X-RAYLAB
QUALITY SHINES THROUGH

Computer Tomography
3D-Measurement
Non-Destructive Testing
3D-Object Scanning

THE COMPANY
ELECTRONICS
CASTING
3D METROLOGY
FIBER COMPOSITES
GEOSCIENCES
ASSEMBLY INSPECTIONS
SPECIAL ENGINEERING
POLYCT

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THE COMPANY

Founded in 1998, the XRAY-LAB has been growing from a small family business to a broad-based international and integrated quality service provider. We began with the quality engineering department in Germany. Later in 2003, we opened a quality control facility in Tuscaloosa, Alabama to do re-work for companies there. We provide our customers with resident engineering, assembly, storage and quality engineering.

At an early stage, we adopted new technologies and proved ourselves in the field of **radiography examinations** (Non-Destructive-Testing) XRAY-LAB was one of the pioneers in Industrial Computed Tomography. We have partnered with universities and corporate companies to improve **Computed Tomography (CT)** technologies, including software for Non-Destructive Testing. Currently, we are creating **inline and special machines** to improve Computed Tomography and 2D/2.5D scanning, to keep up with production speed. XRAY-LAB produces and engineer **specific multi-sensor machines** for customer needs.

As our capital funding increased to record levels, our company now employs several hundred people worldwide in various business sections, including R&D, Quality Control and operating a growing pool of equipment in our modernized testing facilities.

XRAY DEPARTMENT

As per our business name, the x-ray services are making up the core of our company. In **Auburn Hills**, we own a range of x-ray and computed tomography equipment. Our main laboratory is located at **Stuttgart**, Germany and we have other locations in **Wolfsburg** (Germany), **Bratislava** (Slovakia) and **Pilsen** (Czech Republic). Our clients come from the automotive, electronics and aerospace sector. Our customers appreciate our expertise in the field of x-ray and computed tomography. With decades of experience, as well as our immense testing capacity, we can perform single component testing as well as serial test with several thousand parts. While being able to inspect large quantities, we also provide a quick turnaround.

COMPUTED TOMOGRAPHY

The industrial computed tomography represents an important tool for qualitative product and process development. Therefore, the method ensures the permanent process monitoring and product requalification.
The computed tomography **saves customers time and money** by preventing them having to create more parts for destructive testing. Also, streamlines production schedules. With new materials and manufacturing practices, computer tomography allows for the **highest quality for measurements and inspections**.
The computed tomography enables the **digital imaging**, also called three-dimensional volume model, even of multi-material products. Also, products produced by **three-dimensional prototyping can be tested** by CT in an expedient way.
This kind of testing method has the advantage of a **high measurement accuracy** of inboard and inaccessible surfaces. Defects like fine cracks, inclusions, pollution or gas cavities can be detected confidential. The Computed Tomography is also often used in **testing castings and metalworking industry** for analyzing cavities in work pieces.
Furthermore, the three-dimensional reconstruction enables **detailed target-actual comparison** and **analyses of wall thickness** and **fiber composites**.

NON-DESTRUCTIVE TESTING DEPARTMENT

In this department, we bundled our mobile testing methods. We provide **mobile Radiography Testing and Examination** (RT) for the examination of stationary objects. We can examine and inspect metals, welding seams, plastics, buildings, and composites.

The **Ultrasonic Testing** (UT) is being used for inspecting pipes, welding seams, cast parts as well as wall thickness measurements.
The **Eddy Current testing** (ET) method is being used perform conductivity testing as well as crack detection. These processes allow us to find cracks or flaws at or under the surface of the material, which can be more than few millimeters deep.
In addition to these two processes, we perform **dye penetrant testing** (PT), the **magnetic particle testing** (MT), as well as remote **visual inspection** (borescope).

QUALITY ENGINEERING DEPARTMENT

Our expert team will always help you with preventive quality planning as well as accompanying quality measures from planning to implementation.
In case of quality discrepancies our task force team will immediately help you analyze, stop and prevent any other escapes. We will also provide expert advice for your customers.

