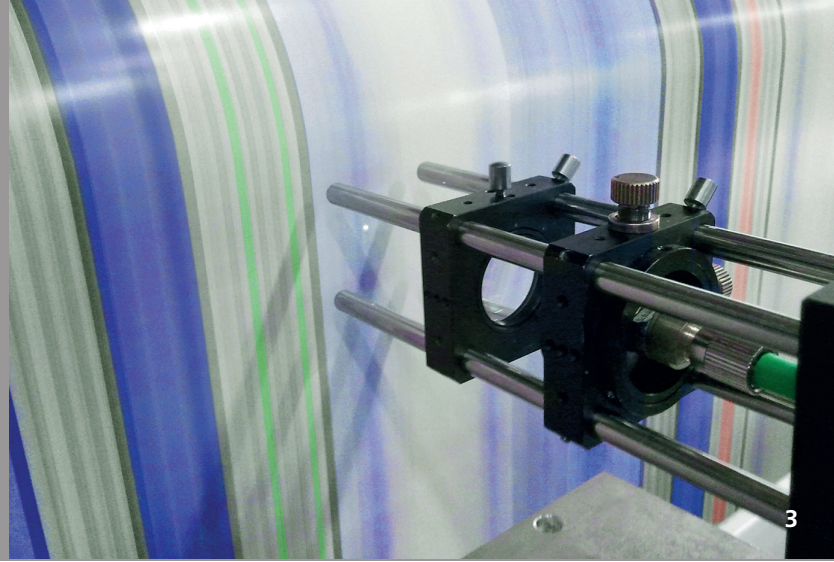




2



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## INLINE-THICKNESS AND SURFACE ROUGHNESS OF PAPER AND CARDBOARD SHEET MATERIAL WITH »bd-2«

### Task

In the production of paper and cardboard, the weight per unit area constitutes the main product property. To determine this, manufacturers commonly use radiometric sensors. While these sensors operate without contacting the object, they make it necessary to observe a high degree of safety precautions to protect employees. An alternative are inductive and capacitive sensors, which are harmless to humans, but touch the sheet material to be measured or are separated from the surface only by a thin air gap. What these three measurement sensors have in common is that they measure the thickness of paper and cardboard webs only indirectly. Thereby, the measuring results are temperature and moisture dependent and do not provide information about the surface structure.

### Method

In paper and cardboard production, laser sensors have already been successfully used for various purposes, e.g. to determine the track speed or the humidity of the paper. Thickness measuring methods, such as laser triangulation, are not sufficiently accurate because of the speckle effect. Within the scope of several studies, Fraunhofer ILT has conducted experiments for measuring the thickness of paper and board webs by absolute measurement interferometry for the first time. The sensors of the »bd-2« measuring device developed at Fraunhofer ILT

have compact rotationally symmetrical measuring heads with bidirectional beam guidance, i.e. the beam moves back and forth along the same axis. This offers significant advantages for the integration of the measuring gauges in manufacturing machines or testing equipment.

### Result

»bd-2« sensors use a spectrally wide radiation source so that they are unaffected by the speckle effect. This was confirmed in field trials on paper finishing machines at track speeds of up to 100 m/min. The thickness was measured with an accuracy in the micrometer range. Further experiments should show that the absolute measuring interferometric sensor also works reliably at track speeds of up to 2000 m/min.

### Applications

In addition to the weight per unit area, the surface structure of paper and cardboard is of great importance for further processing steps and for the intended use. In addition to measuring thickness, »bd-2« sensors can also measure the roughness of untreated, painted, embossed, smooth or satin paper or cardboard.

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- 2 Measuring head with fiber optic cable,  
L x Ø = 55 mm x 18 mm, m = 40 g.  
3 Measuring head for inline measurement  
of a board web interface.