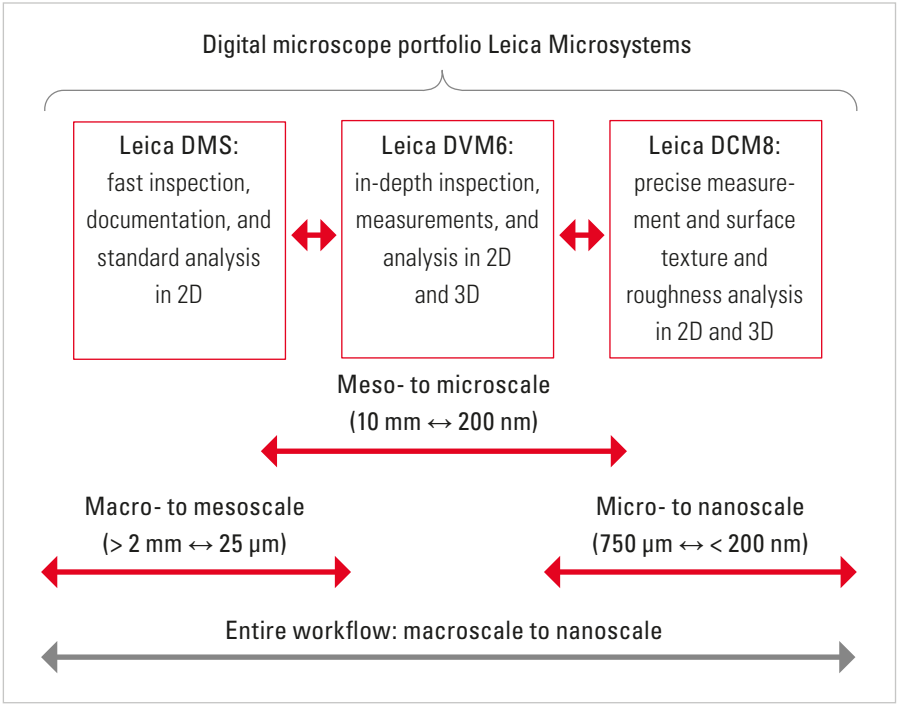
From Eye to Insight

# EFFICIENT OVERALL WORKFLOWS FOR MICROELECTRONICS USING DIGITAL MICROSCOPY

Today faster and cheaper manufacturing with ever-stricter specifications is common. State-of-the-art digital microscopes help users work efficiently when imaging from the macroscale to nanoscale, because:

- Finer, clearer details are seen in the image with the high resolution digital camera (up to 10 MP)
- Obtain results quickly with just 1 click to record images and videos
- Start working right away as minimal training required thanks to an intuitive system design and software
- Work always in a comfortable, ergonomic position
- Reliable and reproducible results easily recalled from image data due to software/hardware encoded optics

Whether working in microelectronics, electronics, automotive, information and communication technology, biomedical and electro-medical technologies, industrial machinery and equipment, or renewable energy technologies, users should choose a digital microscope from the Leica Microsystems' portfolio which best suits their needs.

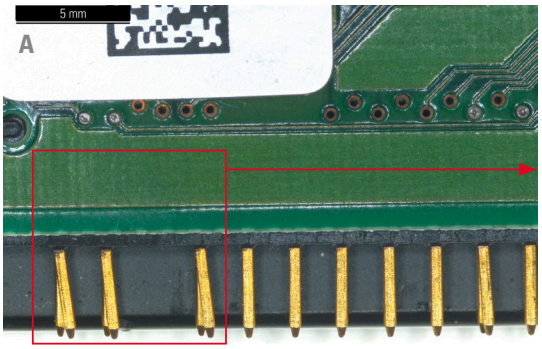


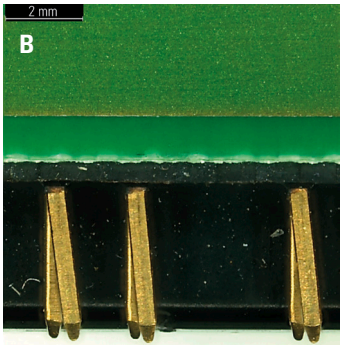

**Inspection of hard drive for data storage with the digital microscope portfolio**

A hard drive is one type of microelectronic device which requires inspection over the full size scale. As an example, parts of hard drives were analyzed with the Leica DMS1000 and the Leica DVM6 A digital microscopes and the Leica DCM8 digital and confocal microscope/optical profilometer in high end configuration. Some results are presented below.

