

# fastmicro

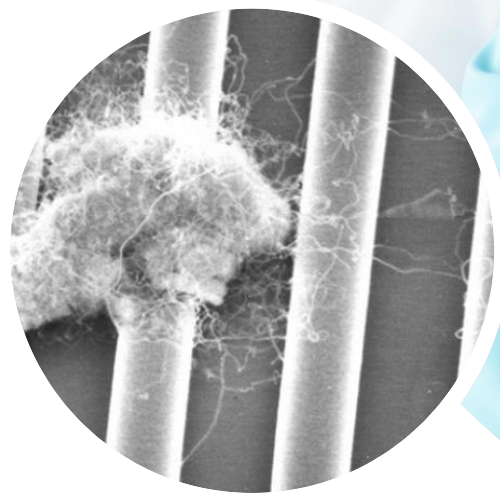
cleanliness control

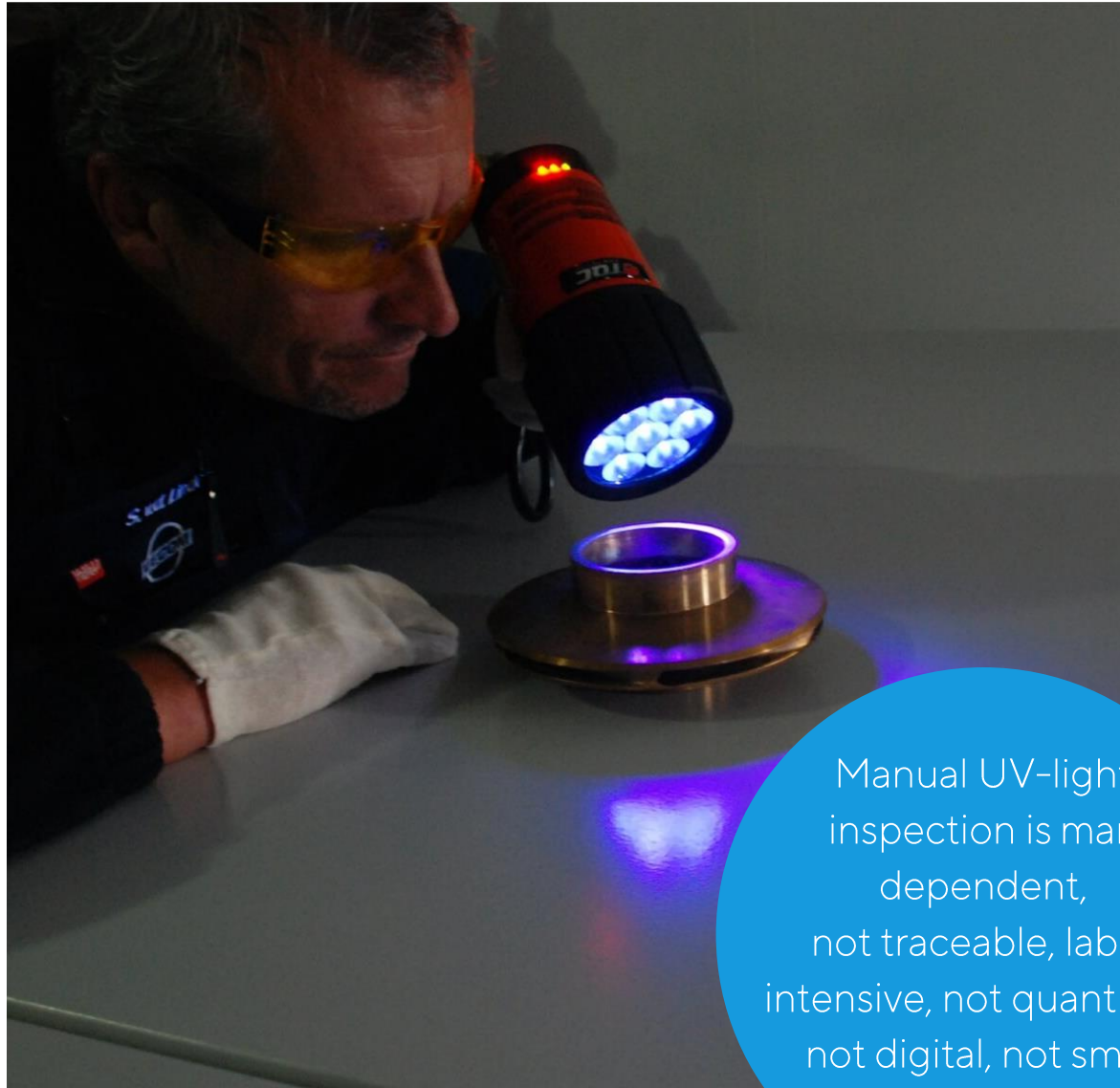
**Introducing the new standard in surface  
particle contamination measurements**

