

Optical Surface Measurement

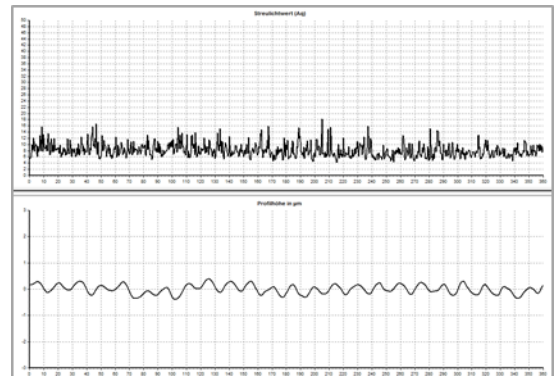
- Roundness
- Waviness
- Roughness

The main areas of application for the OptoShaft are the rapid measurement of waviness (chatter marks) on ground and finished bearing seats on gear shafts. Due to the extremely robust and at the same time precise scattered light sensor, the measuring device can be used directly next to the production machine.

Measurement Results

Roughness

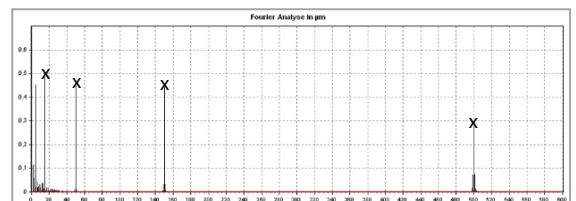
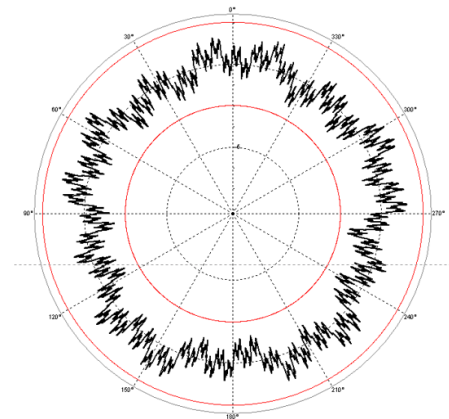
The roughness is recorded using the scattered light parameter Aq. This measured value has a high functional relationship and, with 100% measurements, also provides a basis for process control based on measured data.



Above: roughness profile Aq over 360°. 2048 individual Aq measurements. bottom: waviness profile after high-pass filtering.

Roundness and Waviness

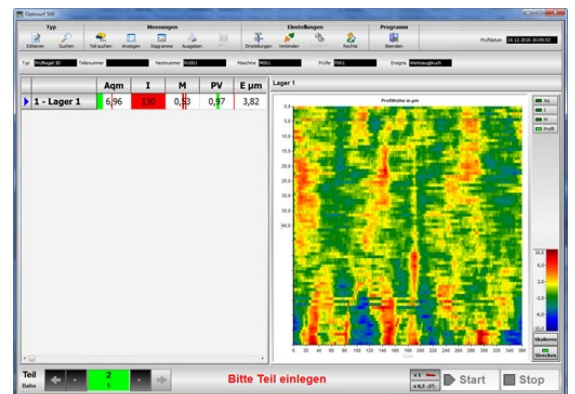
The roundness measurement with the scattered light sensor is based on deflectometry, in which local shape angles are measured on the circumference. Through integration and subsequent LSC compensation calculation, an absolute roundness profile is created that is comparable with highly precise tactile measurements. Roundness deviations of up to 0.1 µm can be measured. ISO Gaussian filters are used for the waviness calculation. The detection limit for fine waviness is in the range of 0.01 µm. The system can be calibrated using precise waviness standards with ISO 17025 certificate.



Multiwave standard. roundness diagram and FFT analysis, x = calibrated values

Area Scan

A big advantage of the fast scattered light measurement with the OptoShaft is the possibility of measuring the entire surface of the storage area. entire functional area. With the 3D software, the roughness values and the shape and waviness can be displayed in one measurement. Inhomogeneities and defects can thus be recognized and assessed.



Area Scan of a shaft journal

Measurement System

How it operates

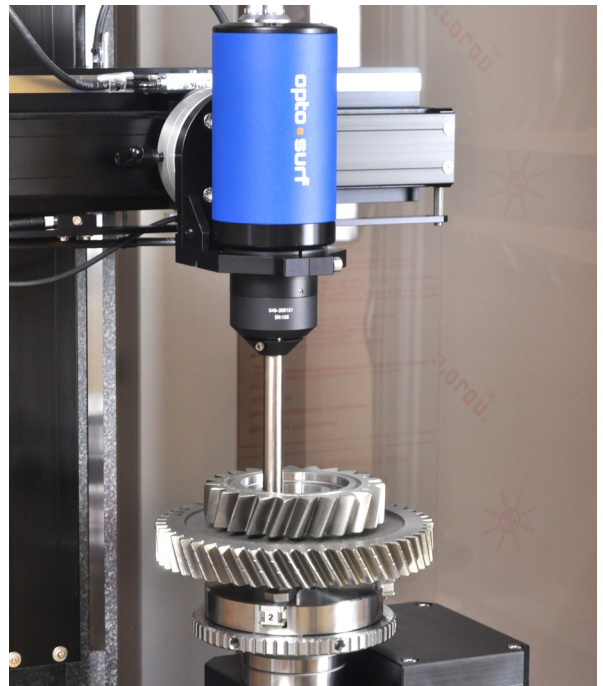
The test parts are clamped between centers and rotated by means of a high-precision rotary table. The scattered light sensor then automatically moves to the measuring positions to be checked. The typical measuring time for, for example, three journals at three different positions is approx. 10s. The recorded measurement data can be recorded with the qs-STAT statistics software for further quality assurance .