Leica DMS1000: Large overview of parts and fast zoom-in

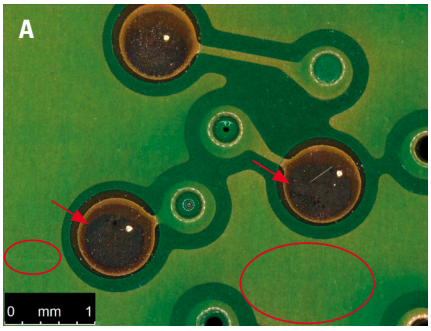
A: PCB underside of a hard drive imaged with the Leica DMS1000. The hard drive cable connector pins are seen at the bottom.
B: Zoom-in of the indicated area in red showing more details of the bent connector pins.

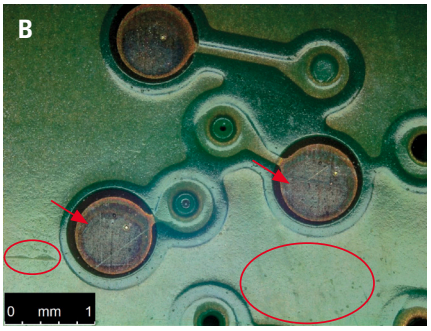


## Leica DVM6 A: Visualize hard-to-see features on parts – versatile integrated illumination

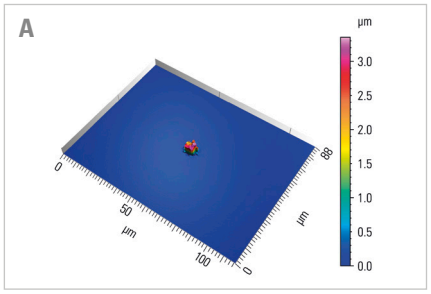
Portion of the PCB underside of a hard drive imaged with the Leica DVM6 using the (A) LED ring light and diffusor and (B) oblique illumination. Scratches and defects on the pads (arrows) and imperfections and variations on the substrate (encircled areas) become more visible in image B.

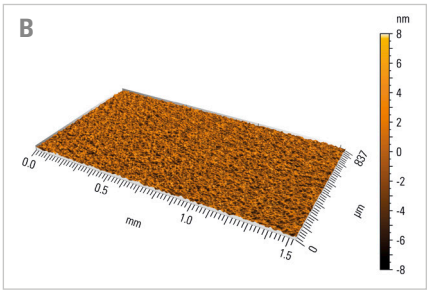



## Leica DCM8: Precise material surface characterization

A: Dust particle present on the hard drive disk surface imaged in 3D with the Leica DCM8 in confocal mode. Height scale is pseudo-color. B: Topographic image of the hard drive disk surface recorded with the Leica DCM8 in interferometry mode. Height variations on the order of 8 nm. See results below from surface analysis ISO 25178.




ISO 25178 – ANALYSIS OF HARD DRIVE DISK SURFACE DATA:HEIGHT PARAMETERS

| | | |
|---|---|---|
| $S_a$ | (arithmetical mean of height values) | 1.33 nm |
| $S_q$ | (root mean square of height values) | 1.67 nm |

PERFORMANCE ADVANTAGES: LEICA DIGITAL MICROSCOPE PORTFOLIO

| LEICA DMS | LEICA DVM6 | LEICA DCM8 |
|---|---|---|
| High quality images with a 2.5 or 5 MP digital camera having 30 frames per second live display | High quality images with a 10 MP digital camera having max 37 frames per second live display and plan apochromatic optics | Precise functional surface characterization → optimal lateral resolution (< 140 nm) with confocal microscopy |
| See more of the part in a single image → large field of view (up to 94 mm) | Find a point of interest easily using the unique hybrid XYZ stage | Precise metrology of surface texture and roughness → optimal vertical resolution (0.1 nm) using interferometry |
| Fast and easy to change magnification with parfocal and parcentric optics | Visualize difficult-to-image details with versatile contrast methods → integrated LED ring light and coaxial/oblique illumination in combination with HDR | Viewing parts in their authentic colors with confocal microscopy → 4 LED RGB illumination |
| Accurate measurement for parts with large height differences → telecentric optics | Obtain consistent results no matter the user expertise → unique 5 axes encoded system | Recording multi-focus images of areas with large height differences using FV or Z stacking |
| Standalone operation with live HD image display and direct recording | Mosaic overviews with XYZ stitching and multi-focus images of areas with large height differences → EDOF or Z stacking | |

For more details, please refer to the complete report which is referenced here.

**Full report:** J. DeRose, O. Rodriguez, How Digital Microscopy Can Contribute to Efficient Workflows for Microelectronics and Electronics, Industrial Manufacturing Technical Report

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