SPECIAL MACHINES AND SYSTEMS DEVELOPMENT DEPARTMENT

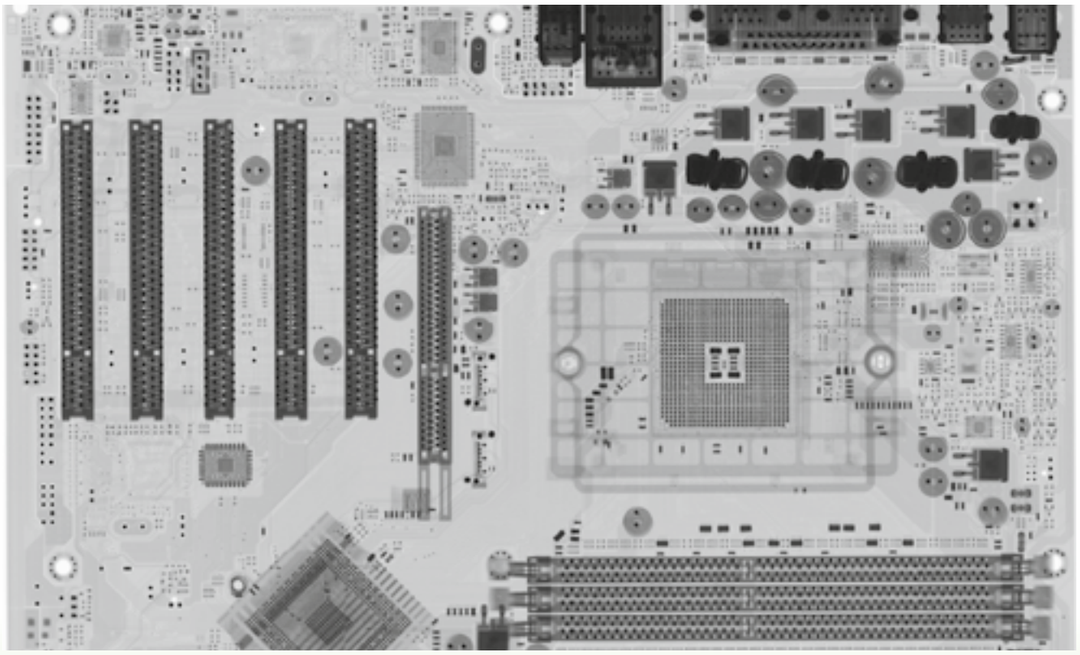
This is our newest department, developed based on our successful customer relationships in the service sector and our long years of practical experience in the field of non-destructive testing. The demand for **inline-testing systems** is continuously rising. These systems provide the **advantages of industry 4.0** with integrated manufacturing and optimal traceability including documentation. Together with you, our engineers will develop customized test procedures and systems that meet your production needs.

ELECTRONICS

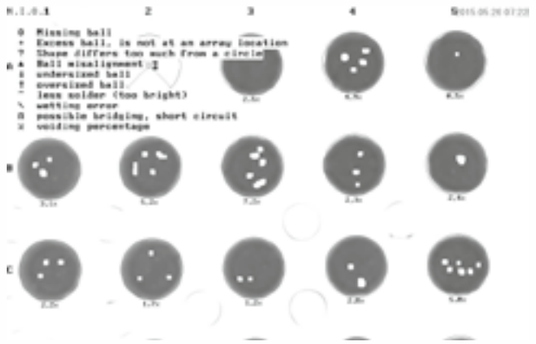
Non-destructive testing with radiography and CT offers outstanding possibilities for electronics and semi-conductors.

The XRAY-LAB has a great experience in analyzing a variety of electronical devices, e.g.: **lead frames**, **circuit boards**, **surface-mount devices** (SMD), **column grid arrays** (CGAs) or **ball grid arrays** (BGAs). Latter are analyzed with **automated** and **semi-automated software for pores** and for the correct position and form of the connections. Furthermore, the XRAY-LAB offers different methods to analyze solder connections and integrated circuits quickly and efficiently.

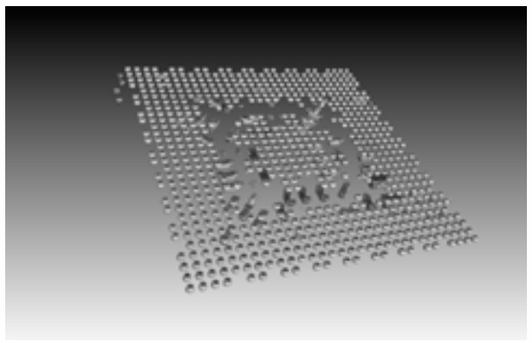
Testing cables and cable connections non-destructively, that are otherwise inaccessible, is one of our specialties as well. 2D radiography gives fast results **without damaging** or **mechanically loading the analyzed goods**.



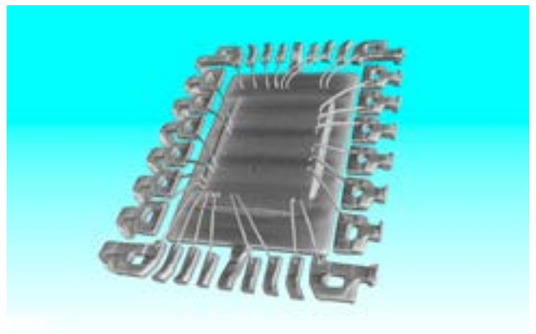
2D X-ray panorama image of PC motherboard.



