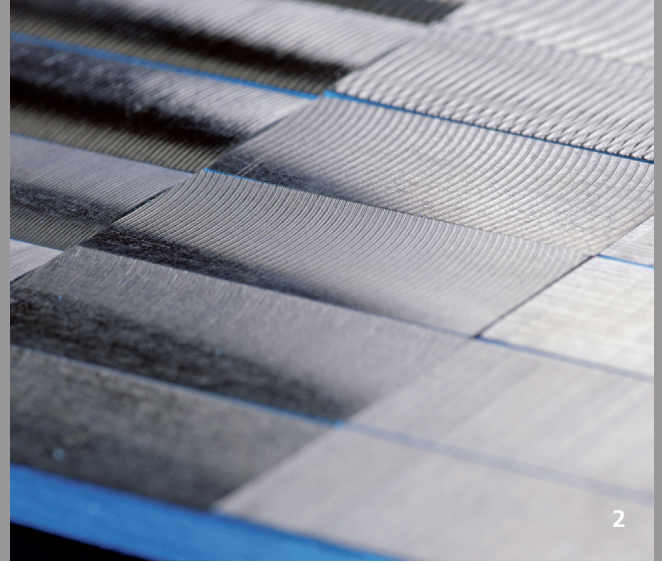


1



2

## OPTICAL SENSOR TECHNOLOGY FOR INSPECTION OF SURFACES

### Task

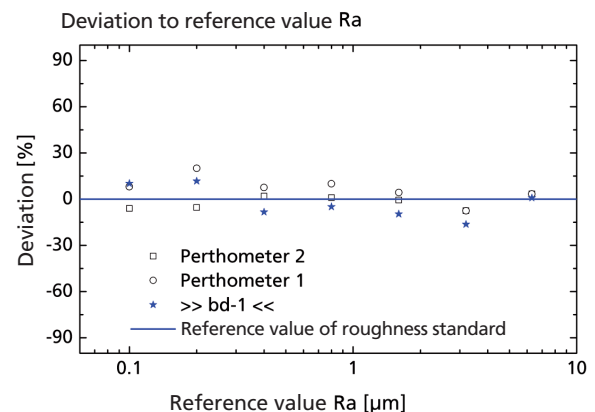
The surface of a component can influence its function and service life decisively. Therefore, during its manufacture special attention must be paid to the quality of a component's surface, especially for machine parts subject to high stress. Examples include bearings and gliding surfaces of motor components. In the automobile industry the surface quality, among others, is determined by surface roughness. Parameters for the roughness are, for example, the arithmetic average of roughness values Ra or the identified roughness depth Rz according to DIN 4287.

### Method

Fraunhofer ILT has developed a new optical distance sensor to measure the roughness of technical surfaces without contacting them. The method and computing algorithms used for determining Ra and Rz are oriented to DIN standards by means of the profile method. The distances to be measured can be adjusted and reach up to 20 cm. Due to the measuring frequency for single distance measurements of 70 kHz, the feed can be adjusted to run much faster than the case with tactile processes.

### Result

With the sensor »bd-1«, test measurements were conducted on roughness standards with Ra values in a range from  $0.05 \mu\text{m} \leq \text{Ra} \leq 10 \mu\text{m}$ . The measurement results correspond within the tolerances with the results of commercial tactile measuring devices from well-known manufacturers.



### Applications

With this sensor »bd-1« roughness values can be measured in-line for the first time. Furthermore, »bd-1« measures distance and geometrical features simultaneously at a precision below a micron. On turning parts, roundness deviations can be identified down to 100 nm.

The work was conducted using devices and plants that were funded by the State of North-Rhine Westphalia and the European Union's European Regional Development Fund EFRE (»Regionale Wettbewerbsfähigkeit und Beschäftigung 2007-2013«) under the grant number 290047022.

### Contact

Dipl.-Phys. Cristian Tulea  
Telephone +49 241 8906-431  
cristian.tulea@ilt.fraunhofer.de

Priv.-Doz. Dr. Reinhard Noll  
Telephone +49 241 8906-138  
reinhard.noll@ilt.fraunhofer.de

1 Measurement on a ground shaft.

2 Roughness measurement standards.