Erik Vermeulen, CEO Fastmicro  
Semicon Europe  
17th October 2021

# Global challenges and trends in microtechnology

- Dimensions reducing
- Cleanliness requirements increasing
- Particle defectivity arising, causing yield challenges





Manual UV-light inspection is man dependent, not traceable, labor intensive, not quantified, not digital, not small enough



Airborne measurements are not measuring where the problem is, at the surface

Need for metrology solutions  
with the right throughput, objectivity and sensitivity  
towards improved cleanliness control

**How can we solve this?**

# Surface particle measurements at microscale

At Fastmicro, we believe you can accomplish breakthroughs in cleanliness control with fast, quantified and easy to operate surface particle measurements



# So our process engineers can accomplish breakthroughs in cleanliness control

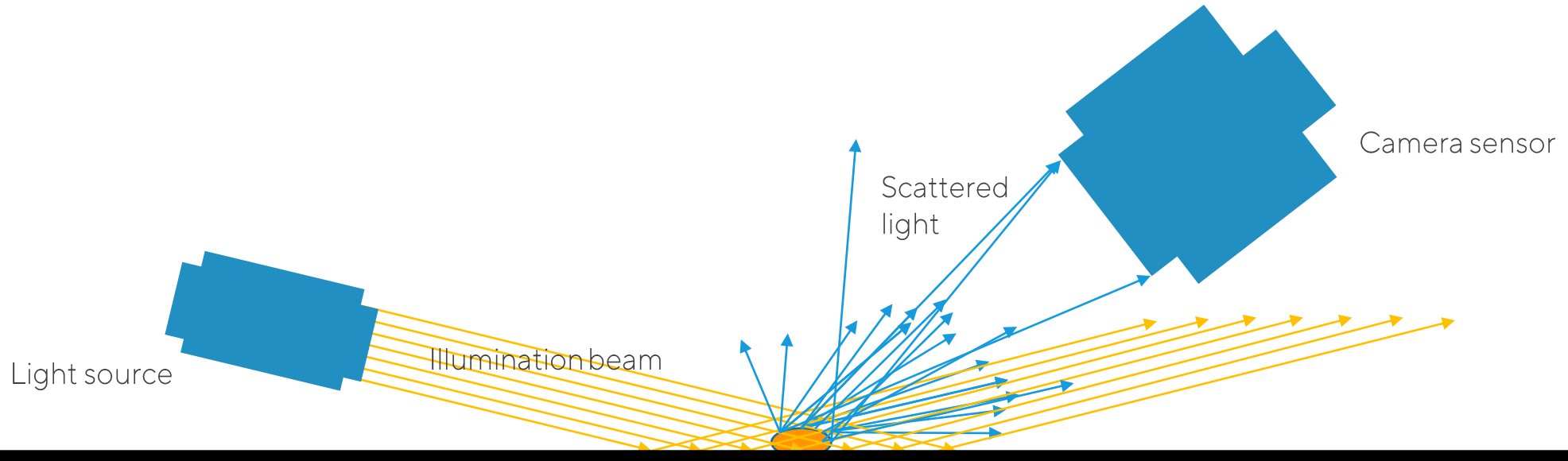
Our innovations enable process quality engineers to take reliable decisions on where and how to improve the cleanliness processes and deliver consistent quality products. And ultimately, reach high equipment performance for their end users.