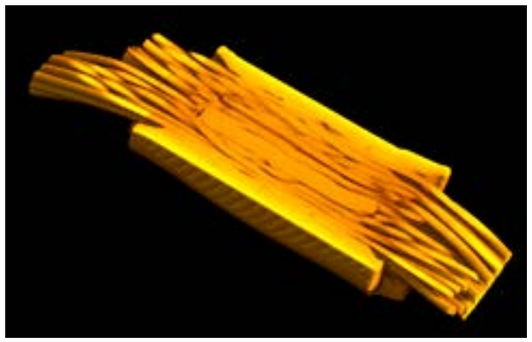
Void analysis of balls regarding gas content.



3D depiction of complete BGA.



3D depiction of integrated circuit (IC) and connecting bond wires.



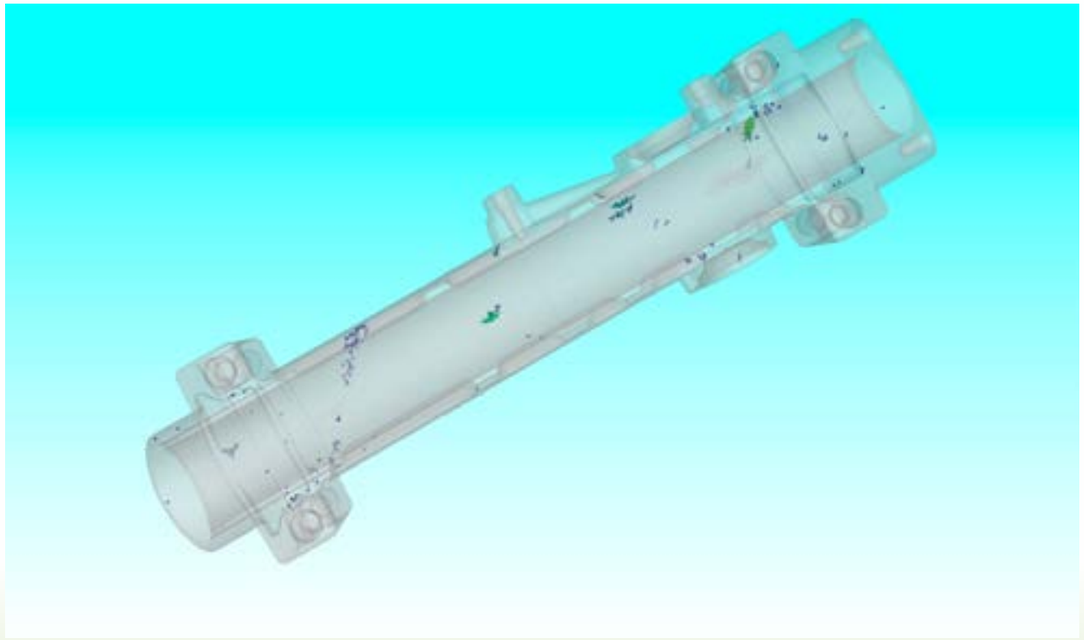
Crimp detection using 3D X-ray imaging.

CASTING

The XRAY-LAB offers a broad spectrum of services in the field of casted materials and metal processing industry.

2D and 2.5D radiography detects voids and **impurities** in your goods to **test the quality**, the **process reliability** and the **process stability**. **3D models provided by computed tomography** (CT) give us the opportunity to take arbitrary measurements and **compare them to a CAD model**. These **3D models allow cross sections** in any direction for **void and impurity analysis**, which is a tremendous advantage compared to other methods, e.g. grinding and polishing.

In addition to radiography, the XRAY-LAB offers **ultra-sonic** (UT) and **eddy current** (ET) **testing services**. With these methods we supplement our services for metal processing industries, **especially for welded**, **rivet** and **glued connections**. We test with regards to the highest international, as well as your own, standards.



