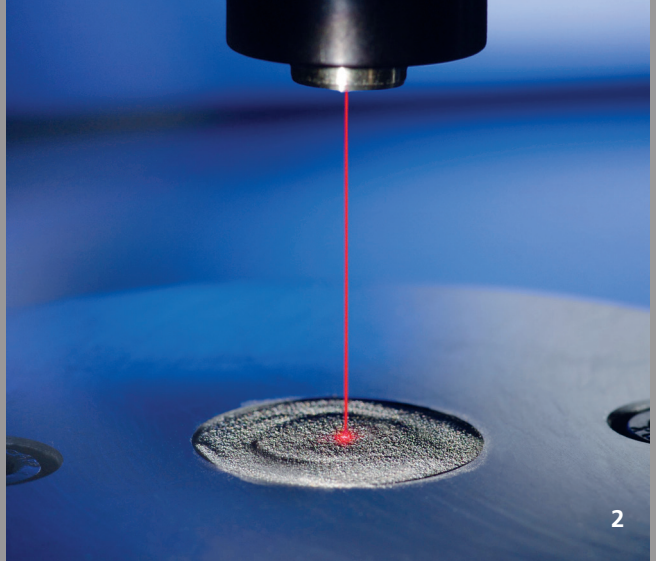

»bd-1« SENSOR FOR INLINE MEASUREMENTS OF GEOMETRIC PARAMETERS

Task

Non-contact inline measurement of geometric parameters opens up a variety of possibilities for process control and optimization when metallic components and materials are machined. Examples of such parameters to be measured inline are the thickness of rolled sheets, the welding depth during laser welding, the height of applied traces in laser material deposition or the microtopography of structures produced by ultrashort pulse laser. Fraunhofer ILT has developed an absolute-measuring interferometric sensor system with which these parameters can be determined quickly and precisely. Currently, the institute is investigating whether the scope of application of this sensor technology can be extended to inline measurement tasks for the Laser Powder Bed Fusion (LPBF) process.

Method

The »bd-1« sensor has a compact measuring head with bidirectional beam guidance. The outward and return beams run along the same line. The wavelength of the measuring radiation is chosen so that it can be guided coaxially to the processing laser radiation. The measurements can be triggered and synchronized with the machining process flow. Thus, measurement results are available in real time for process control.

1 Measuring head of the »bd-1« sensor.
2 Measurement of the microtopography of a metal powder bed.

Results

Special features include a measuring frequency of up to 70 kHz and a measuring accuracy better than 1 µm in a measuring range of 8 mm. The measuring beam is moved relative to a powder bed surface to measure the microtopography of the powder bed. Different powder forms of the same material result in varying local bulk densities, which can be detected with the help of the »bd-1« sensors and used for process control.

Applications

Their compact design makes it easy to integrate »bd-1« measuring heads into laser processing systems like LPBF. The working distance is up to a few hundred millimeters. Thus, geometric parameters can be selectively measured in the processing field in real time, at the powder bed as well as in the melting zone and on the solidified parts.

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