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VISITEC
VISITEC
Technology with a Vision.
Your vision, our vision.

Who we are

VisiTec Microtechnik GmbH is technology with a vision; we are an innovative company with the capability and technical expertise to develop breakthrough state-of-the-art products and applications in Vacuum Technology and Electron Optics.

Whether we have envisioned a new application that will impact positively in the engineering and materials science world, or we are approached to develop an innovative idea, our team of qualified engineers can make it possible.

Founded in 1994, the breakthrough project that marked the birth of our company was the development of the Large Chamber Scanning Electron Microscope (LC-SEM), developed by VisiTec's founder and President, Martin Klein. The prototype was shown in the Hannover Industrial fair of 1995, attracting the attention of many researchers and scientists from the Engineering and Materials Science community. Since the beginning, the LC-SEM has been a product of interest for many types of test in a wide range of industries, from Archeology to Aerospace. The company's first ventures where supported by various important partners and collaborators, creating a solid foundation for the future. VisiTec experimented a positive growth in the next years, hiring more experienced Engineers and Technicians and expanding the physical facilities, moving to the actual location in Grevesmühlen, where a complete design and manufacturing process takes place.

Our vision is to never stop creating. With the expansion of our borders and the creation of our sister company VisiTec of America LLC in Knoxville, Tennessee in the beginning of 2007; the company is now able to expand the geographic reach of its products and services to the American market and satisfy the needs of our actual and future customers.

Where we are

Locations of offices and customers of VisiTec

VisiTec Microtechnik GmbH is the headquarter of the group and manufacturing facility of MIRA, the Large Chamber SEM. Located in Grevesmühlen, northern Germany, just one hour east of Hamburg. In this facility, over 20 Engineers and Technical experts work in new developments of products and services for our new and future customers.

VisiTec of America LLC is the main office for the American operations of the group, located in Knoxville, Tennessee, USA. With a centric location, we offer services and first-hand technical response for the actual and future LC-SEM users in the USA, as well as all the products and services developed by the group.

Location of MIRA Users

Aachen, Germany
Bremen, Germany
Braunschweig, Germany
Dortmund, Germany
Erlangen-Fürth, Germany
Hannover, Germany
Tsukuba, Japan
Oak Ridge, Tennessee. USA
Oklahoma City, Oklahoma, USA

MIRA Expand Your

The Large Chamber Scanning Ele

The ultimate tool for

Does your sample have to go into service after being tested?

Do you have to perform quality control on 100% of your production?

Does your sample have a value such that it cannot be destroyed for any type of analysis – Forensic, Failure Analysis, Archaeology?

Does your application/process become more valuable if it would be possible to have in-situ SEM Testing?

One of the most confronted challenges in materials science, when using scanning electron microscopy, is the limitation of the size of the sample tested. Normally, only small samples in the order of ten to the hundred millimetres in diameter can be investigated. This limits the samples that can be analyzed by using this important testing technique.
MIRA, The Large Chamber Scanning Electron Microscope (LC-SEM) developed by VisiTec Microtechnik is an answer to overcome this and many other challenges in non-destructive testing. The LC-SEM can accommodate samples up to 1500mm in diameter due to the size of the vacuum chamber and the Extended View capabilities of the optic system.

Top of the line Vacuum Chamber and Vacuum System

The chamber, which can be designed in the size the customers application requests, is built to achieve a maximum of high vacuum @ 10^{-6} mbar, with the work of the powerful Vacuum System that consists of three pumps: rotary vane and rotary lobe pumps for low-vacuum applications and a powerful Turbo pump for operation in high vacuum. This system has sufficient capacity to outgas the specimens placed in the chamber and can achieve the desired vacuum levels in only 45 minutes under the appropriate conditions. Built with multi layer walls, the chamber design also assures protection from any external magnetic fields

Extended View: "walking" around the sample

MIRA is also equipped with a patented positioning system that allows views from different angles by moving the electron gun and detectors, as well as the sample, somehow identical to the behavior of human beings – the principle behind the concept of the design of the positioning system.

View

ctron Microscope

Non-Destructive Testing.