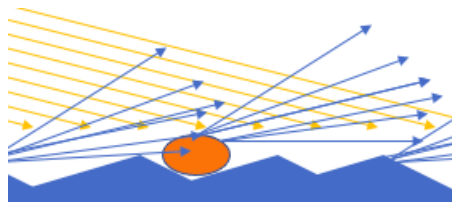
## The technology: Mie scattering metrology



# The technology: Mie scattering metrology

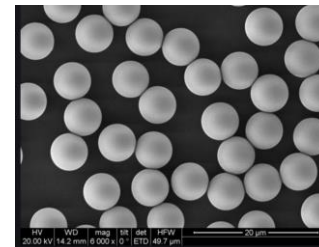


Designed for smooth surfaces



Size calibration on PSL particles

Shape & optical properties





# Surface particle measurements at microscale



## Fast

Imaging in seconds



## Quantitative

Measurement and qualification reports



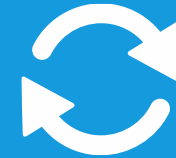
## Easy to operate

Operator independent



## Accurate

High-resolution measurement (quantity, position, size)



## Consistent

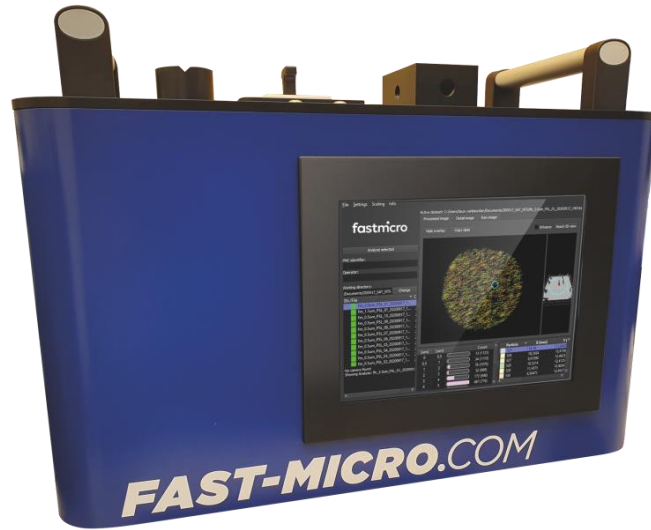
Objective measurements, time after time



## High throughput

Processing in less than a minute

# Products



Fastmicro  
Sample Scanner



Fastmicro  
Product Scanner

# Fastmicro product scanner

- Direct measurement on big surfaces
- Modular for any product
- Applications
  1. Pellicles, front and back
  2. Reticle blanks and back
  3. Wafer blanks and back
  4. Displays, including cracks detection



Fastmicro Product Scanner manually operated



Fastmicro Product Scanner automated

# Fastmicro product scanner performance specifications

<b>Fast</b>	<ul style="list-style-type: none"> <li>Imaging in seconds on surfaces of any size</li> </ul>
<b>High production throughput</b>	<ul style="list-style-type: none"> <li>Processed in a few minutes, depending on the number of particles</li> </ul>
<b>Scanning area</b>	<ul style="list-style-type: none"> <li>Modular design for an unlimited scanning area in one measurement</li> <li>Per scanning head 5.5" field of view</li> </ul>
<b>Accurate measurements</b>	<ul style="list-style-type: none"> <li>Detection limit from 0.5 <math>\mu\text{m}</math> PSL particles</li> <li>Sizing accuracy within 20% with PSL particles</li> <li>Location accuracy 80 <math>\mu\text{m}</math>, location repeatability 30 <math>\mu\text{m}</math></li> </ul>
<b>Data output</b>	<ul style="list-style-type: none"> <li>Quantity, position and size of particles</li> <li>Analysis, reporting and export functions, including standard bin sizes, KLARF and Excel files</li> <li>Annotated image with particle detection overlay</li> <li>Optional qualification report in UI and pdf, according to ISO standard 14644-9</li> <li>Optional connection to database through XML</li> </ul>
<b>Ease to operate in manufacturing</b>	<ul style="list-style-type: none"> <li>Operator independent</li> <li>Automated version available with filling stations, robot arms, package openers</li> </ul>
<b>Clean: no contact - no contamination</b>	<ul style="list-style-type: none"> <li>No contact with measurement area</li> </ul>
<b>Front side/back side/holes classification accuracy (e.g. for pellicles)</b>	<ul style="list-style-type: none"> <li>&gt;99% (PSL equivalent <math>\geq 0.5 \mu\text{m}</math> and <math>\leq 20 \mu\text{m}</math>)</li> </ul>
<b>Requirements on product</b>	<ul style="list-style-type: none"> <li>Roughness Ra &lt; 50 nm</li> <li>Flatness</li> </ul>
<b>Model</b>	<ul style="list-style-type: none"> <li>FM-PS-PRS-V01</li> </ul>

Listed performance specifications are valid for areas that are not effected by straylight or shading caused by the product carrier.