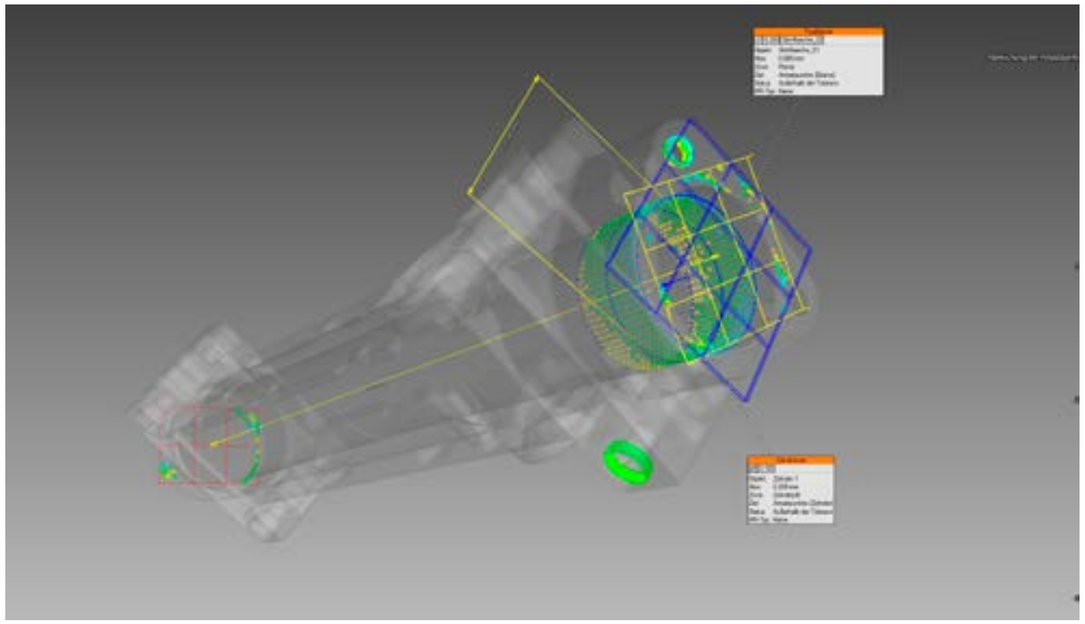
3D void analysis of casting. CT imaging allows for the determination of number, size, geometry and distribution of cavities within a component. Unlike traditional 2D analysis, location and form of the defects can be determined.

3D METROLOGY

The components with complex interiority are often prepared with great efforts to measure the internal structure.

A complete and easy solution for **3D measurement** is available by **Computed Tomography** (CT) in combination with efficient software. The data obtained allows **Non-Destructive 3D metrology** and **precise analysis** of **geometric properties** of **complex components**.

By **comparing the CAD model** with the **acquired data**, **geometric deviations** can be traced and visualized in colors. Compared to tactile metrology, 3D metrology on the basis of CT data is very fast and can be performed for the entire component surface.

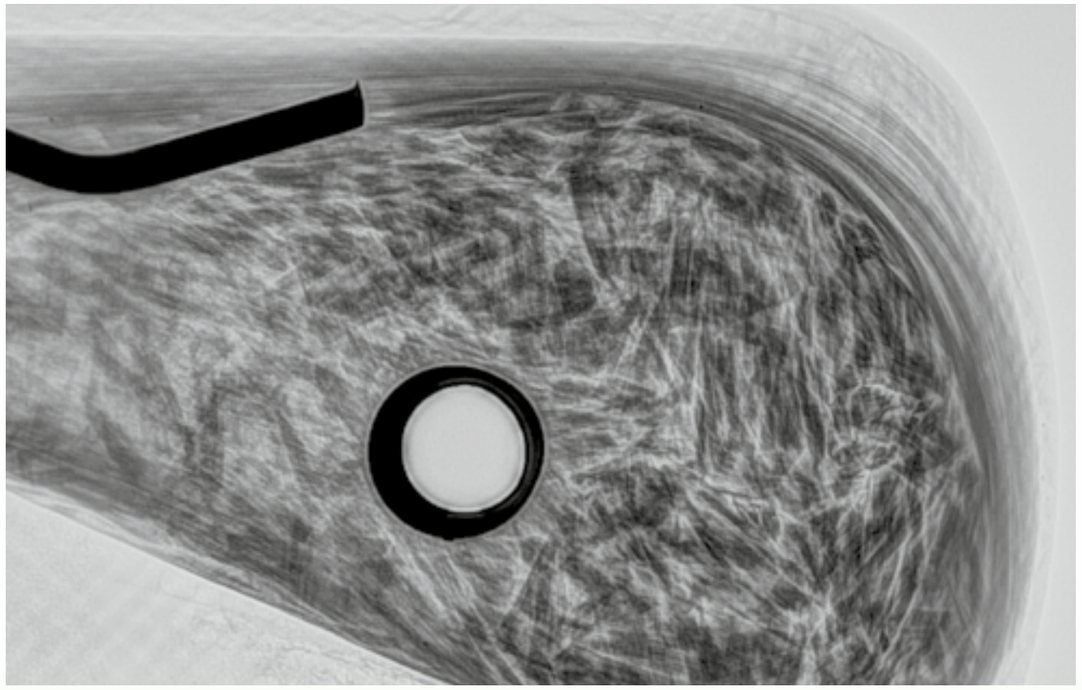


CT volume data enables non-destructive 3D metrology and the investigation of geometric characteristics that are also in inaccessible areas of the component.