Extendend View Continued

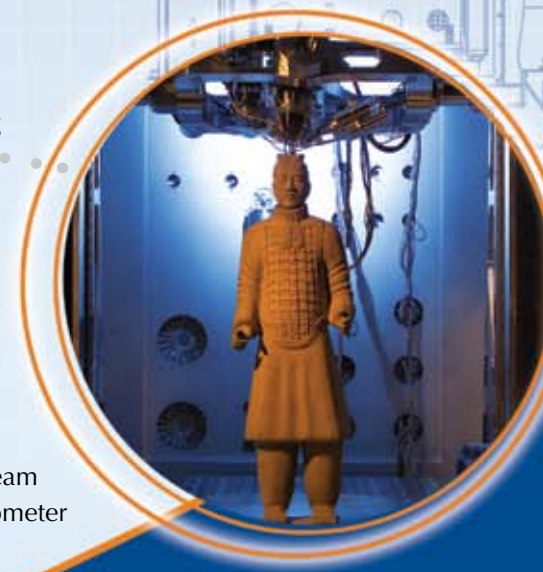
If humans look at a small object, they will turn around the object and the human eye – the visualization system – is fixed. When looking to a larger object, the human will move around the object in order to observe it completely. The first case is similar to the situation in standard SEM's, while the latter reflects the situation for the LC-SEM.

Tests inside this innovative SEM take on a whole new meaning. The microscope has a 5+1 axis capable of rotating and moving the sample, as well as the complete optic system. By using a micro-step control to operate the axis, it's possible to test various angles of the sample, reducing the number of load cycles.

Precision testing

Equipped with a top of the line electron gun, MIRA is capable of generating images with a resolution of better than 10nm and a magnification up to 300,000x. Together with a powerful channeltron detector that works with secondary and backscattered electrons, the complete system is kept in optimum working conditions by several processes to ensure the quality of the images: an active damping system that keeps the system isolated from external vibrations and an innovative cooling circuit for the electron gun and detectors.

- 100% Computer Controlled
- MIRA and all its components are controlled using a Microsoft Windows® based software.
- Extended Capabilities



With the integration of analytical systems like Energy Dispersive X-Ray Spectrometry (EDS) and Electron Backscatter Diffraction (EBSD) within the vacuum environment of the chamber, MIRA is capable of generating complete testing results.

MIRA can also be configured with a Focus Ion Beam (FIB) and a Fourier Transformed Infrared Spectrometer (FT-IR) to expand the capabilities and applications that it can be used for.

Applications

Besides the investigation of large samples, the LC-SEM also has a great potential for in situ observations of deformation behaviour of materials, as well as for relatively small production processes in the field of micro-system techniques.

The Large Chamber SEM also makes it possible to perform "interrupted monitoring" experiments for larger engineering parts. As an example, testing the tribological behavior of highly loaded parts from high-pressure pumps can be investigated by interrupted monitoring. The parts can be in service for a special period of time followed by an investigation of the loaded surfaces in the LC-SEM, bringing them to service immediately after the investigation is completed. This way of monitoring a system will open a vary broad field for engineering applications that will allow to get a closer and more detailed understanding of the running-in and damaging processes.

Latest development – Fatigue Testing inside MIRA

To fulfil the need of evaluating in-situ investigations of deformation behavior, a new design of the LC-SEM was created.
A servo-hydraulic fatigue-testing frame was integrated into the chamber creating new possibilities for materials testing, as well as overcoming the challenge of performing fatigue testing in a SEM.

In this combined test, not only the force and break point of the material is determined, also the crack is available to be viewed and studied thanks to the microscope. By this, the microscope transforms itself into a complete testing device; since the properties of the materials crystals can be studied after the fatigue testing is performed, delivering complete testing results. This system increases the researcher's ability to record material structural changes that precede crack nucleation and allows observation of the influences of microstructure on the early stages of crack propagation. The design of the system includes a node control mechanism that will create a still observation node at any location on the specimen as the fatigue cycling occurs, allowing a point of interest to remain within view. The exceptional stability of this machine enables improved in situ study of the fatigue-cracking phenomenon.

