



## INLINE MEASUREMENTS OF SHAFTS

### Task

As the demands upon the tolerances of shafts – camshafts, crankshafts or drive shafts – continue to increase, new optical sensors are required that check the dimensional accuracy of shafts in a production line both contact free and with sub-micron precision.

### Method

As part of preliminary research, Fraunhofer ILT has developed the new interferometric sensor »bd-1«, which measures absolute values and overcomes the boundaries of conventional triangulation. The sensor has a compact rotationally symmetric probe with bi-directional beam control. The beam to the shaft and its reflection run along the same line. This offers significant advantages in terms of integrating these sensors into testing machines. Thanks to the interferometric principle, »bd-1« carries its scale quasi in itself, reaches maximum precision this way and provides high dynamics with respect to scattered radiation on the object measured.

### Result

»bd-1« reaches a measuring frequency of up to 70 kHz and a measurement accuracy of better than 200 nm in a range of 8 mm. The measuring head has a size of, for example, 55 mm x 18 mm (L x Ø) and is connected to a measuring unit via a fiber optic cable. Due to its high dynamics, almost all types of metal surfaces, i.e. shiny, polished or rough, can be measured. In addition, »bd-1« can also capture roughness values. At the trade fair Control in 2014, the »bd-1« sensor was presented for the in-line testing of camshafts to a professional audience for the first time.

### Applications

»bd-1« is predestined for the geometric inline measurement of metallic semi-finished products, such as all kinds of shafts, but also sheet metal, formed or stamped parts all the way to tools. Since it offers high accuracy and measurement frequency in a compact design, it can easily be integrated into processing or testing machines, thereby opening up a new level of inline inspection of geometrical parameters for efficient process control.

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- 1 Testing of geometrical tolerances on a camshaft.  
2 Exhibit of Fraunhofer ILT at Control in 2014:  
camshaft measurement with »bd-1«.