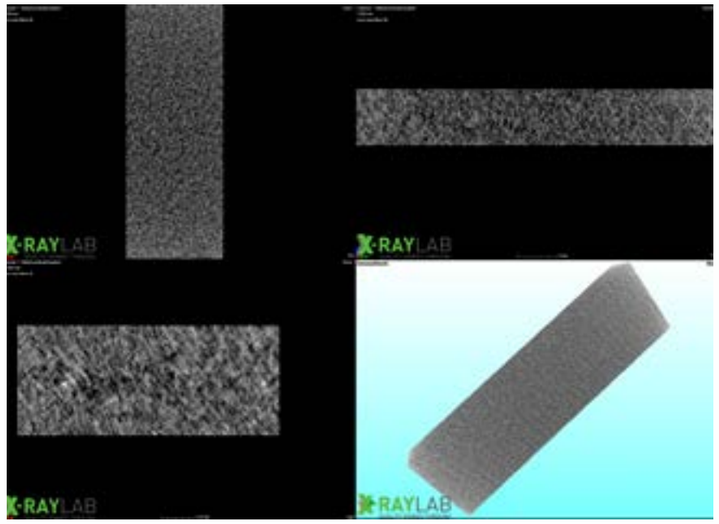
FIBER COMPOSITES

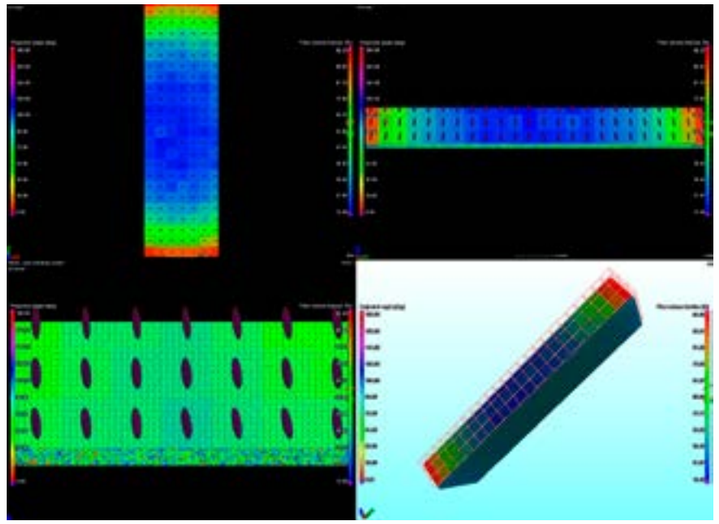
Voids and pores in compound materials deteriorate the integrity of these materials. Radiography and CT analysis offer a fast and reliable analysis of these goods and their functionality.

In addition, a CT analysis produces information about the **distribution of the fiber** and their **orientation**, which gives important information about the **material properties** and **process reliability**. Furthermore, the CT data can be extracted to files accessible to simulation software. With these files, one can carry out **finite element calculation** of the mechanical or thermodynamic properties of your parts. This will help you during **development and optimization of your processes**. The methods are applicable to various compound materials, e.g. **glass and carbon fiber materials** as well as **sandwich materials** and **honeycombs**.



2D X-ray image of rotor blade made of carbon fiber. Note the orientations of the fibers.





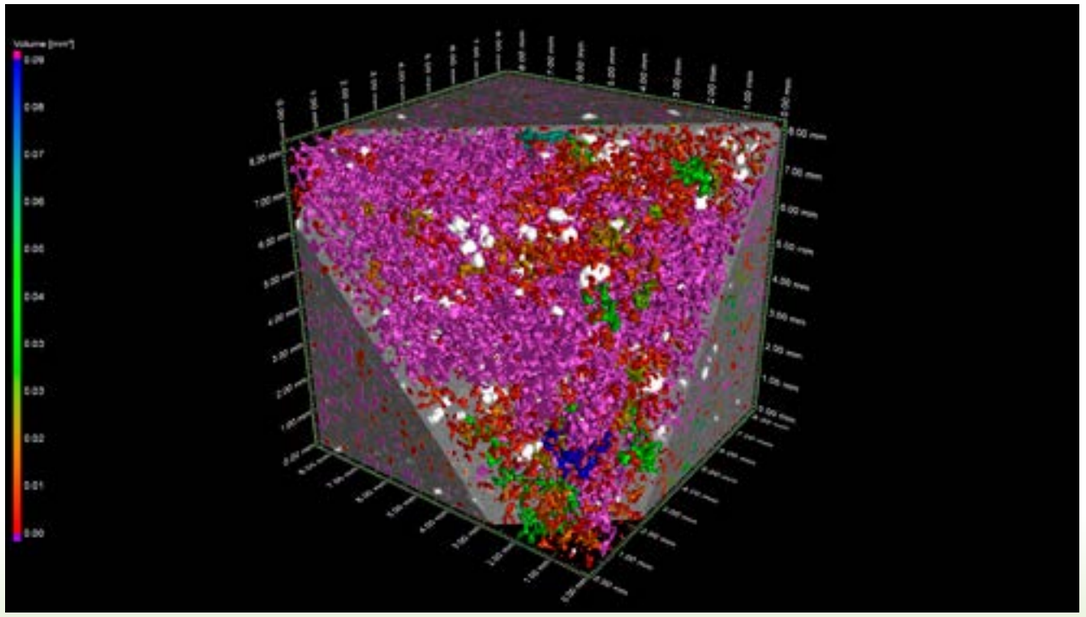
Special software allows for the 3D analysis of the fiber composites by planar CT. Location, contrast and distribution of the form can be visualized and quantified.

