MarForm

NEW: MarForm MFU 200 Aspheric 3D

High-precision 3D measuring station
to measure and evaluate optical components

- 0 +

Mahr

EXACTLY

- **CNC measuring machine with 9 motorized axes, incl. 4 measuring axes**
- **Ultra precise path control of the measuring axes**
- **Highest dynamics and measuring speed**
- **Fully automatic adjustment of the work specimen**
- **Measuring range diameter up to 260 mm and Z 320 mm**
- **Fast feedback to the processing machine (closed loop)**

MarForm MFU 200 Aspheric 3D

Mahr is your competent partner for precision metrology – since 1861.

The **MarForm MFU 200 Aspheric 3D** was developed for quick 2D and 3D testing of optical components on the shop floor. MarForm measuring machines have been known for decades for their accuracy and stability.

The **MarForm MFU 200 Aspheric 3D** makes this experience accessible to the optics industries.

Accuracy

With the **MarForm MFU 200 Aspheric 3D**, a highly precise measuring instrument is available with a very small measuring uncertainty to ideally suit the requirements of your process optimization.

Measuring principle

The **MarForm MFU 200 Aspheric 3D** measures the topography of optical components. Of course a fast 2D measurement with a tracing segment over the zenith of the lens can also be recorded. For the 3D measurement, first one linear profile is measured over the zenith of the lens. Then several concentric circle profiles are recorded by turning the C-axis. These measuring points are used to create a topography. Also interrupted surface can be measured applying the free positioning of the probe arm.
With the use of the measuring station in a vibration damped cabin, external interference such as vibrations and filth are kept away from measuring objects.

Measuring procedure

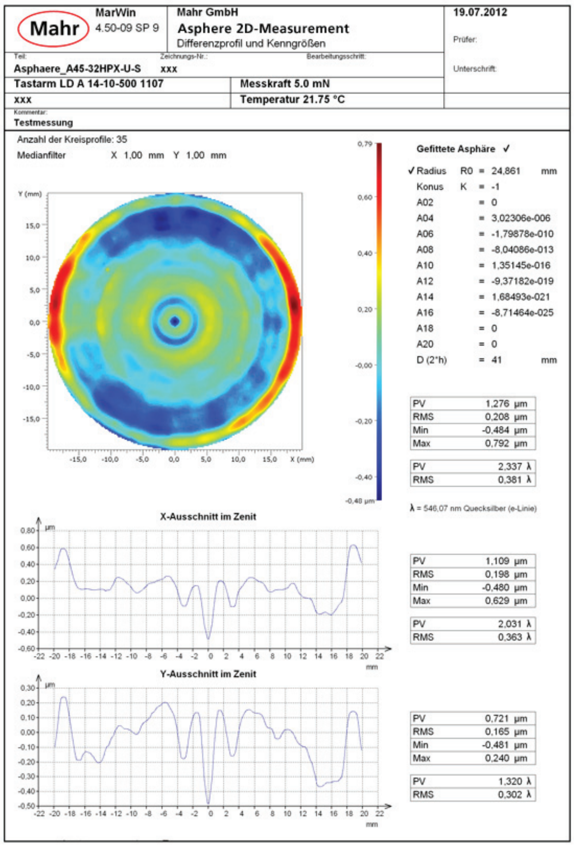
Before the measurement begins, the user selects the nominal geometry and sets the parameters of the nominal lens. Next, the measuring data is recorded and compared with the nominal data of the lens.

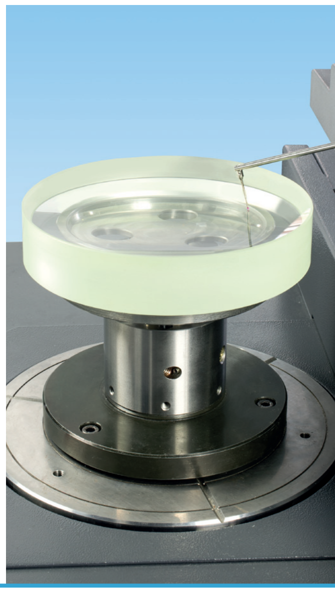
The parameters shown are the RMS value, PV value and the slope error.

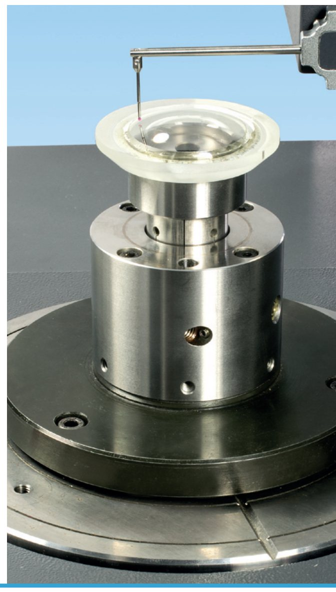
In the software, the individual parameters for the asphere, such as the degree of curvature R_0, the conic constant k and the aspheric coefficient A_i can be adjusted to the measuring results when adapting the nominal asphere into the fit asphere.

The differential topography between the recorded measuring values and the nominal lens are depicted as a color-coded height image. The 2D segments and the differential topography can then be exported in well-known formats for correction for the processing machine.

