The edges of the minted coin are angled both inwardly and outwardly. Vertically directed light is mainly scattered and only a part is reflected back to the sensor. The edges are reproduced dimly. The margin and embossed design are at right angles to the illumination source, reflecting most incident light back to the sensor and appearing as bright surfaces.

Continental Europe and the British Isles have a distinctively patterned surface that scatters most of the incident light. This pattern produces a largely dark field with bright punctuated highlights. The background between these raised areas exhibits an angled depression which is rendered as a surface with gray tones.

In microscopy, the application of sophisticated illumination techniques for the enhancement of specific object features has been routine for a long time. It is well known that the quality of the image is crucially dependent upon the type of illumination as well as the performance of the lens. Incident light microscopy techniques, such as bright-field and dark-field illumination or directed and diffuse illumination, have been used since the 19th century for examining the crystal structure of metallic and other surfaces.

Directed bright-field illumination is ideally suited for surface inspection and, by using high contrast, reveals damage normally invisible to the human eye. Subsequent image and data processing steps are speeded up substantially by having the best possible imaging methods.
**Figure 5: Disc brakepad with sintered surface**

A. Diffuse illumination  
B. Bright-field illumination  
C. Example of a fault

Images A and B were taken using the identical line scan camera and coordinates but differing only in the type of illumination used. By using directed bright-field illumination, the sinter particle clusters and fault areas can be clearly recognized in the inspected region. Image C is a magnification of the fault in the sintered coating of the brakepad.

**Application: Surface inspection**

**Application: Inspection of overall geometry and blade edges**

**Figure 6: Shaving foil from an electric razor**

A. Shaving foil pictured under bright-field illumination  
B. Magnified portion of A

The hexagonal dark areas are holes in the flexible 3D shaving foil. The bright edges are the flat cutting edges, which are interspersed with a contiguous gray area that delineates the depressed surface of the metal foil.

**Dimensions**

**Figure 7: Extruded object and magnified inspection area**

A. Extruded object  
A1. Surface scan of the extruded edge; camera C1  
A2. Crack in the outer surface  
A3. Surface scan showing texture of the pressed contour; camera C2

- 100% control of critical areas of components manufactured in round-the-clock processes  
- Custom-designed specialist editions are our speciality  
- Line scan camera with integrated bright-field illumination  
- The final system and protective casings are carefully designed to conform to the minimum space available  
- The robust camera covers and casings are resistant to dirt and scratches – in high quality sapphire look  
All components are specially designed and assembled for the demanding environments found in industrial production.

**Figure 8: Inspection assembly with cameras and transport system**

A. Measured object (cold-extruded component)  
A1. Camera, horizontally mounted, checks the surface of upper lip  
A2. Camera, angled mounting, checks the conical area