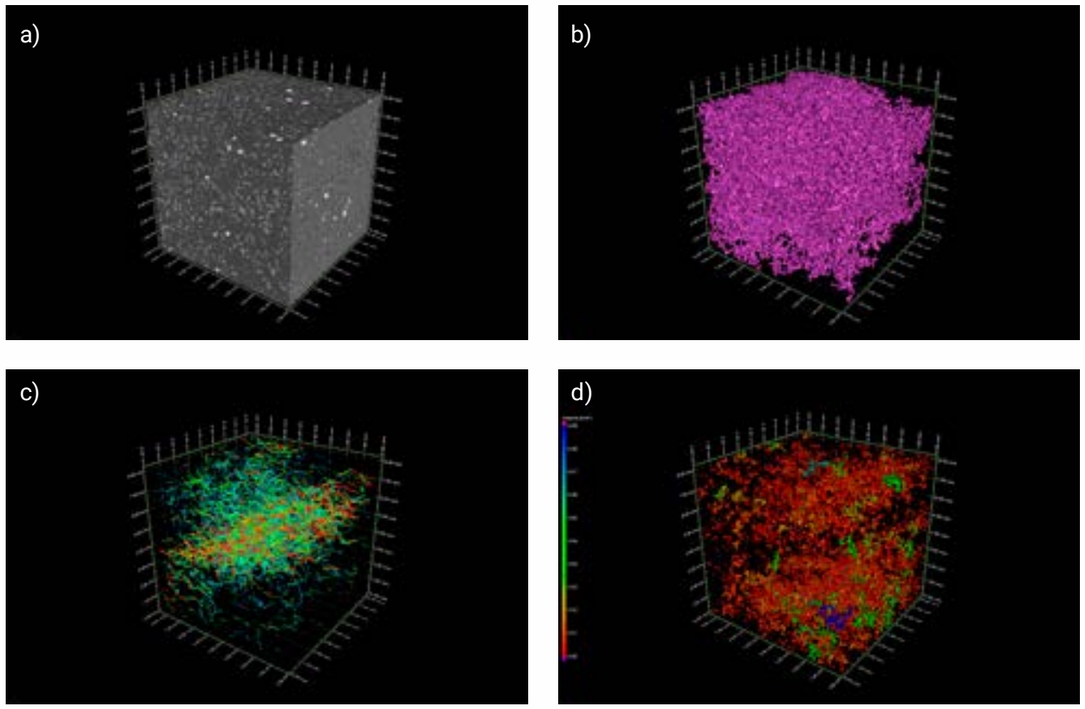
GEOSCIENCES

Computed tomography represents a new and innovative method in the realm geology, archeology and natural materials.

This, new approaches for old problems and questions in the geosciences can be found. The actual trend digital rock shows how **CT imaging** is being established pervasively in this sector. The XRAY-LAB is **cooperating with scientific institutions**, such as universities, research institutes or federal agencies, which are concerned with the **characterization of rocks**, **minerals**, **fossils** and **natural materials**. Moreover, clients from the energy and natural resources industry benefit from our expertise in the field of **non-destructive analyses**. Particularly in the **oil and gas industry**, CT analyses ensure a decisive progress for the characterization of **reservoir rocks** and the evaluation of **potential resource deposits**.

CT imaging enables for instance the **quantification and visualization of pore space**, **oil** and **gas phases in rocks**, fractures or **migration pathways for fluids**.