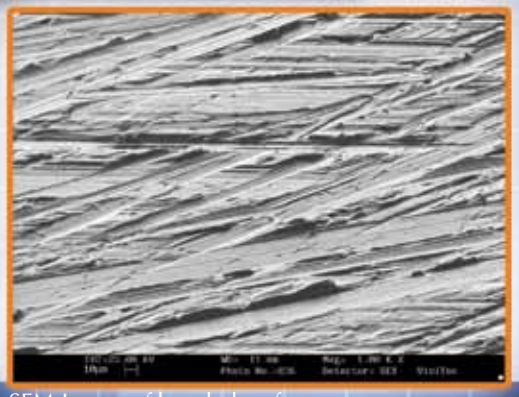
Industries

Automotive
Aerospace
Military & Defense
Culture & Archaeology
Semi- Conductor & Electronic Components
Medical & Bio Materials
Forensic Sciences
Materials Science

Areas of Application

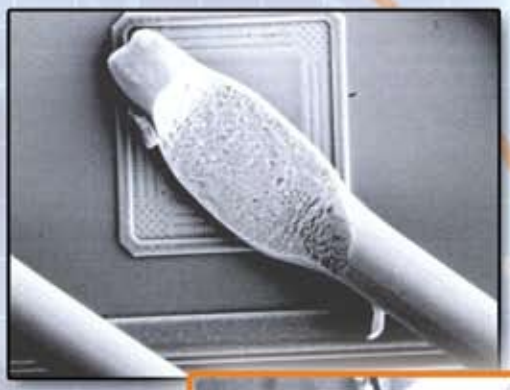
Non-destructive Testing
In-situ analysis
Failure Analysis
Research and Development

Cylinder bore of diesel engine



SEM-Image of bonded surface

Soldered bond

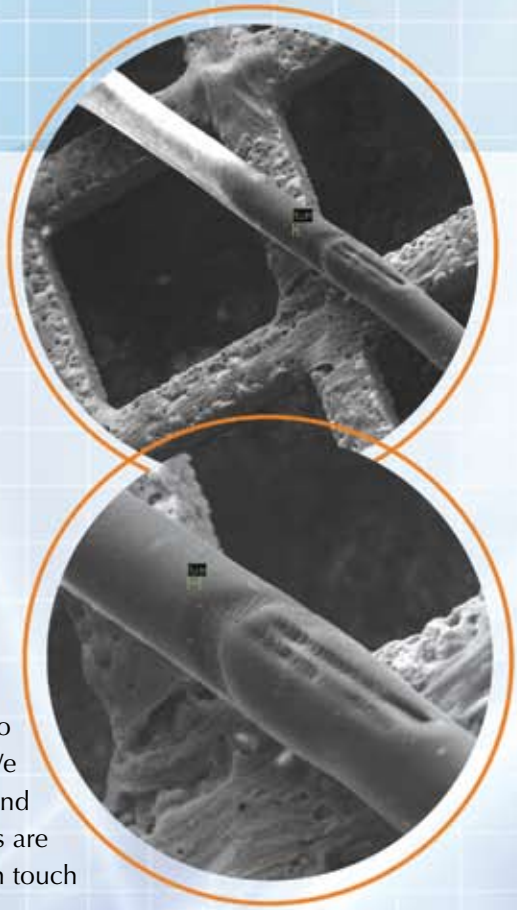


SEM-Image of bonded surface

Services

When looking for Nanometers, the equipment as well as the environment, have to be ideal in order to achieve precision. VisiTec offers the specialized services and expertise combined with our state of the art products to help you achieve accurate and repetitive results:

- Specialized Designs of Vacuum Chambers
- Positioning Systems for extreme environments
- Engineering of Equipment for Vacuum environment
- Advanced Power Controllers
- Specialized Technical Consulting in Vacuum Environments and Electron Optics
- Specialized Lab Design and Operation



