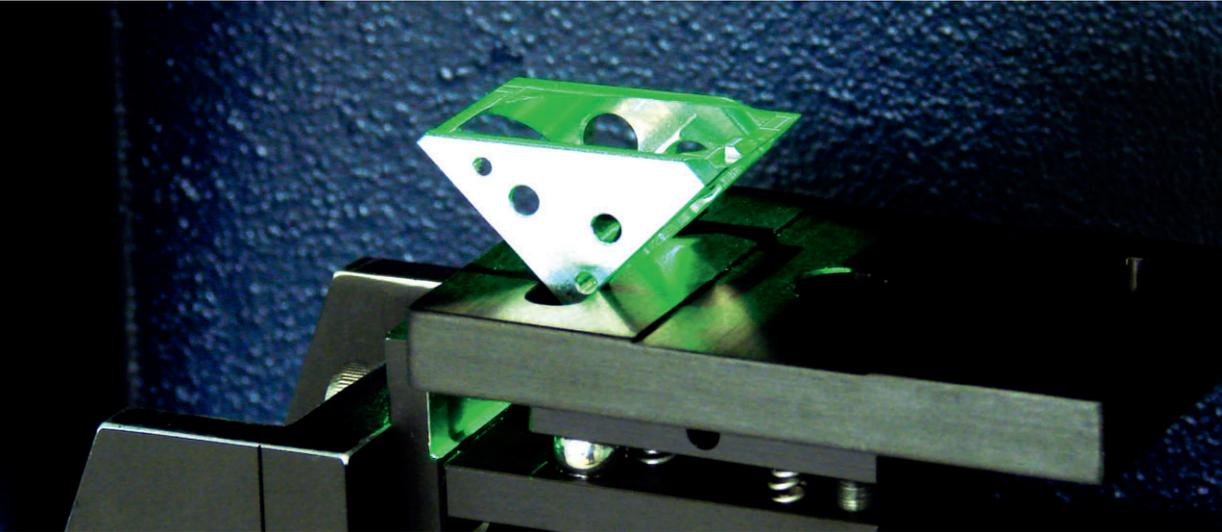


Meeting Critical Flatness Specifications of Mirror Holders



Field of Application

- VIB Vibration measurement using laser Doppler vibrometry
- LSV Velocity and length measurements using laser surface velocimetry
- TOP Measurement of surface topography using white-light interferometry
- ST Measurement of spectral material properties using NIR spectrometry

Critically precise mirror holders are used in the Geometry Scan Unit of Polytec's Scanning Vibrometer. These holders are manufactured in an automated machining center installed in Polytec's production machine shop. Stresses induced in the part from the machining can impair the flatness of the mirror mounting surface. Deviations from acceptable flatness tolerances were identified using a TopMap Topography Measurement System and were corrected appropriately in the manufacturing process.

Precision is the Key

To perform correctly, the Geometry Scan Unit of the scanning vibrometer sensor head (image below) must direct the probe laser to the required measurement points using software control. The mirror holders must be manufactured with great precision to hold the optic accurately. Starting with an aluminum rod, the outer surfaces, windows and holes are turned and milled in a single run using a CNC machining center.

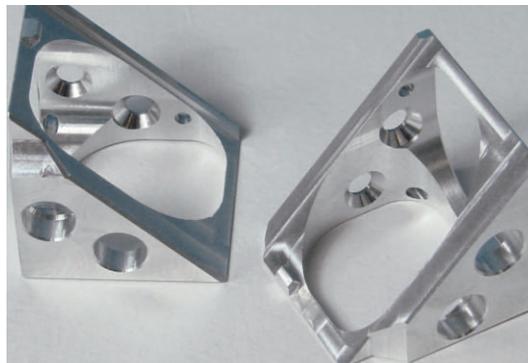


Fig. 1: Mirror holder for the PSV geometry scan unit.

The mirror holder is a complex structure (Fig. 1) with narrow portions that can twist and distort during and after manufacturing. The effect of these distortions is to move the mounting surfaces and misalign the mirror. If the flatness of the mounting surface falls below a critical value, the mirror will be out of alignment and will not work properly.



Polytec GmbH
Optical Measurement
Systems
Application Note
TOP-05
November 2008

Flatness Measurements – Tactile or Optical

The mounting surface is very intricate and is made up of relatively narrow, partially recessed ligaments. It was not possible to determine the flatness with a conventional tactile sensor system because only a small portion of the surface was accessible to the scanner tip.

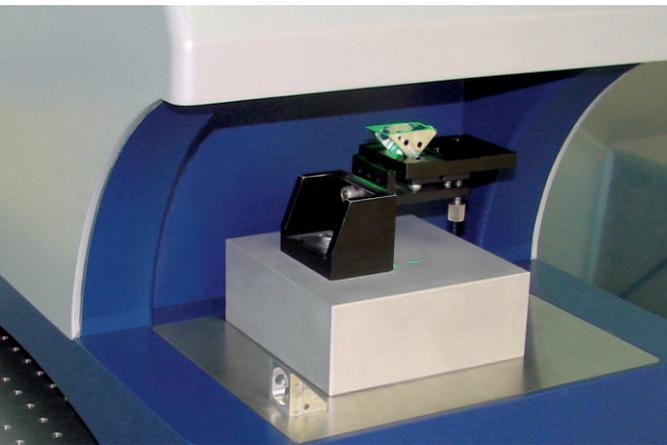


Fig. 2: Measurement setup with TopMap Metro.Lab White-Light Interferometer.

