

How to use a digital microscope in Electronics

What to expect when going digital and how to choose the right microscope for your inspection needs

Introduction

Digital microscopes have become more and more popular within the Electronics industry due to them being digitally native, thus introducing new and smarter ways of using magnification as well as software and automations when soldering and/or doing PCB inspection tasks.

Compared to traditional microscopes, digital microscopes are also more comfortable to use, creating less tiring work stations for the operators with reduced PCB escape rates and annual customer returns as a result.

What's in this e-book?

In this e-book, you'll learn how digital microscopes differ from traditional microscopes and how other companies have benefited from using them for their visual inspection processes. You'll also gain insight into specific processes where digital microscopes can make a difference, not just for the individual operator, but also for the quality of your products and overall efficiency.

Lastly, we'll invite you to take a look at your existing inspection processes in light of the enhanced capabilities of a digital microscope and guide you towards finding the right digital microscope for your specific needs.

What is a digital microscope?

Digital microscopes are characterized by using a camera and optics to magnify and display a sample on a monitor instead of using eyepieces typically used on traditional microscope systems.

Digital microscopes, due to their optical design, not only provide a larger optical magnification range in comparison to traditional microscope systems, for example: 1.5x–53x, allowing for both broad overviews and detailed inspections on the same system. This versatility makes a single system suitable for various inspection tasks within the electronics industry, from gross inspection to minute components.

Lastly, digital microscopes are fundamentally a digital microscope vs an eyepiece-based microscope. Beyond resolving ergonomic constraints of eyepieces, this results in the camera being the core of the system and as such, lends itself instantly to assisting in photo documentation or the recording of inspections at the entire field of view, vs a subset or requiring additional hardware to be added to perform photo capture.

Digital microscopes offer new features

Digital microscopes also come with advanced auto-focus features that automatically adjust to ensure the best possible image clarity, and automatically, through its firmware, balance optical contrast and resolution through automatic aperture control. This reduces the need for manual adjustments and minimizes operator fatigue. It also provides more consistency and accuracy in operation across multiple users as the microscope itself is performing the microcopy.



Digital microscopes use a camera and optics to magnify and display a sample on a monitor.

Much more than magnification

By being digitally native, digital microscopes also bring automation, software, and assistance to the inspection or job at hand. Let's look at three examples in particular:

- **Augmented reality and presets:** Digital microscopes, by their nature of being digital, can easily incorporate digital augmented reality with work instructions, gauging, and more displayed directly for the operator. Instead of having to refer to separate instructions, it is possible to have the microscope itself assist additively to the inspection or task at hand. These features allow operators to overlay important information directly onto the microscope's display, providing real-time guidance and insights. For instance, operators can use the microscope itself to display measurement grids, comparison images, or defect libraries while inspecting a PCB. Presets can be configured for specific inspection tasks, ensuring consistent and repeatable results. By leveraging these systems and features, PCB manufacturers can enhance the accuracy and efficiency of their operations.
- **Firmware updates and evolves as needs change:** As with many of the smart devices we use in everyday life, digital microscope systems have the ability to receive periodic firmware updates, which can add or fix features that were not available when they were delivered. This can be particularly helpful if a customer needs change; for example instead of just magnifying the customer wants to add customized reticles that are rev-specific.
- **Integration with AI and software systems:** Perhaps one of the hottest topics of digital microscopes is AI incorporations. Some systems have their own bespoke AI platforms, and others which use generic USB 3.0 camera drivers are able to integrate, out of the box, with virtually any software, including any AI platform and other manufacturing software. Regardless of which software is used, this ability to integrate into AI and other software opens a world of possibilities for sophisticated automated inspection and data analysis to be used from simply documenting incoming material to offloading and automating inspections through the use of AIs.

By using these unique features, PCB manufacturers can introduce new production processes that are more efficient, standardized as well as more comfortable for the everyday microscope user.



BB Electronics, a Danish full-service EMS provider, uses digital microscopes from TAGARNO to save and share high quality documentation with customers when performing visual inspection of PCBs from the production line.

