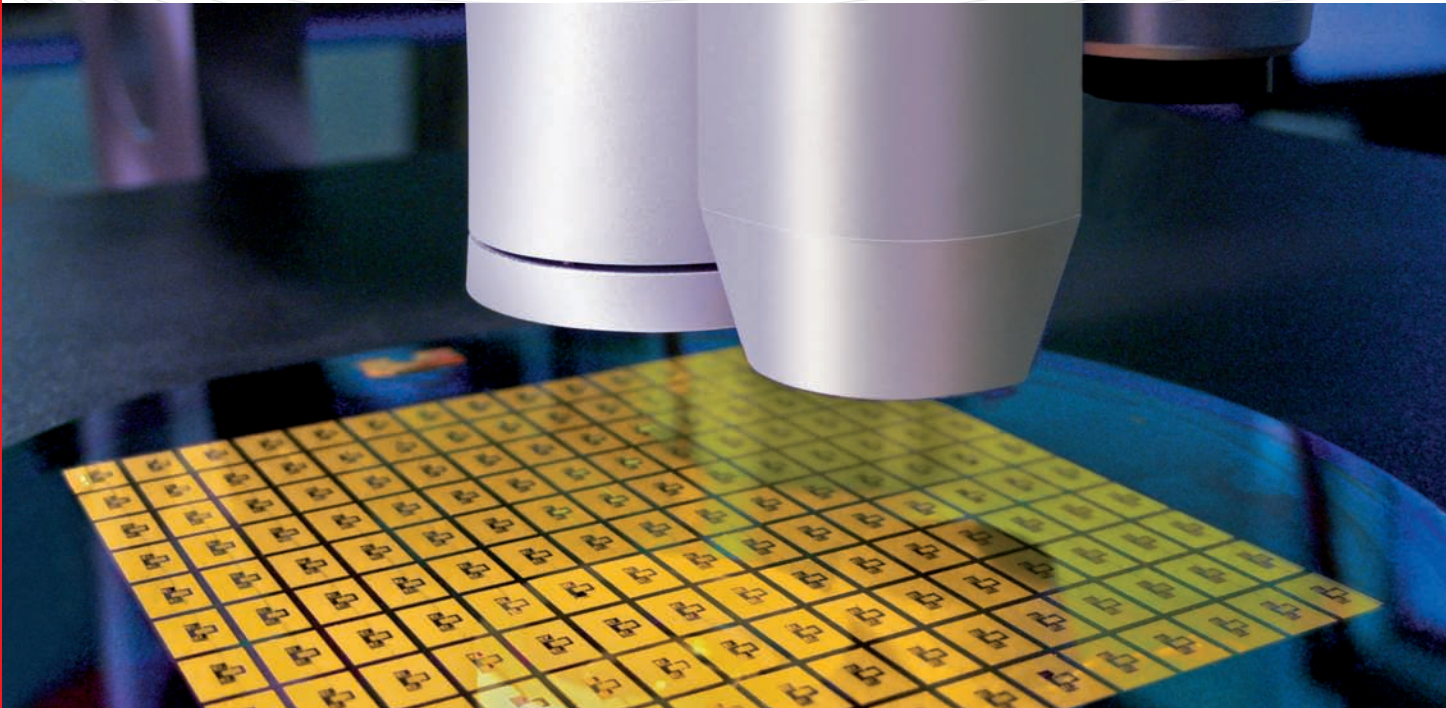


# Non-Contact Multisensor Surface Metrology

For Manufacturers in the MEMS Industry



STEP HEIGHT WIDTH  
TTV RADIUS LENGTH DEFECTS  
PROFILE FILM THICKNESS  
TOPOGRAPHY  
PLANARITY ROUGHNESS

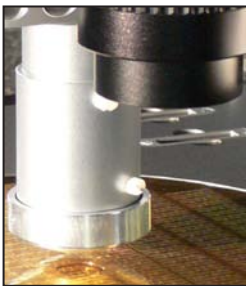
SINCE 1995,  
FRT HAS BEEN SERVING THE  
INDUSTRY WITH HIGHLY PRECISE  
METROLOGY SYSTEMS BOTH  
MANUALLY OPERATED AND  
FULLY AUTOMATED.

