



F-Scanner

Inspection of surface cleanliness, lubrication and coatings

Spatially resolved, fast, high-precision

Residual contamination or coating – organic substances exhibit fluorescence when exposed to UV light. The intensity of the emitted light is proportional to the layer thickness.

The quality and functionality of products are determined by the quality of their components' surfaces. This entails high demands on surface coatings and cleanliness and accordingly the need for powerful monitoring methods. Fraunhofer IPM's fluorescence-based laser scanners inspect surfaces directly in production or in the lab.

Fluorescence reveals hidden details

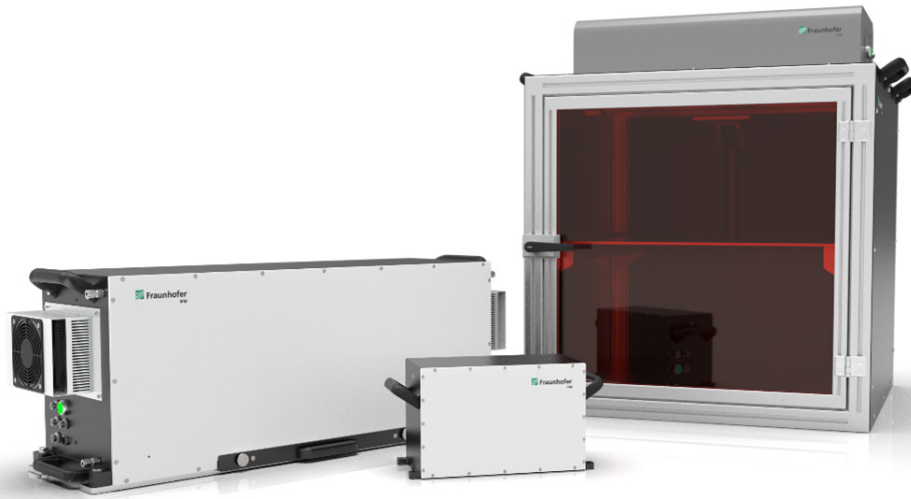
The F-Scanner inspection systems scan surfaces rapidly with UV laser light. Most organic compounds, in particular lubricants, corrosion inhibitors, adhesives and release agents, exhibit strong fluorescence activity at these wavelengths, i.e. they convert a fraction of the UV light into visible light. This fluorescence emission can be measured unambiguously and with high contrast by means of spectral filtering and sensitive detection. This allows organic substances to be detected even on the few milligrams per square meter level – whether it is a contamination or a functional coating. Fraunhofer IPM combines imaging fluorescence measurement and laser scanners for various applications:

- Detecting unwanted residues of lubricants, corrosion inhibitors, adhesives, release agents, or photoresists
- Analyzing oil films on strip metal and sheet metal blanks
- Monitoring functional coatings

Unlike spot measurements, the F-Scanners by Fraunhofer IPM enable spatially resolved 100-percent inspection of large surfaces. From the millions of data points, a high-resolution map is generated that reflects the distribution of organic substances on the surface. Thanks to its collimated laser beam, the system features a large depth of field, which enables the reliable inspection of roll stock and parts with complex geometries.

Advantages at a glance

- Spatially resolved 100 percent surface inspection
- Suited for fast moving large or complex components
- Flexible integration into production lines
- Automated image processing
- All-digital documentation for quality assurance
- Clear and intuitive user guidance
- Full CE documentation



The F-Scanner product line:
F-Scanner 1D (l.), F-Scanner
1Dmini (m.), F-Scanner 2D (r.)

System concept to match the task

The F-Scanner is offered in two versions for different applications:

- The **F-Scanner 2D** scans the surface in two dimensions generating a complete image of the coating or contamination. This makes quantitative analysis of the surface coverage possible for the first time, even for free-form 3D objects. The system is suitable for pre-inspection, for flexible quality assurance of batch components and for online monitoring in production lines. (Further information see data sheet F-Scanner 2D)
- The **F-Scanner 1D** is optimized for measurement of components in motion, e. g. components on conveyor belts or strip metal. The inline inspection system scans the component surface rapidly perpendicular to the direction of motion. Even at speeds of several m/s, the surface is recorded with millimeter resolution. With its F-Scanner 1D_{mini}, Fraunhofer IPM offers a version for robot-based inspection of large and complex components. (Further information see data sheet F-Scanner 1D/1D_{mini})

Quantitative results thanks to calibration

By correlating the optical signal to the amount of the substance to be detected, these systems enable quantitative measurements of the coating layer thickness or amount of residues, respectively. This calibration involves referencing the signal to a precise weighing or infrared measurement, for example.

Image processing for process control

Automatic image processing is an essential part of Fraunhofer IPM's fluorescence measuring systems. The fluorescence image is evaluated automatically in real-time by means of pattern recognition. If contaminations exceed the defined limit or coatings deviate from the specified value, the software alerts the user or transmits a message to the plant. This is how spatially resolved evaluation helps to ensure optimum performance, documentation and thus long-term optimization of production workflows.

Typical system properties

Fluorescence excitation	Typ. 405 nm
System dimensions (L×W×H)	F-Scanner 2D: 70 × 60 × 55 cm ³ F-Scanner 1D: 27 × 95 × 35 cm ³
Detection limit	Typ. < 0.01 g / m ²
Inline-capable pattern recognition	Measurement of the position, shape, and / or amount within a few milliseconds
Detectable substances	Processing agents, e.g. oils, fats, organic coatings

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