Automatic approach to a measuring position on a gear shaft.

Measuring internal journals

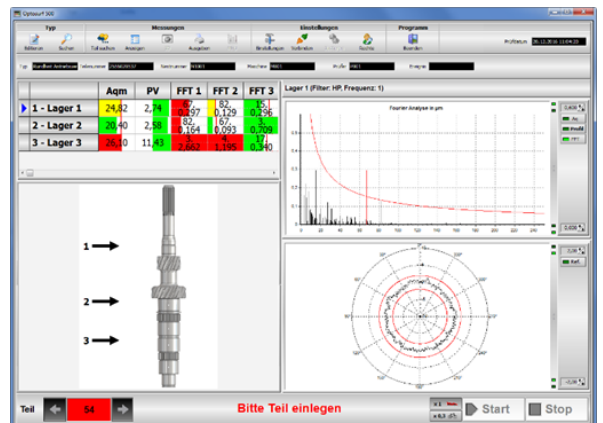
With the help of an additional optical adapter, internal bearings can be measured. To do this, the tailstock is moved manually and the sensor is set vertically using a swivel device. The light beam is deflected by 90°.



Using the bore hole adapter.

Software

The software controls the automatic measurement process and evaluates the data. In the administrator mode, new components including measuring positions and tolerance values can be defined and edited. The user only has to select the component and start the measurement. A DMC barcode scanner can also be used. All measurement data are saved in an SQL database under an individual batch name. The measured values are displayed graphically and numerically. Export to qs-Stat and Excel is possible

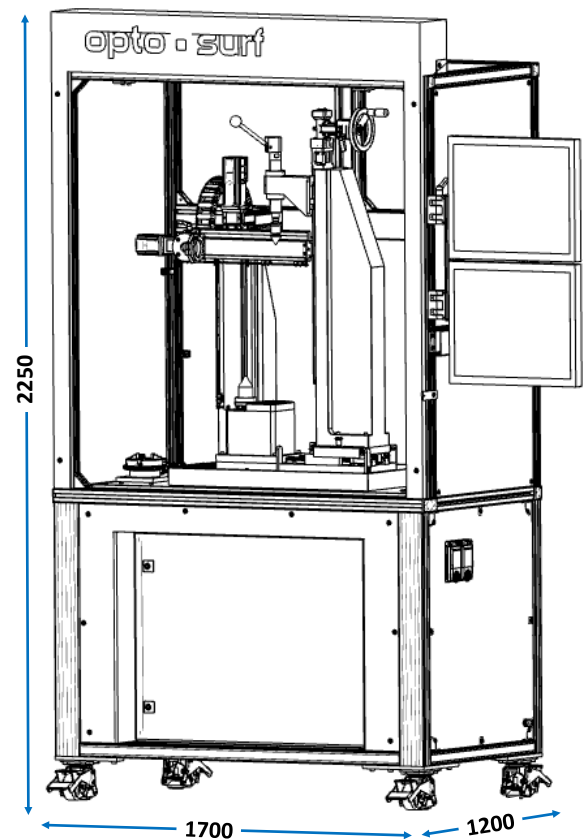


Software layout with FFT-, roundness- and roughness evaluation.

Specifications

SYSTEM

Measurement principle:	Scattered light (acc. to VDA 2009)
Light source:	LED 670 nm with 0,9 mm spot and switchable to 0.03 mm spot for high frequency harmonics (laser class 1)
Measurement values*:	Roughness Aq, roundness LSC (RONt) waviness (FFT-analysis), Defects Aq*
Measurement speed:	2000 single measurements/s
Accuracy:	Roundness: < 0,2 μm , Waviness: < 0,02 μm , Roughness acc. to < 0,01 μm (Ra)
Rotary table:	Runout < 1 μm wobble < 0,1 μm
y-axis	Motorized CNC controlled
x-axis	Motorized CNC controlled
Tailstock:	Mounted on a movable granite column
PC-System:	Industrial PC (Win 10) integrated in the controller cabinet
Achsensteuerung:	CNC
Calibration:	Waviness standard WS 300-01 (300 waves with 0.1 μm amplitude)



*Comment measurement values

Roughness	The scattered light measurement technology records the roughness with the characteristic value Aq (VDA 2009) here in the circumferential direction. To monitor Ra, Rz or Rk values, comparative measurements must be carried out beforehand.
Roundness/Waviness	The roundness measurement using the scattered light method provides identical parameters as high-precision tactile roundness measuring devices. ISO filters are used to measure the waviness.
Defects	Morphological filter technology supplies the Aq * value for the detection of scratches and impact marks