# Surface Metrology

**MEMS components have revolutionized today's products by making them safer and adding exciting new features. They detect pressure, temperature, velocity and more in cars, cell phones and other consumer products. In labs and production they are used to quantify mass flow, analyze chemical composition and to conduct experiments with labs-on-a-chip or micro heat engines. MEMS mass production is based on semiconductor production equipment – including non-contact, high-resolution metrology tools for 2D and 3D wafer inspection from FRT.**

## Application Versatility

Multisensor technology is the key



Multisensor Configuration

Advanced metrology tools need to be flexible, upgradable, and future orientated. This is why we developed the FRT *Multisensor* concept which allows you to adapt your measuring tool to your needs as applications evolve. Just imagine the advantages of a tool

that combines several measuring methods such as e.g. confocal microscopy, chromatic aberration, interferometry and atomic force microscopy in one powerful system. Along with over 13 years of metrology experience at FRT, we offer micro- and nanometer measuring tools for your specific requirements!

## Product Versatility

Solutions for labs and fabs

FRT offers a complete line of surface measuring systems. The entry-level system *MicroSpy® Topo* incorporates three of the most requested measuring tasks

(roughness, contour, topography) in a high-performance metrology tool. For even more sophisticated applications, FRT *Multisensor* metrology systems like the *MicroProf® 200* and *MicroProf® 300* can be customized based on individual software and 25 different sensors.

In the fab, FRT's *MicroProf® MFE* systems offer measuring capabilities with state-of-the art automation including wafer handling, EFEM and SECS/GEM as well as full application versatility through *Multisensor* technology.

**VTI**   
TECHNOLOGIES

*"The FRT MFE system is a valuable asset supporting our product roadmap. Customer specific applications in high-volume manufacturing are not an easy task but FRT has the ability to listen to their customers and fulfil their needs without compromise."*

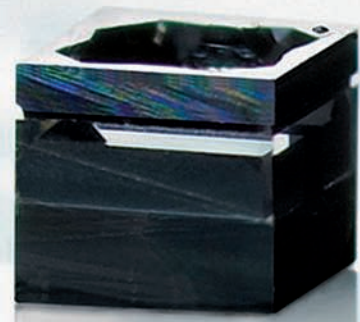
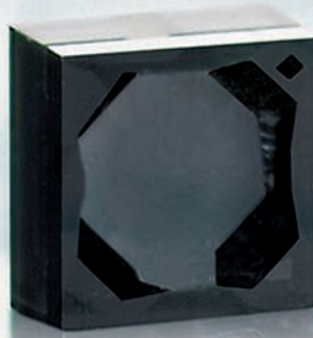
Henrik Leskinen, Equipment Control Manager of VTI Technologies

## Professional Support

Understanding your needs

Beside building hard- and software, a comprehensive solution consists of additional value added services and superior technical support. FRT has a global network of subsidiaries and distributors to provide on-site support and training for the operation of far more than 300 installed systems around the world.

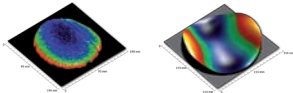
We recently introduced an exciting new mode of direct technical support. By means of the easy-to-use internet based *FRT Remote Support System*, our in-house experts can not only tell but also can show you how to solve your questions, no matter where you are located in the world!



MEMS-based pressure sensing elements.  
By courtesy of VTI Technologies, Finland.

# Solutions from the Lab to the Fab

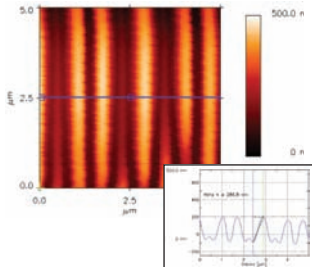
1



Wafer No.	Parameter						
	TTV	TIR	LTV	PLTV	LTIR	PLTIR	LFPD
1	2.746	2.719	2.525	100.0	2.515	62.7	-1.47
2	4.741	4.706	2.746	82.6	2.671	62.7	-1
3	15.040	12.866	4.116	0.0	4.109	0.0	3

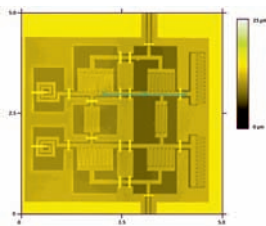
**Left:** 3D measurement of wafer thickness and total thickness variation (TTV). **Right:** 3D topography of wafer bow. **Bottom:** SEMI compliant TTV, thickness and flatness parameters of wafers. The measurements were made with two opposing chromatic sensors in the FRT *MicroProf*<sup>®</sup> TTV system, controlling the quality of various process steps in the fab.