Characterization of sandstone porosity and fluid flow simulation. a) CT volume of sandstone, b) Segmentation of effective (connected) porosity. c) Streamlines of simulated fluid flow along connected pore space network as shown in b). Note the heterogeneous distribution of potential migration pathways. d) Visualization of isolated porosity colored depending on the particular volumes of the single pores.

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X-RAY SERVICES
NON-DESTRUCTIVE TESTING
QUALITY ENGINEERING
MECHANICAL ENGINEERING

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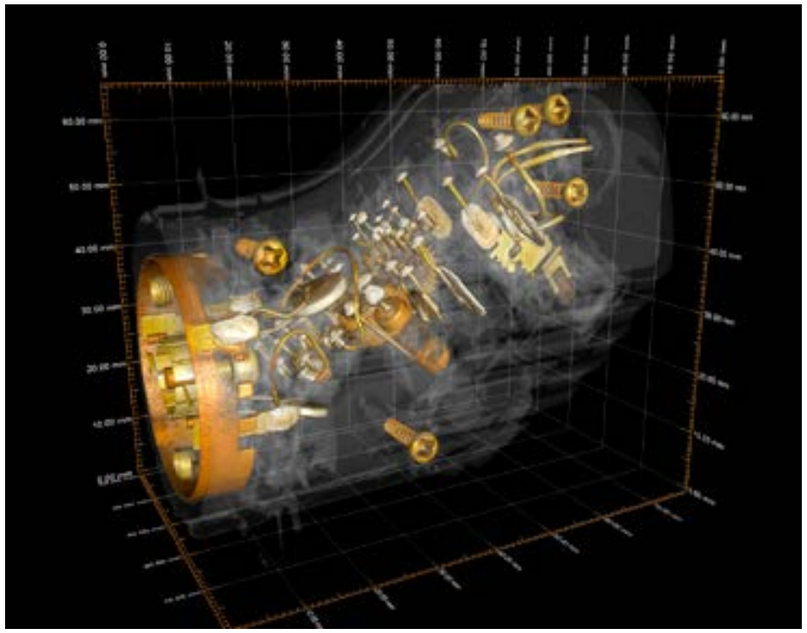
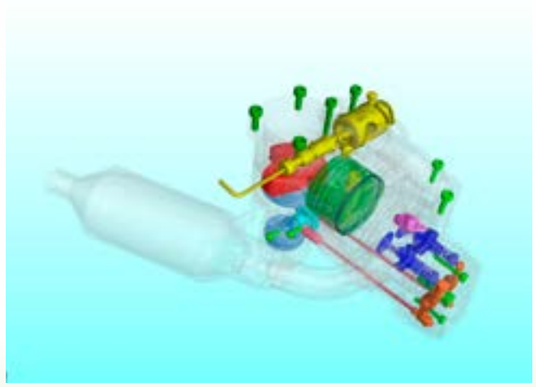
ASSEMBLY INSPECTIONS



3D depiction of an electromechanic assembly. This application of CT imaging allows for the correct and complete control of obstructed components.



3D depiction of gear unit (left) and a combustion engine (right).

SPECIAL ENGINEERING

We offer standard machines for 2D and 3D applications as well as special machines for serial, inline, and custom inspection tasks.

With the help of modern CT systems, **computational analyses** can be **fully automated** and **directly integrated in the production lines**. This technique enables a **100% 3D inspection to ensure quality** by providing feedback in **real-time**, resulting in higher efficiency, lower costs, and less defective parts. This allows an intervention in the manufacturing process as soon as the quality standards of the product are not met. The networking is achieved with the **Industry 4.0** standards.

ROBO-CT **Highly flexible** and **fast testing** in the range of **2D** and **3D** with different test objects and test requirements. Networking per **Industry 4.0** standards.

INLINE-CT **100% 3D control** mainly for **series of components in production**. Securing high quality, use of available resources, **fast operating speed**, absolute view.

In-Line solution for 100% quality.

Modern CT systems as inline solution or automated test stands can be adapted to latest standards and implemented in smart factories. Material and component testing according to Industry 4.0

POLYCT

XRAY-LAB and the Fraunhofer Development Center for X-ray Technology (EZRT) present the PolyCT as an intuitively usable add-on equipment, which can reduce the scanning time by a factor of 3 – even with complex inspection tasks, such as analyses of highly x-ray-attenuating objects.

