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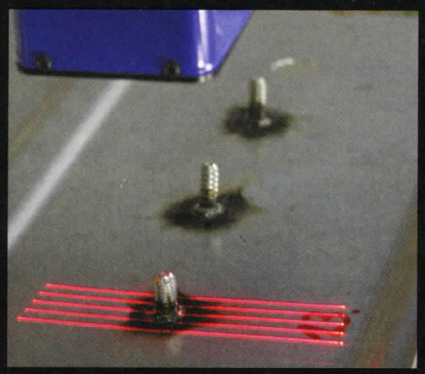
Quality MAGAZINE

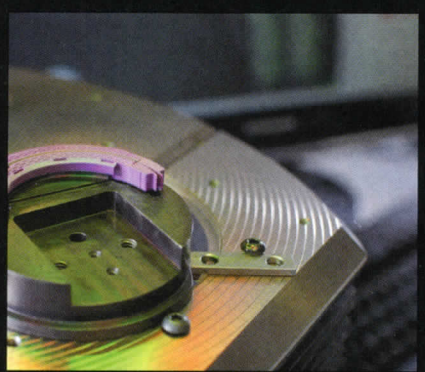
IMPROVING YOUR MANUFACTURING PROCESS

VISION & SENSORS

NDT
nondestructive testing
including materials test



HOW TO GUIDE 2014



A Special Section to Quality Magazine

How to Measure Flexible Printed Electronics

While still in their infancy, flexible printed electronics offer the potential for enormous growth, replacing circuit boards and conventional wiring in a wide variety of applications. Emerging technologies allow complex circuits to be printed on flexible substrates at very high speeds.

The small size (10 – 100 microns) of these devices and the speeds at which they can be produced (in excess of 600 feet per minute) point to non-contact optical measurement as the preferred technique to ensure quality and reliability.

VIEW Micro-Metrology pioneered many of the techniques for optical non-contact measurement of printed circuit boards and micro-circuits found in MEMs, recording heads and semiconductors. These same technologies are now being applied to high speed measurement of flexible printed circuits.

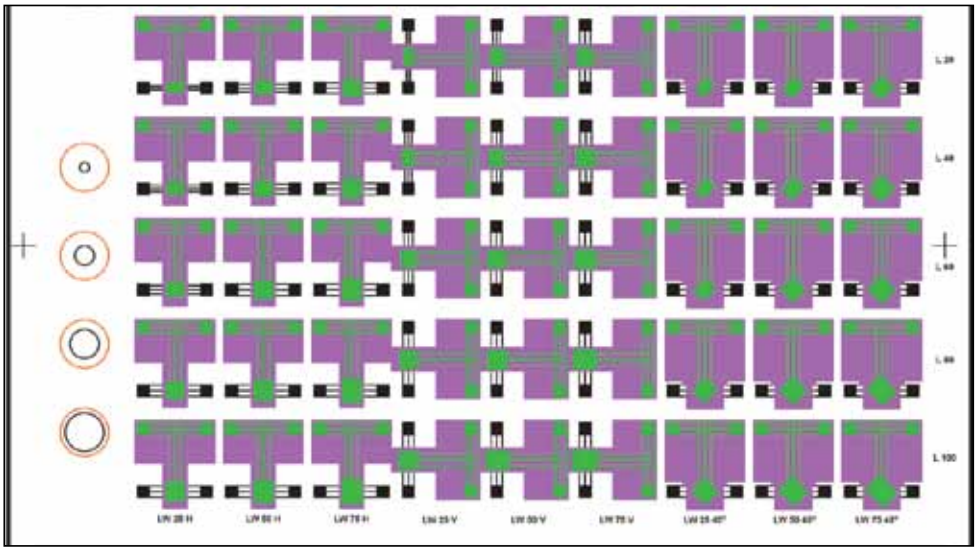
Flexible substrate materials pose the first challenge. These materials can be delicate and sensitive to changes in temperature and humidity. They must be handled gently, yet also held securely without damage during inspection.

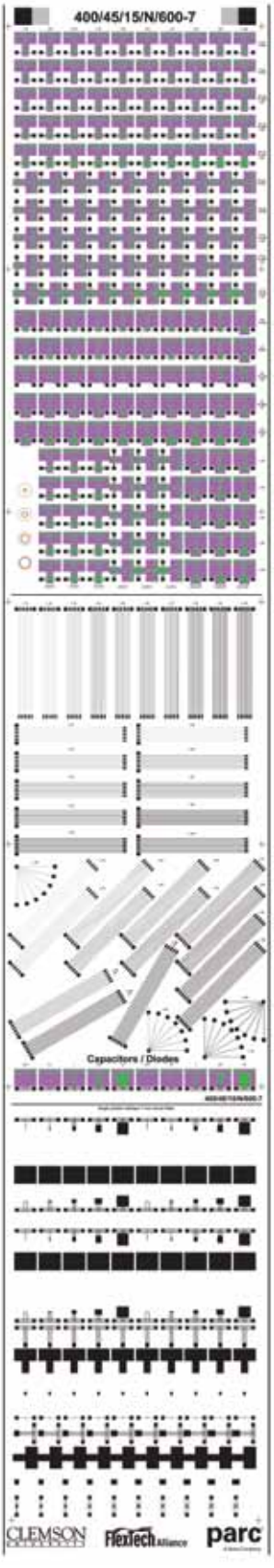
Besides being delicate, flexible printed electronics may be printed on transparent or opaque materials, sometimes using inks that are not easily imaged using visible light. These materials demand that the imaging optics and illumination be extremely versatile to handle the range of situations that come up in manufacturing.

In terms of dimensional measurements, there are four main factors requiring characterization and monitoring:

CHANNEL WIDTH

Channel width is the number one critical dimension that must be controlled. Traditional line width or line-to-line vision measurement routines can be used with a high resolution camera, but the image analysis must account for edge roughness and grain size to provide accurate measurements.





STRIPE HEIGHT

Stripe height of the printed ink is the second most critical dimension. Average uniformity is important for controlling resistivity, as are min and max heights and especially local maxima which can literally poke-through, creating an interlayer short. Depending on the ink, stripe height can be measured using an integral laser or white light interferometer with a spot size and resolution suited for the stripe dimensions. Area multi-focus (AMF) is an optical technique for profiling that offers high speed and significantly more data for accurate 3D characterization.

DEFECTS

Flash or blobs can create shorts which can reduce performance or even render devices inoperative. Because defects can occur anywhere on the device, high densities of edge measurements are needed to identify defects by location.

OVERLAY REGISTRATION

Comparing concentricity of interlayer targets for device registration in multi-layers to tolerances of plus or minus a few microns is also required. Standard optical measurement technique with shallow depth of field is needed for these measurements.

Flexible printed circuit manufacturing is in its early stages, with little or no standardization of the material sizes or form factors. It is highly desirable to choose measurement and inspection equipment which can serve both sub-scale R&D and pilot production today, and be extended to full scale production in the future. VIEW Micro-Metrology offers a full line of measurement platforms, ranging from small benchtop systems to large format systems which can be automated with roll-to-roll material handling. All VIEW Micro-Metrology systems offer the same optics, lighting, cameras and image measurement software, enabling pre-production systems to scale efficiently to full production in the future.

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