2



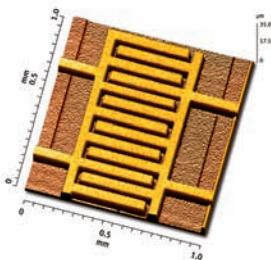
Atomic force microscopy image and corresponding profile measurement of a micro lens array. The measurement was conducted with the high precision *MicroGlider*<sup>®</sup> AFM metrology system. The depicted structures were investigated for verifying the aspheric radii of the single lenses and for quality check of the surface roughness.

3



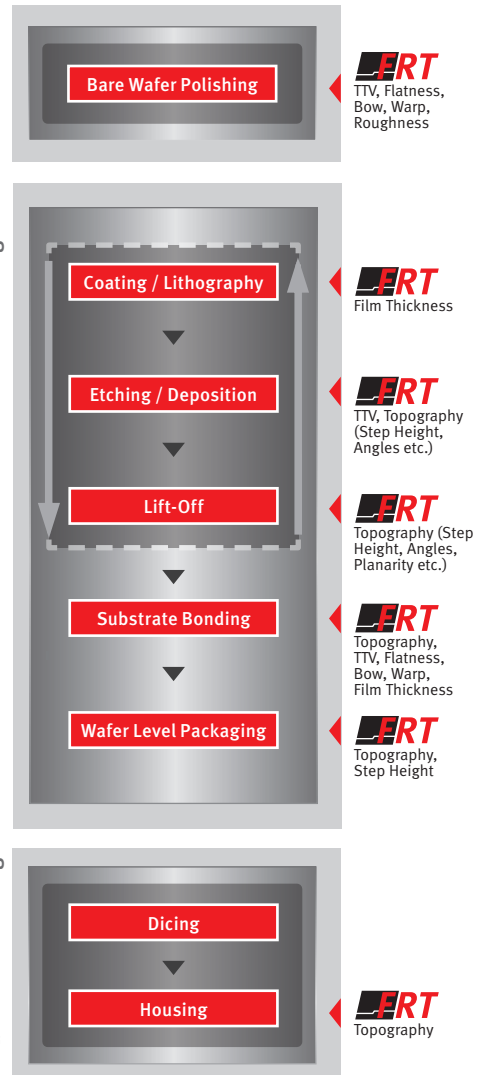
3D topography measurement of a single wafer die. This measurement is one out of a series of fully automated wafer inspections made with the metrology system *MicroProf*<sup>®</sup> MFE. By using a *Multisensor* configuration, it is possible to quantify several different parameters such as step height, planarity, roughness, film thickness, membrane bow, cavern depth etc. with just one inspection tool in the fab.

4



3D topography measurement of a MEMS taken with the *MicroSpy*<sup>®</sup> *Topo*. The system is used in research & development as well as production to quantify the height and width of finger structures and the roughness of substrate and coatings.

## Wafer Maker / Reclaim



# Current FRT Customers

**Avago Technologies**

**IBM**

**EV Group**

**Infineon**

**Bartels Mikrotechnik**

**Lexmark**

**Boehringer microParts**

**Sony**

**VTI**

**Technologies**

**Bosch**

**REC ScanWafer**

**SIEMENS**

**ASE**

**Philips**

**EPCOS**

**First Sensor Technology**



## MicroSpy® Topo

High-performance metrology system based on confocal microscopy. The system measures roughness, profile and topography.

- non-contact metrology
- confocal sensor
- stitching
- awarded with the German Industry Prize 2008

## MicroProf® Multisensor Tool

Multisensor metrology tool for roughness, profile, topography, film thickness and more.

- non-contact metrology
- multisensor capable
- automated measurements

## MicroProf® Multisensor Production Tool

Multisensor metrology tool for roughness, profile, topography, film thickness TTV and more.

- non-contact metrology
- multisensor capable
- protective enclosure
- automated measurements

## MicroProf® TTV

Multisensor metrology tool with automatic wafer handling for the measurement of roughness, profile, topography, film thickness, TTV and more.

- non-contact metrology
- fully automated handling
- open cassettes
- SECS/GEM interface
- SEMI compliant

## MicroProf® MFE Bridge Tool

Combined 200 and 300 mm wafer metrology tool for front-end use. Its multisensor capability allows the measurement of TTV, profile, roughness, topography, film thickness and more.

- non-contact metrology
- fully automated mini environment (EFEM)
- handles FOUP or SMIF
- SECS/GEM interface
- SEMI compliant

**Sensor options:** chromatic point sensors, film thickness sensors, white light interferometer, confocal microscope, atomic force microscope

With compliments from your local FRT distributor.

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