How to use digital microscopes in the Electronics Industry

Magnified viewing has long been an integral part of the electronics industry for a variety of processes. Below we'll go through the processes where digital microscopes are most commonly used and the benefits they create:

- **First article inspection:** Assessing the quality of randomly selected samples from a new production run. During this process, the monitor display allows multiple users to inspect the sample at the same time while also enabling easy documentation processes to create golden sample photos.
- **Quality assurance and control:** Examining conformal coating coverage with UV ring light accessories, ensuring alignment and placements of components on PCBAs with either in-line or off-line microscopes. Using software add-ons allows users to make measurements and annotations directly on the microscope as well as building an image library of golden samples that can be used as reference images during future inspections.
- **Repair and rework:** Reworking and soldering faulty PCBAs to correct issues identified during quality control. Before the rework can begin, users can use overlay graphics that outline all components on the PCBA to quickly search for and identify the specific component requiring rework. To perform high-quality soldering, users not only benefit from using a digital microscope with a truly live image with low latency. When using the microscope in combination with a footswitch that controls the magnification level and manual focus of the microscope, users are also able to work more efficiently and comfortably.

Performing more accurate, efficient and ergonomic inspections with multipurpose microscopes

Before going digital

Before switching to digital microscopes, MSL Circuits, part of the All Circuits group and one of Europe's leading subcontractors for the automotive industry, used magnifying lamps. But they needed higher magnification and has since discovering the many benefits of going digital invested in more than 20 digital microscopes for their highly automated lines.

Why MSL Circuits chose TAGARNO

After reviewing different options from multiple suppliers, the vast majority of the employees at MSL Circuits voted for the TAGARNO solution because of its user friendliness.

Today, MSL Circuits have more than 20 microscopes installed at their facilities, assisting them in multiple processes:

- Manual inspection of AOI rejects and component alignment
- Polarity inspection
- QFP inspection by changing the camera angle

Microscopes also improve ergonomics

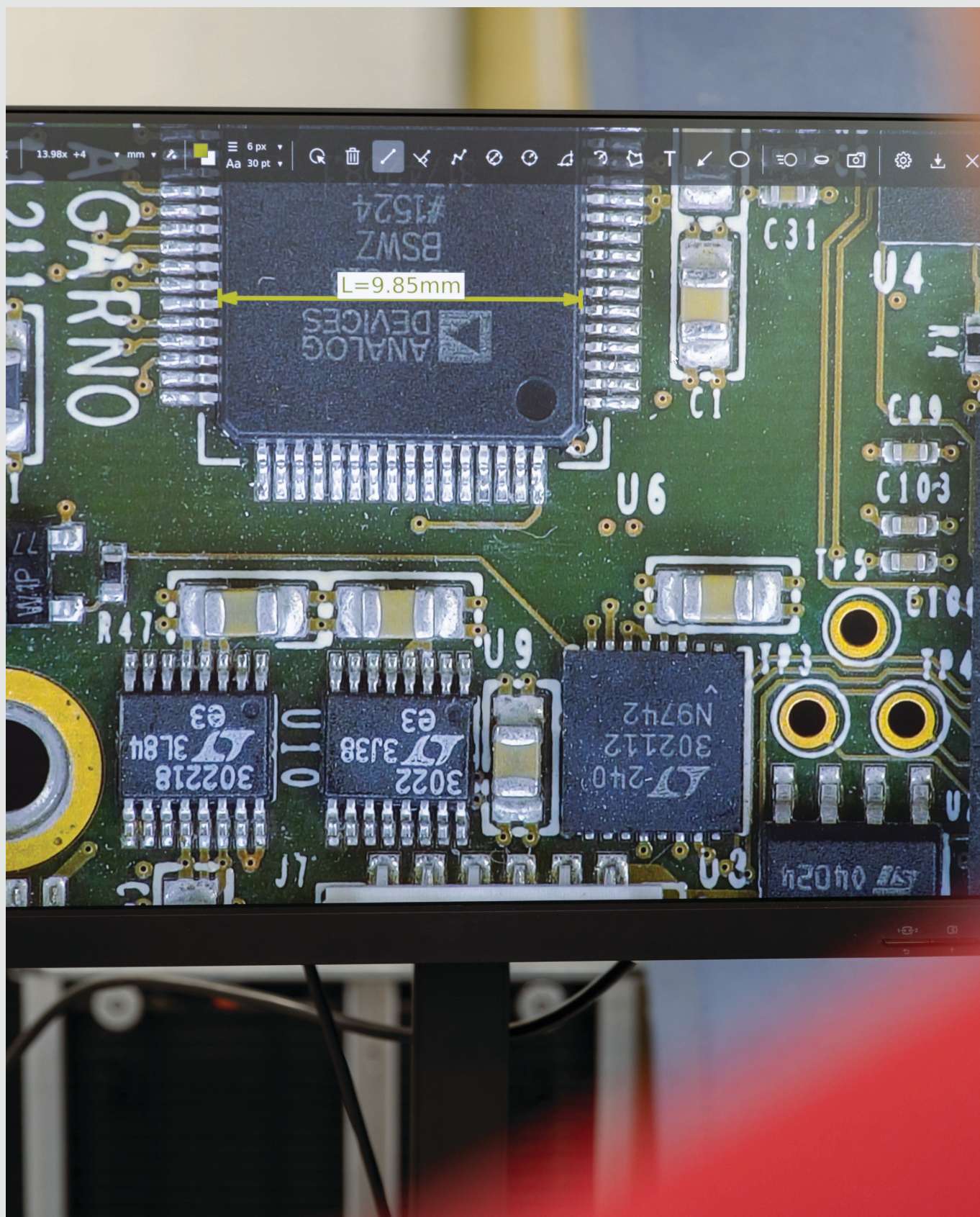
Besides providing insufficient magnification levels, the previously used equipment was uncomfortable to use as staff had to bend over the conveyor to inspect the boards. Today, the operators can use the digital display of the microscopes to maintain proper posture as they're inspecting PCBs.