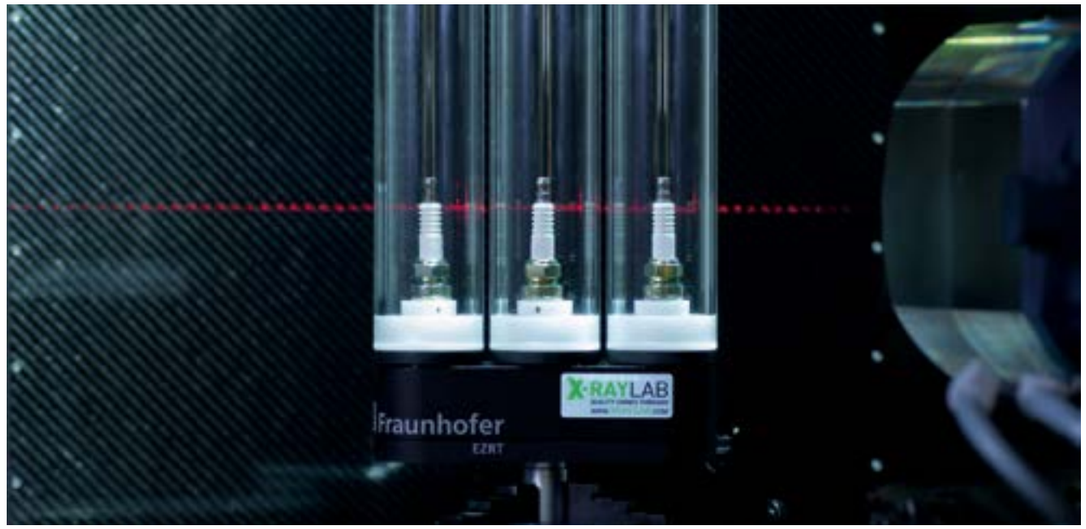
The patented new product combines **precision mechanics**, CT know-how as well as **progressive reconstruction algorithms** to an **easily usable tool** for every CT laboratory.
In particular: **PolyCT** is **compatible** to all the **common CT systems** on the market and is **easily put into operation** in few short steps. This way, the operator can use this upgrade kit **for various machines**. Additionally, once the system is installed, it does **not interfere with the standard CT functions** and **does not adversely influence the quality of the results**. The upgrade can be easily performed even between scans.

SETUP The measuring device is clamped into the CT chuck instead of the sample(s) or directly mounted on top of the rotary table using a centering adapter.

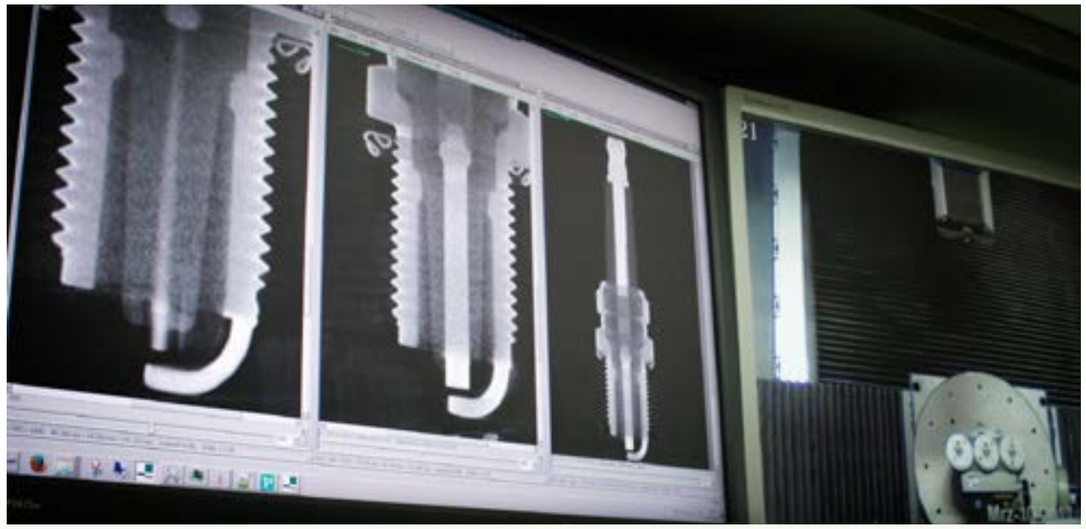
OPTIMIZED USE The PolyCT kit enables optimum use of the detector areas due to individual rotating centers. Thereby less angular increments are necessary compared to a standard CT scan.

PROCESS CHAIN The data processing is automated by the usual reconstruction software and does not require further intervention in the existing system architecture.

FIELD OF APPLICATION The combination of precise mechanics, easy handling and the Fraunhofer reconstruction software enables a user-friendly application in every inspection laboratory.



With mutiple rotation axes the PolyCT allows simultaneous scanning of several objects causing higher sample throughputs in combination with partly improved image quality.



The simultaneously scanned objects can be post-processed as separate and individual data sets using conventional CT software.

Think local, act global.

CONTACT

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