## Fastmicro sample scanner

Fast: imaging in seconds  
throughput < 1 minute

### With card sampler holder, for indirect measurements

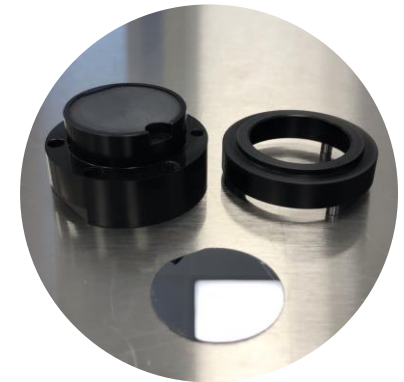
- From 500nm
- 16mm diameter particle collection area
- Even relative rough and curved surfaces
- Even places difficult to reach
- Any place, any time

### With 1" wafer holder, for particle fallout measurements

- Batch driven (also real time available)



Card sampler holder



1" Wafer holder

# Fastmicro product scanner performance specifications

<b>Detection limit</b>	<ul style="list-style-type: none"> <li>From 0.5 µm PSL particles</li> </ul>
<b>Sizing accuracy</b>	<ul style="list-style-type: none"> <li>Within 20% with PSL particles</li> </ul>
<b>High production throughput</b>	<ul style="list-style-type: none"> <li>Imaging in seconds; processed in less than 30 seconds for 225 mm<sup>2</sup> sample area with 500 particles; operator workflow in a less than a minute</li> </ul>
<b>Data output</b>	<ul style="list-style-type: none"> <li>Quantity, position and size of particles</li> <li>Analysis, reporting and export functions, including standard bin sizes, KLARF and Excel files</li> <li>Annotated image with detection overlay particle and the '3D' signal representation of the by the operator selected particle</li> <li>Data exchange via USB, or via an ethernet option</li> <li>Optional qualification report in UI and pdf, according to ISO standard 14644-9</li> <li>Optional connection to database through XML</li> </ul>
<b>Reproducibility</b>	<ul style="list-style-type: none"> <li>90% when replacing a sampler, with PSL particles from 0.5 µm</li> <li>Also as repeated result between scanners</li> </ul>
<b>Size &amp; weight</b>	<ul style="list-style-type: none"> <li>Scanner size 615 x 300 x 460 mm, weight 16 kg</li> <li>Transport packaging: size 710 x 530 x 670 mm, weight 45 kg</li> </ul>
<b>Nondestructive – no cross contamination to samples</b>	<ul style="list-style-type: none"> <li>Nondestructive: measurements can be repeated</li> <li>No contact with measurement area</li> <li>No cross-contamination due to sampler</li> <li>No particle generation by the scanner in the measurement area (no moving parts)</li> </ul>
<b>Requirements on sampler and sample handling</b>	<ul style="list-style-type: none"> <li>Above scanner requirements can only be achieved with the use of certified samplers</li> <li>Sampler contamination levels must at least be 10 times lower than the qualification level of the customer Combined use in clean environment, i.e. cleanroom ISO 7 or better Standard with card sampler holder for indirect measurement               <ul style="list-style-type: none"> <li>- Fit for Particle Measurement Cards (PMC 2.0 in a box, as certified by partner)</li> </ul> </li> <li>Optional with 1" wafer holder, for particle fallout measurements</li> </ul>
<b>Model</b>	<ul style="list-style-type: none"> <li>FM-PS-SAS-V01</li> </ul>

# Launching customer testimonial

Fastmicro has transformed our inspection capability business significantly. Before migration to this new inspection tool, we saw a 50% variation in the particle count measurements. This is now reduced to less than 10% in combination with a particle detection limit that went down significantly by more than one order of magnitude to **500 nm**. We have confidence in the Fastmicro scanner to help us with finding an excellent quantification of the surface cleanliness of critical parts.

As valued customer, I know that the integration of Fastmicro, has allowed us to **reach our required machine defectivity performance**.

Besides **accurate measurements**, the tool offers **ease of use** and **high throughput** features. We appreciate the **professional service and collaboration** with Fastmicro to extend the capabilities of the tool further in the future.

Dr. Ir. L.H.A. Leunissen  
ASML, cleanliness project manager

# fastmicro

cleanliness control

[www.fast-micro.com](http://www.fast-micro.com)