The challenges of optical surface metrology

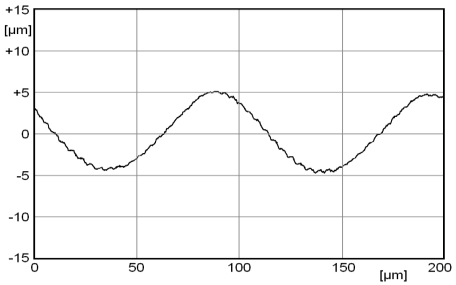
Optical metrology is popular and everybody is talking about it.

For **macroscopic** applications of optical metrology, optical system design is often simple. Take an optical imaging system, digital cameras and an extensive software package for data acquisition, calibration and data evaluation and the optical metrology system is complete. Insufficiencies of the optical system itself and related measurement errors can often be "calibrated off". For a given **macroscopic** application, this results in a large number of suppliers and for the customer they are difficult to differentiate.

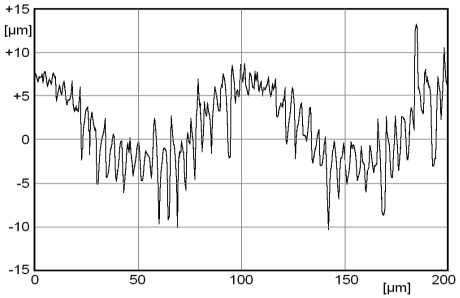
Compared to that, things are fundamentally different in the **microscopic** range of optical surface metrology. For the construction of a **precision microscopic 3D metrology device**, aspects of the **interaction of light and surface** regarding **local surface slopes**, **texturing (roughness)** and **reflection properties** have to be taken into account with care. Only if this is fulfilled, a well designed **microscopic surface metrology instrument** results not only in **high resolution** but also in **high accuracy**.

If these aspects were not taken into account in the system design of **microscopic** optical **surface metrology**, then these would result in a irretrievable loss of primary information. And this would produce measurement errors that cannot be used for calibration.

The images below show an example how that can look like in practice. The top image shows a reference stylus measurement of a simple calibration standard. The image below is the corresponding example of a **poorly designed optical sensor**. Due to the loss of primary information which cannot be calibrated, the poor design results in **artificial amplification of small profile amplitudes**.



Stylus measured profile of a sinus standard (period 100 µm, PV 9 µm). Due to the manufacturing process of diamond turning, the sinus shape is overlapped by small profile amplitudes in the sub-µm range with partly large surface slopes.



Optical measured profile of the same standard using a poor sensor design. The interaction light – surface which was not taken into account with due care results in false amplification of the profile amplitudes of several µm.

Take this opportunity to design the optimum

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JORDAN
OPTICAL
ENGINEERING

Jordan Optical Engineering GmbH

Consulting - Development - Production and more
… everything related to high accuracy optical surface metrology - and roughness measurement.

Jordan Optical Engineering GmbH (JOE) supports you in all aspects of **non-contact and high accuracy optical surface metrology - and roughness measurement**.

Whether you like to develop new products in this area or to implement difficult and technically demanding projects - **we are the experts in these fields**.

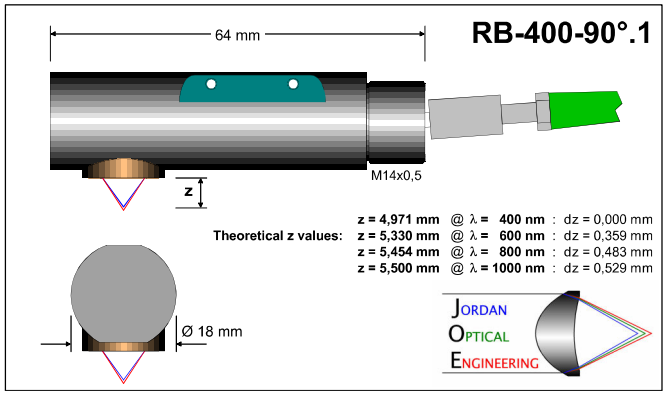
We have been involved in high accuracy optical surface and roughness measurement since 1990. Our technology is comparable to traditional stylus measurement. With **more than 25 years of experience in optical surface and roughness measurement** we can therefore guarantee the highest levels of reliability to our customers.

