto-mechanical equipment.

OPTICAL PROPERTIES

The AMA features an angular working range of $\pm 10^\circ$ for one angle and $\pm 7^\circ$ simultaneously for both angles. As the sensor heads measure the displacement of their individual targets with picometer resolution, the AMA allows angular measurements with a resolution of single nano-radians. The position stability under thermally controlled conditions is better than $0.5 \mu\text{rad}$ per hour, as can be seen from the measurement data in Figure 2. For this measurement, the sensor head was mounted with the help of the included M4 thread, whereas the retro reflector holder was mounted in a 1" optics holder and fastened by a retaining ring.

SOFTWARE SUPPORT

In the small-angle approximation, the angle can be calculated straightforwardly by subtracting the signals of two adjacent sensor heads and dividing by their distance. Using the **PICOSCALE** Calculation System firmware module (PS-SP-CS) allows real-time calculation of angles directly. Thus, the angle data can be displayed or streamed into a data file without the need

Table 1. Summary of specifications.

Property	Value
Angular range (pitch/yaw)	$>\pm 10^\circ$ (pitch <u>or</u> yaw)
	$>\pm 7^\circ$ (pitch <u>and</u> yaw)
Resolution	$\approx 1 \text{ nrad}$
Stability	$<0.5 \mu\text{rad/h}$
Sensor head separation	10.5 mm
Outer diameter	25.4 mm (1")

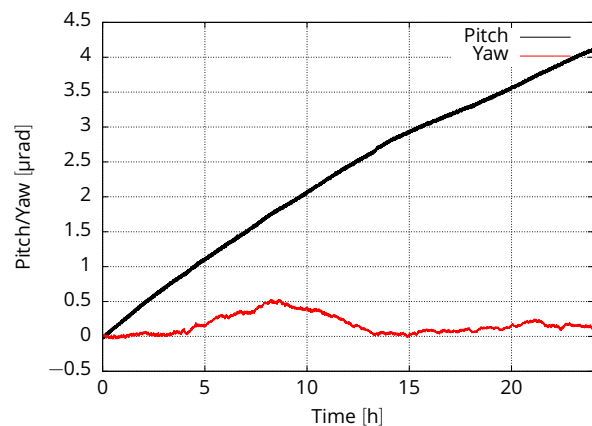


Figure 2. Angular stability data of the AMA measured over 24 hours in a temperature-controlled chamber.

for post-processing. The look-up table function of the Calculation System allows to calculate the precise angles even outside the range of the small-angle approximation. The correct configuration of the look-up table with the necessary trigonometric functions is supplied as a pre-set configuration ready to load into the **PICOSCALE** software. The distance of the laser beams is given in the data sheets.

ORDER CODE

Please contact SmarAct Metrology to find the optimal sensor head assembly for your application.

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

Schuetten-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
Zhonggong 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

Schuetze-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