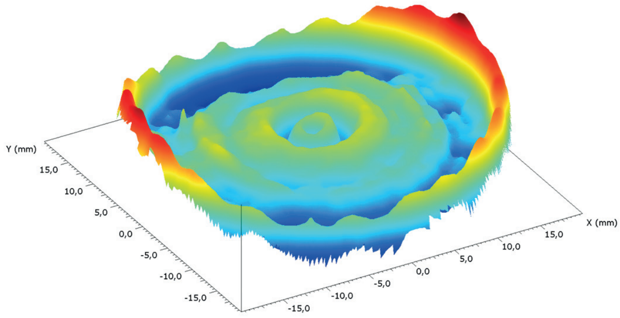
In addition to the measuring of spheres and aspheres according to the above given description, other rotation-symmetrical objects can also be measured and evaluated with the help of the nominal form as a conic section or saggita or a 3D point cloud.







$$z(h)=\frac{\frac{h^2}{R_0}}{1+\sqrt{1-(1+k)\left(\frac{h}{R_0}\right)^2}}+\sum_{n=2}^{5}A_{2n}\cdot h^{2n}$$



Advantages

Topography testing starting with the first step of processing

- Early detection of deviations reduces expensive postprocessing
- Output of the differential profile in a machine readable format for optimal control of the processing machines

Increased flexibility

- Rotation-symmetrical lenses, polished and ground, different types can be measured with one measuring system. No additional investments are needed.
- 3D mode: large measuring range up to 260 mm in diameter
- Combined 2D/3D mode: measuring range up to 180 mm in diameter
- Highest measuring speed and dynamics for
  - Large lenses: freely adjustable up to 10 mm/s
  - Microlenses: up to 0.02 mm/s or up to 10 U/min for 3D measurements
- Program controlled motorized inclined position of the probe element, thus free positioning of the probe tip and an angle of up to 90° can be measured
- Automatic centering of the lens with a centering and tilting table
- Same software as in the MarSurf LD series – parameters can be transferred!

Your results are correct!

- The high-precision **MarForm MFU 200 Aspheric 3D** is the reference for the precise measurement of your work-pieces. The vertical resolution of 1 nm and form deviations of <100 nm (< ± 50 nm) guarantee you the exact reproduction of your lens
- Probe arm change without recalibration
- Probe arm protection function via a Hall effect sensor
- Measurements of optics with step flanks possible

Measuring probe T7W

- Can be swiveled up to 360°
- The measuring probe is magnetically held and thus easily exchangeable
- Patented by Mahr

MarForm MFU 200 Aspheric 3D - Technical Data

Properties of the horizontal measuring axis (X-axis)	
Measuring path	180 mm
Straightness deviation per 100 mm	0.15 µm
Tracing length (Lt)	0.1 mm to 180 mm
Positioning speed	0.02 mm/s to 50 mm/s
Measuring speed	0.02 mm/s to 15 mm/s
Smallest profile point distance	1 nm
Properties of the vertical measuring axis (Z-axis)	
Measuring path	320 mm
Straightness deviation per 100 mm	0.1 µm
Tracing length (Lt)	0.1 mm to 320 mm
Positioning speed	0.02 mm/s to 50 mm/s
Measuring speed	0.02 mm/s to 15 mm/s
Smallest profile point distance	1 nm
Path control of the Z-axis as a measuring function (measuring direction Z+ / Z-)	
Path control of the X-axis as a measuring function (measuring direction X+ / X-)	
Resolution	1 nm
Positioning uncertainty	1 µm (with probe return)
Speed	freely adjustable up to10 mm/s
max. measuring points /measurement	5.2 million points
Properties of the horizontal measuring axis (Y-axis)	
Measuring path	6 mm
Straightness deviation filter 0.25 mm	0.5 µm / 5 mm
Smallest profile point distance	5 nm
Properties of the circular measuring axis (C-axis)	
Roundness deviation	0.02 + 0.0004 µm + µm / mm measuring height
Axial runout	0.04 + 0.0002 µm + µm / mm measuring radius
RPM	0.1 to 200 min^{-1}
Resolution	0.0001°
Properties of the automatic centering and tilting table	
Table diameter	180 mm
Table load, centric	200 N
Travel path (X-; Y-; A-; B-axis)	± 1.8 mm
Positioning uncertainty	0.2 µm
Properties of the probe system (measuring direction Z+ / Z-)	
Probe measuring range	± 0.5 mm (60 mm probe arm)
Resolution	0.6 nm
Probe arm swivel range (Hb)	360 °
Function 3D measuring station	
Measuring time	Approx. 5 to 10 min.
C-axis	Measuring and positioning speed < 180 °/s Rotation speed up to 1200 °/s
General data	
Accuracies	Filter at 15 UPr (LSC) ot 2.5 mm (LSS)
Operating temperature	+ 18°C to + 35°C (with optional temperature controlled environment)
Working temperature (recommended)	20°C ± 2K (with temperature change < 1 K/h)

Mahr GmbH, Germany
Jena site:
Carl-Zeiss-Promenade 10; 07745 Jena
Phone +49 3641 64 2696, Fax +49 3641 64 3368,
vertrieb-jena@mahr.de; www.mahr.de

3760597-18.09.2013