Take advantage of our know-how
… and our versatility
… and design the optimum system you deserve!

Our products

Chromatic confocal distance sensors

We have a small but high-quality selection of chromatic confocal distance probes developed in our laboratories and manufactured in-house.
These include our RB-400-90° angled sensor head with a measurement range of 400 µm (approximate range of visible light 400 nm and 800 nm) and a numerical aperture of 0.5.



You can find further examples of standard sensors with **premium focusing aspheres** from our own development center on our webside under www.jordan-oe.com/english/products/.

We also develop and produce **customer-specific** chromatic confocal distance probes.

Information on the function of chromatic confocal distance probes and on confocal surface metrology in general can be found on our website under www.jordan-oe.com/english/publications/.

Our services

related to optical metrology

Our expertise covers a wide range in the areas of

- non-contact **optical surface metrology**,
- non-contact **optical roughness measurement**,
- **optimization of optical surface metrology** with respect to the **interaction of light and textured surfaces (effects of surface slopes)**,
- **comparison of optical and stylus sensors**,
- **optical design of measurement and test systems**,
- **optical system analysis (trouble-shooting)**
- and many **other areas of optical metrology**.

As your consultant and independent of any manufacturer, you would enjoy

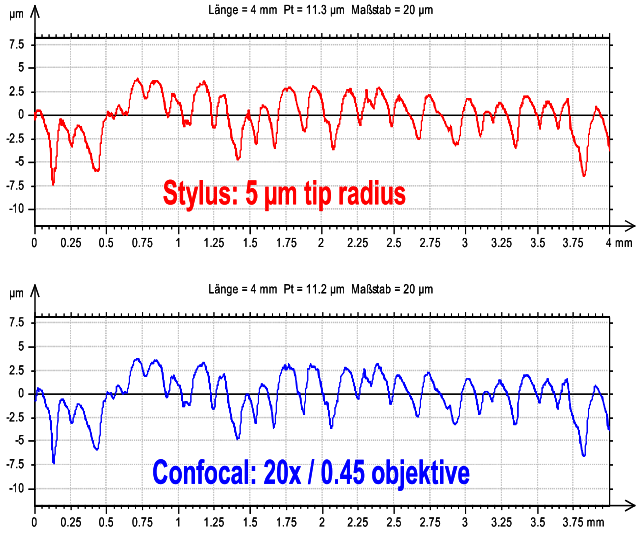
- freedom for **investments decisions** concerning optical surface metrology
- freedom for general **evaluations** concerning surface metrology.

Based on our in-depth technical know-how, we would like to offer you an **individual quotation** which suits your requirement concerning optical testing and measurement tasks on surface and roughness metrology.

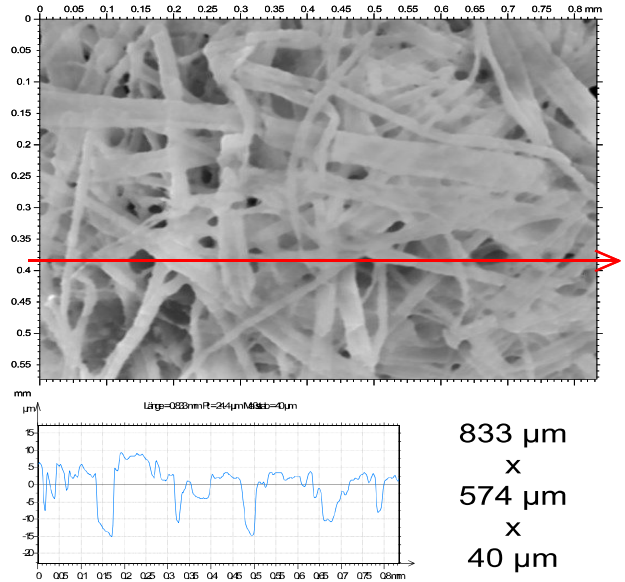
Some of our examples of perfect

optical surface metrology

Comparison stylus - optical confocal using a PTB standard (Ra = 1.45 µm)



3D structure of a paper surface



833 µm
x
574 µm
x
40 µm