This situation was easily solved with the TopMap Topography Measurement System. The non-contact optical measurement procedure allows the characterization of almost any surface, independently of its specific geometry constraints. The simple-to-use TMS-100 TopMap Metro.Lab was chosen to determine the flatness of the mirror holder quickly and with high precision (Fig. 2).

Results and Conclusions

Following ISO 1101, a comparison was made of the flatness of a good mirror holder (Fig. 3) and a defective mirror holder (Fig. 4). The measurements show that deviations of up to 100% can occur. The good part shows a flatness of about 15 μm , whereas the flatness of the defective part is more than 30 μm . With the aid of these measurements, it was possible to adapt the manufacturing process to minimize the stress causing the deformations. The manufactured parts now have the required flatness without any further efforts being taken. Thus, when setting up the machining center, an early examination of the

You will find more information on TopMap White-Light Interferometers on the internet at www.topmap.info or contact your local Polytec sales/application engineer.

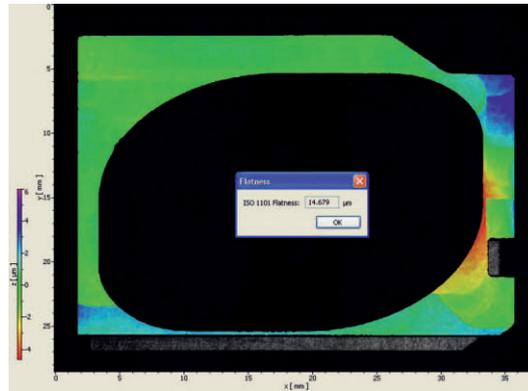


Fig. 3: A good mirror holder shows a flatness measurement (<15 μm) that is within dimensional tolerances (ISO 1101).

workpieces using the TopMap Metro.Lab can ensure better quality control while simultaneously saving both time and money. For production runs, the TopMap Metro.Lab is a perfect comparison standard for statistical process control, taking random samples at set intervals in batch processes and verifying the consistency of a manufacturing process. This allows much longer manufacturing intervals with sustained quality. Serial measurement of workpieces on pallets is also possible. Because of the TopMap's good price-performance ratio, an investment in the Metro.Lab generally pays for itself very quickly.

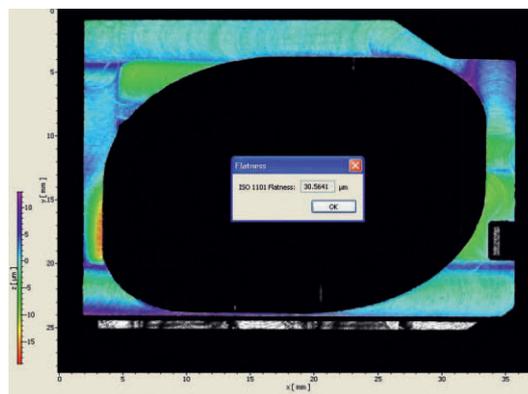


Fig. 4: A defective mirror holder shows a flatness measurement (>30 μm) that fails dimensional tolerances (ISO 1101).

More Info: www.topmap.info

Polytec GmbH (Germany)

Polytec-Platz 1-7
76337 Waldbronn
Tel. +49 7243 604-0
Fax +49 7243 69944
info@polytec.de

Polytec France S.A.S.

Bâtiment Orion – 1^{er} étage
39, rue Louveau
92320 Châtillon
Tel. +33 1 496569-00
Fax +33 1 57214068
info@polytec.fr

Polytec Ltd. (Great Britain)

Lambda House, Batford Mill
Harpenden, Herts AL5 5BZ
Tel. +44 1582 711670
Fax +44 1582 712084
info@polytec-ltd.co.uk

Polytec Japan

Arena Tower, 13th floor
3-1-9, Shinyokohama,
Kohoku-ku, Yokohama-shi,
Kanagawa, 222-0033
Tel. +81 45 478-6980
Fax +81 45 478-6981
info@polytec.co.jp

Polytec, Inc. (USA)

North American Headquarters
16400 Bake Parkway
Suites 150 & 200
Irvine, CA 92618
Tel. +1 949 943-3033
Fax +1 949 679-0463
info@polytec.com

Central Office
1046 Baker Road
Dexter, MI 48130
Tel. +1 734 253-9428
Fax +1 734 424-9304

East Coast Office
25 South Street, Suite A
Hopkinton, MA 01748
Tel. +1 508 417-1040
Fax +1 508 544-1225