All workstations with TAGARNO ZAPs at MSL Circuits are therefore designed to comply with ergonomic rules and principles for optimal comfort between workers and machines. This actively helps prevent musculoskeletal disorders, a common cause of work-related pain for microscope operators.



TAGARNO ZAP

Thanks to the separation of viewing and optics, the flex arm mounted TAGARNO ZAP can be installed over conveyors while the monitor is installed separately, offering increased comfortability for operators.



Using **digital microscope software** introduces new and more efficient ways of doing visual inspections. Here it's the TAGARNO Measurement app that can be used to perform highly accurate measurements directly on the microscope.

Which digital microscope is right for you?

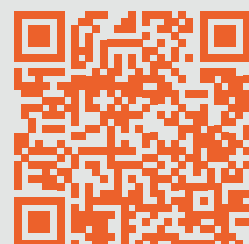
If you're ready to start your digital microscopy journey after reading this e-book, the next step is to figure out which microscope is right for you. To do so, we recommend asking yourself these questions:

- What magnification or field of view is required? Some microscopes offer multiple lenses for added flexibility in case of a high product mix or if you need to perform high as well as low magnification on a single system. Other microscopes only offer a single lens with a narrower but still broad magnification range.
- How often do you need to document your findings? By being built around a camera, all digital microscopes offer easy documentation processes. But there's still some differences to consider. If you have high documentation needs, it's best to choose a microscope with built-in image capture.
- What image quality do you need, 4K or FHD?
- Do you want to introduce automations, make on-screen measurements, build your own image library of golden samples or use overlay graphic to search for specific components on your PCBAs? If so, you need to explore microscopes with on-boards applications.

To see what TAGARNO, a Danish manufacturer of digital microscopes, offers, you can use the product filters on the TAGARNO website to find a microscope that meets your needs and will enable you to reap the many benefits of digital microscopy that range from ergonomic advantages to AI assisted inspections.

Find the right microscope

Scan this QR code to use the product filters on the TAGARNO website to find the right microscope for your needs.





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