

# Interaction between image processing and optical measuring technology

## Technological development through precision measuring technology in the example of cellphone lenses

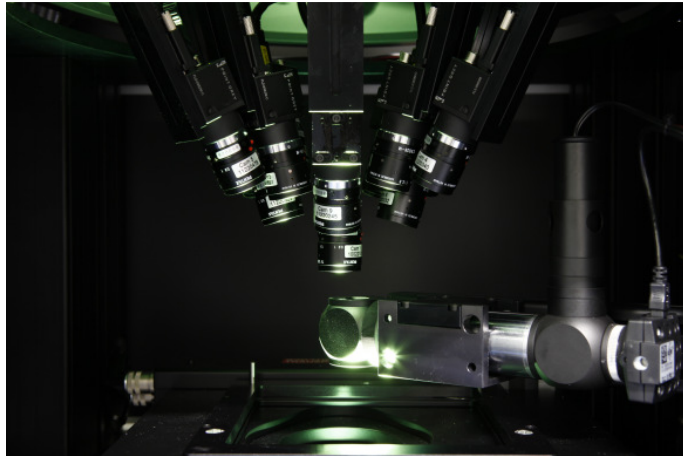
**10 years of cooperation between the two companies Stemmer Imaging and TRIOPTICS GmbH demonstrate how the exchange of expertise from the fields of image processing and optical measuring technology accompanies and improves the entire technological development of cellphone lenses. Through a high degree of innovation TRIOPTICS GmbH was able to become a global market leader and supplies manufacturers of cellphone lenses with the most varied measuring systems that contributed to the improvement of the lenses.**

To develop a measuring instrument measuring the imaging quality of lenses, measuring principle and optical components must be chosen that do not affect the measuring result, introducing additional errors. In addition, a very fast measuring method is required, characterizing the lens completely within 2.5 seconds. To be able to deploy the instrument during mass production, a simple pass/fail output must be issued for each lens. Since the measuring instruments are used round the clock, the measuring method and the instrument design must be very robust, which must be achieved through components of highest quality and durability.

From the start of development in 2001 until today only high quality Pentax CCTV lenses are used in the TRIOPTICS ImageMaster® PRO. The lenses were able to meet the increasing demands for measuring the MTF (Modular Transfer Function) at ever increasing spatial frequencies. This allows for all generations of the cellphone lenses to be measured precisely with the measuring instrument. The Pentax CCTV lenses have a very low image field curvature, low distortion and good contrast characteristics, an important condition for an MTF measuring system. To cover different focus ranges of the test specimens from 1 mm to 12 mm with the ImageMaster® PRO, different Pentax lenses are used in the measuring systems.

The ImageMaster® PRO is mainly used to measure cellphone lenses. Since the optical design of the cellphone lenses is becoming ever more sophisticated and ever more complicated aspherical lenses are integrated in the lenses, it is necessary to measure the MTF at more and more field positions. This means that the number of cameras and lenses in a measuring instrument has risen with the increasing requirements. At the start of the technological development 5 cameras and lenses were used in the ImageMaster® PRO. To measure a high quality lens, up to 17 measuring heads are used today. The

picture gives an insight into the measuring chamber of the MTF measuring instrument with 13 Pentax lenses.



Detailed image of the measuring chamber with cameras and the Pentax lenses

### **Facts about the measuring instrument ImageMaster® PRO 5**

- Greatest MTF measuring accuracy with +/-3% MTF in the field
- Max. spatial frequency up to 300 lp/mm
- High resolution measuring heads with Pentax lenses Pent C5028-M
- MTF traceable to ISO standard through PTB Braunschweig
- Measuring time per lens 2.5 seconds
- Simultaneous measurement of 22 parameters:
  - such as MTF at 17 field positions, focus, flange focal distance, angular image field displacement and curvature, astigmatism, focusing tolerance (depth of focus - DOF)
- Clean room compatibility ISO5 (US- FS209 class 100)
- 24 hours use in shift operation
- Throughput of approx. 34,000 lenses per day

### **TRIOPTICS GmbH company brief**

The internationally active TRIOPTICS GmbH develops and sells fully automated, computer-aided optical measuring instruments for use in industry and research. Early 2012 the innovative medium-sized company celebrated its 20 year anniversary.

Contact:

TRIOPTICS GmbH  
Hafenstraße 35-39  
22880 Wedel

Phone: +49 4103 -18006 - 0

Email: [info@trioptics.com](mailto:info@trioptics.com)

[www.trioptics.com](http://www.trioptics.com)

Head of group ImageMaster® PRO

Dipl.-Ing. (FH) Frank Peter

Phone: +49 4103-18006-177

Email: [f.peter@trioptics.com](mailto:f.peter@trioptics.com)