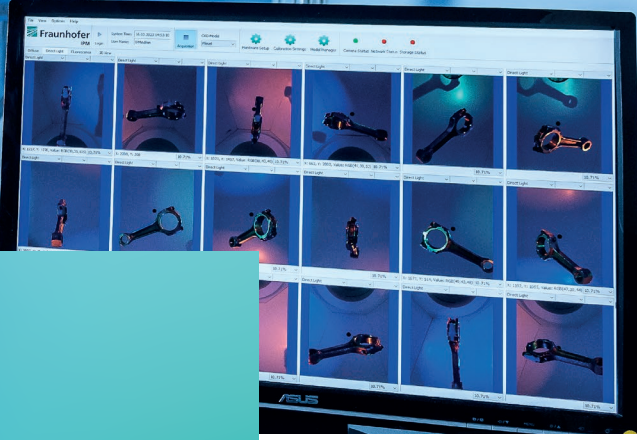


# Inspect-360° F

## Multiperspective fluorescence inspection

Detecting cracks, impurities or coatings in free fall



The Inspect-360° F inspection system records components from all sides in free fall using several cameras. This is how 100 percent of the components' surface are captured in a single recording step.

Non-destructive testing of surface properties under UV light is employed in a wide range of applications, from the detection of cracks and overlaps using fluorescent markers, to coating inspection and cleanliness testing. Often, it is even necessary to inspect all component faces, which until now required additional handling steps, since the components are typically positioned on a carrier or conveyor belt. The free-fall inspection system Inspect-360° F from Fraunhofer IPM inspects the entire component surface – without any component handling at all.

### No need for component handling

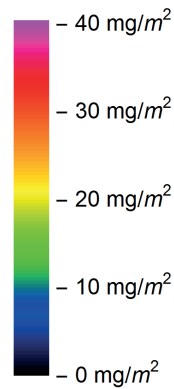
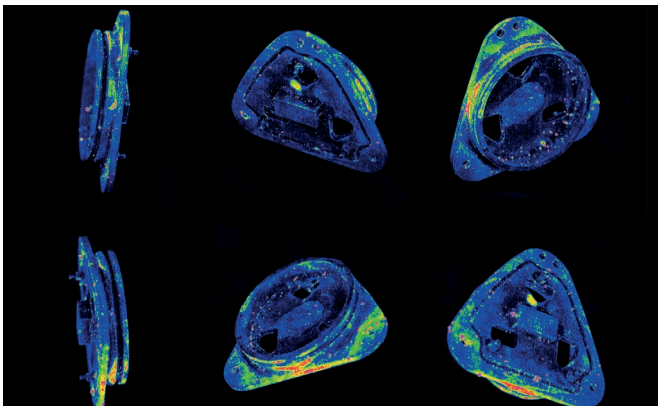
Systems for component testing are faced with two major challenges: On the one hand, the variety of components increases handling costs. On the other hand, the requirement to qualify the entire surface of all parts during the production confronts automatic image processing with almost unsolvable problems. That is why the Inspect-360° F inspection system follows a completely new approach: The multi-camera system inspects the entire component surface in free fall – entirely without handling.

### Fully automated surface testing

The Inspect-360° F system inspects the entire surface of components and bulk material such as forming, stamping, forging, or cast parts completely from all sides. The component is conveyed into the system through an aperture from above. As it passes a light barrier, several UV-LEDs are switched on to illuminate the object from all sides. Simultaneously, several

cameras record the component in free fall from different perspectives, capturing its entire surface in a single process step. Organic substances fluoresce under UV-lighting in the visible wavelength range and can be detected by the cameras spatially resolved and with high sensitivity.

Impurities such as oil drops and residual filmic coatings are captured quantitatively. Layer thickness or mass coverage can be exactly specified. While fluorescence is being measured, conventional images of the object are recorded that capture its orientation. Based on these images, a type recognition is performed via CAD data matching while at the same time the component geometry is measured. A mapping of both procedures allows the local assignment of the fluorescence signals and thus an imaging representation of the organic substances on the object surface (fig. page 2). In Penetrant and Magnetic Testing, the additional information on component geometry helps to reliably identify the indicated cracks and reduce pseudo-rejects.



*Inspect-360° F detects organic substances such as in filmic contaminations using fluorescence. Matching the measurement values with the CAD component data allows the imaging representation of impurities on the object.*

### Intuitive evaluation and direct adjustment of process parameters

The results are provided in an easily analyzable form. Faulty areas are identified quickly and intuitively, so that process parameters can be directly adjusted. With the Inspect-360° F inspection system, an "accept / reject" conclusion with regard to the specific component and requirements can be made within one second. The criteria for this can be adapted to specific objects and adjusted for different surface properties. In addition, the automated analysis of the measuring results can be restricted to selected areas of the component surface, so that only those areas relevant for assessment, such as sealing surfaces or joining surfaces, are examined.

### Simple integration, high cycle times

Inspect-360° F inspects components simultaneously from many different perspectives. This eliminates the need to precisely position the test object in front of a sensor in different orientations, which involves considerable effort in handling. The test objects can be fed into the Inspect-360° F system by a robot or a conveyor belt, for example.

Inspect-360° F can inspect a broad variety of components with virtually no restriction regarding their complexity, provided that

#### Typical system properties

Detection limit (according to BAM K009 lubricating oil)	10 mg/m <sup>2</sup>
Spatial resolution of the imaging procedure	100 µm
Cycle times	Approx. 0.5 s
Maximum detectable object sizes (adjustable for larger components)	Up to 10 × 10 × 10 cm <sup>3</sup>

*All specifications and features are subject to modification without notice.*

the surface is optically accessible. Even with a high diversity of parts, there is no need for mechanical adjustment, which is usually complex and expensive. All that needs to be done is to input CAD component data into the data base.

Given a cycle speed of up to one object per second – including complete inspection and analysis of the results – the system can easily be integrated into production processes. This makes Inspect-360° F ideally suited for a wide range of inspection tasks: The cleanness of clean room and vacuum components as well as the partial purity for joining, adhesion or sealing surfaces can be examined, as can the completeness of coated friction and protection layers for which the layer thickness needs to be measured.

### Other free fall systems of the Inspect-360° product line

In addition to fluorescence inspection with the Inspect-360° F system, components can be inspected for dimensional accuracy and defects with the Inspect-360° MP and Inspect-360° HR inspection systems.

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