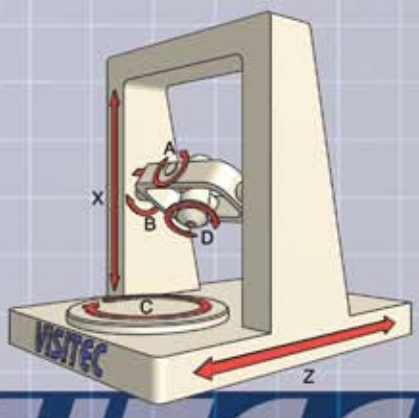
The Future

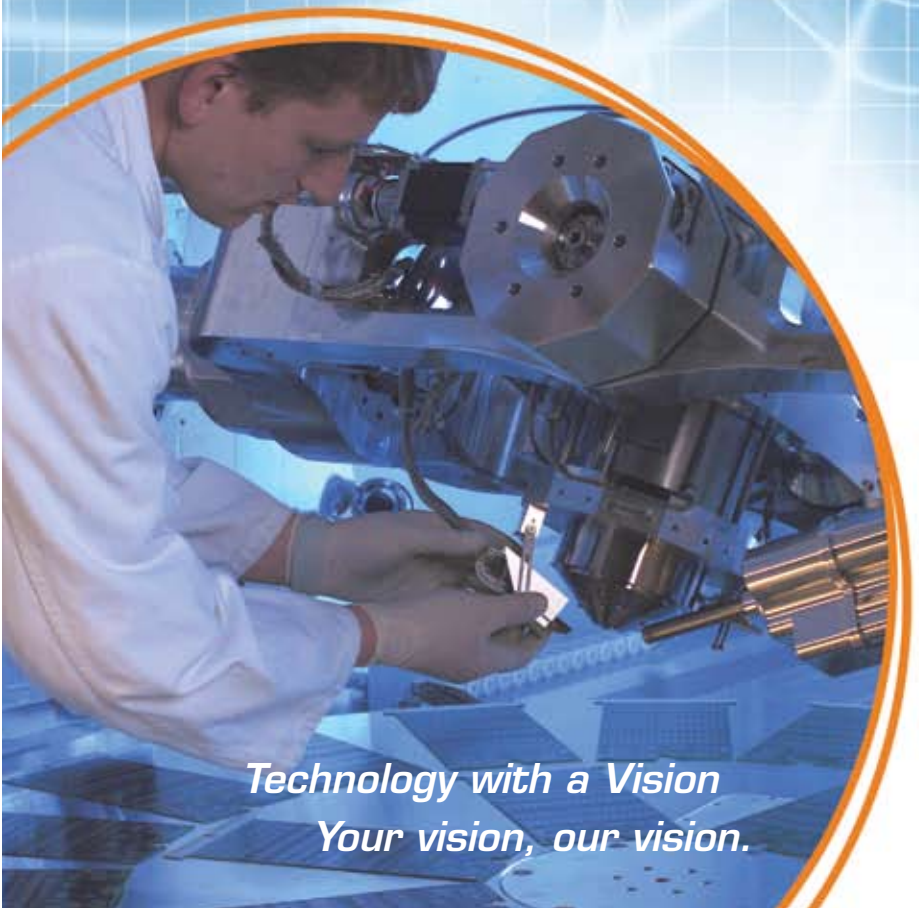
To innovate that is our aim. VisiTec team of Engineers and Technical experts keep up to date with the latest technologies in order to always offer the best products and services. We are constantly creating new developments and expanding our reach, geographically and technologically, with the latest technologies and knowledge. New products and services are being developed in the present and will be released very soon. We invite you to keep in touch with VisiTec and learn about our latest news and releases.

MIRA Technical Specifications

Electron Optics	
Resolution	Better than 10nm
Magnification	10x – 300,000x
Acceleration Voltage	0.2 – 30keV
Detectors	Channeltron for secondary electrons. 4-Cuadrant for backscattered electrons
Analytical Capabilities	Energy Dispersive X-Ray Spectroscopy (EDS)
	Electron Backscatter Diffraction (EBSD)
Additional Capabilities	Focus Ion Beam (FIB)
	Fourier Transformed Infrared Spectrometer (FT-IR)
	Internal Camera System
Image Processing	
Software	MIRA Control System
Hardware	PC, monitors and Printer
Vacuum System	
Low vacuum pumps	Rotary vane pump, 65m^3/h
	Rotary lobe pump, 400 m^3/h
High Vacuum pump	Turbo pump 2400 l/sec
Ultimate Vacuum	Up to 10^{-6} mbar after 45 minutes
Vacuum Chamber	3m^3; 9m^3; 12m^3

Specimens	
Maximum Size	Up to 1500 mm diameter, 1500 mm in height.
Maximum Mass	300 kg
Positioning System	
Axes	5+1 axis system with micro-step control
Repetition accuracy	±50 µm
Positioning Range	
X-axis	600mm, 1000mm, 1500mm
Z-axis	600mm, 1000mm, 1500mm
A-axis	90°
B-axis	135°
C-axis	360°
D-axis	350°





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