

**Fraunhofer**  
IPM

# Track & Trace Fingerprint test stand

Perfect preparation for line integration

*The constraints for inline component tracing can be simulated and examined with the aid of just a few dozen components.*

Track & Trace Fingerprint makes use of the existing individual surface microstructure of components to enable marker-free component tracing. The camera system records a high-resolution image of the component's surface and converts it into a digital fingerprint, which is then linked to an individual object ID. For authentication at a later date, this process is repeated by taking an image of the very same component area and matching the newly generated fingerprint code to the codes stored in the database. The test stand offers the possibility of quickly and easily adapting the Track & Trace fingerprint process to the specific requirements of a production process.



The Track & Trace Fingerprint test stand enables users to easily review how the technology can best be used for specific components and process steps. The test stand makes it possible to use real components to determine the extent to which production steps affect tracing stability and to gain experience with the Track & Trace Fingerprint technology quickly and effectively.

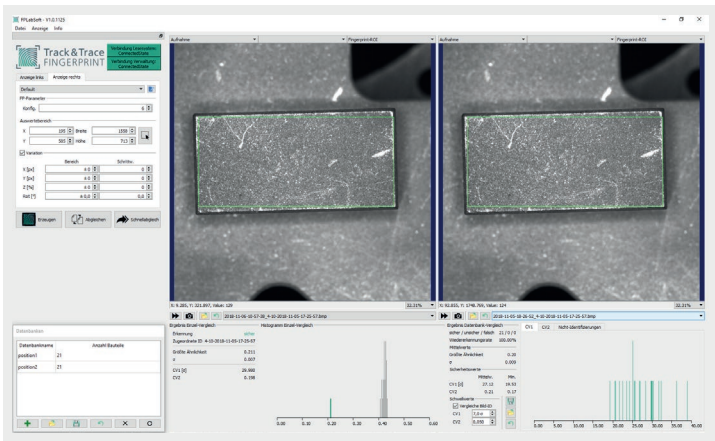
tested using the Track & Trace Fingerprint test stand, making it an indispensable tool for the integration of component-tracing technology into the production line.

## Successful integration into production lines

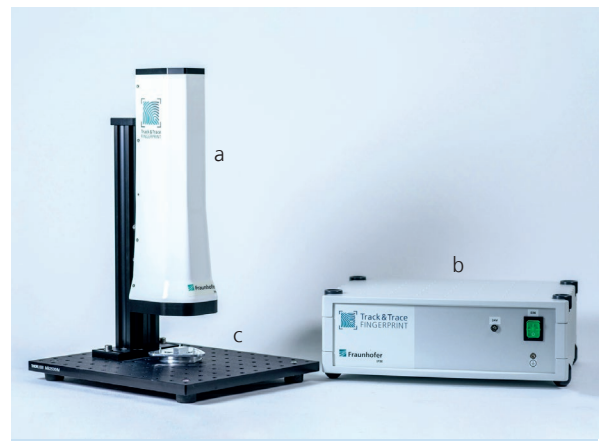
Track & Trace Fingerprint is already being used in industry for inline component tracing. Camera systems provide the images necessary to identify components in production. These systems are placed where important production parameters are set to be assigned to the individual components. A number of factors must be considered, including the mounting space, the handling systems, the rate of production, the environmental conditions, the amount of components in circulation and, of course, the component surface itself. All of these conditions can be

## Planning marker-free tracing under production conditions

Nearly all technical surfaces have unique features that can be used for tracing purposes – similarly to a human fingerprint. These microstructures and the changes they undergo in production can be analyzed using the Track & Trace Fingerprint test stand. The camera system (FP reader) and software (FP laboratory software) parameters can be adjusted for optimal recognition results. For example, the type of lighting used by the FP reader as well as its aperture, depth of field, field of view and evaluation position can be adjusted according to each individual component. The resulting findings enable precise planning for later use in the production line.



Graphical user interface of the FP laboratory software. This software can generate and display component images as well as compare the fingerprints created from them. The resulting statistical values are displayed in the lower third of the user interface, allowing suitable parameters to be established for the Track & Trace Fingerprint process.



Track & Trace Fingerprint test stand, comprising: (a) FP reader incl. camera, optics and lighting fixture; (b) control unit; (c) testing accessories comprising a breadboard and mountings for the camera system and the components to be analyzed. (A PC is also needed.)

### Minimal effort, maximal informative value

The FP laboratory software generates fingerprints based on camera images, saves and compares these fingerprints and calculates the statistics for the component recognition's reliability. The fingerprints can be read directly by the FP reader or generated from recorded images of the components saved on a hard drive. All statistical values can be exported and saved for further analysis, documentation and archiving.

A component's fingerprint must be generated on a specifically defined area on the component surface for recognition to work. Plus, in addition to suitable component or handling fixtures, image pre-processing is often necessary to compensate tolerances with respect to the positioning and orientation of the component area designated for authentication. The FP laboratory software includes a simple imaging pre-processing program that allows high-contrast component edges to be used for the software-based positioning of the area to be evaluated. Images pre-processed by other image processing tools can also be read and analyzed.

### Instruction and support in the commissioning process

The Track & Trace Fingerprint test stand makes it possible to set the constraints for using the Track & Trace Fingerprint technology for specific components and process steps as well as to determine the necessary handling accuracy. Only a few dozen components are needed to ensure a reliable result.

Fraunhofer IPM supports companies who want to use this technology in the commissioning process and provides detailed instruction to the employees. Based on the foundation of substantiated test results, Fraunhofer IPM works together with users to develop and integrate a complete system for enabling the marker-free tracing of components in the production process.

### Track & Trace Fingerprint systems



Authentication in the production line  
Permanently installed reading system



Authentication on the production site  
Cordless reading system for robust component detection



Authentication via smartphone app  
Quick and easy to use



Optimum preparation for the use of  
Track & Trace Fingerprint  
Test stand for purchase or rental

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