

WENZEL exaCT®

THE NEW GENERATION OF COMPUTED TOMOGRAPHY



PRODUCT RANGE
COMPUTED TOMOGRAPHY

WENZEL – INNOVATION MEETS TRADITION



DR. HEIKE WENZEL AND PROF. DR. HEIKO WENZEL-SCHINZER

MANAGEMENT OF THE WENZEL GROUP

The WENZEL Group GmbH & Co. KG is a leading Manufacturer of innovative measuring technology solutions. The success of the largest family-run company in the industry is based on German quality, technology, flexibility and strong partnerships.

Founded in 1968, the name WENZEL stands today primarily for the highest precision, reliability and technological competence.

In recent years, measurement technology has changed a lot. The measuring tasks are performed in production as well as in the measuring room. In addition to high precision tactile measurement, optical sensors as well as new technologies such as computed tomography have found their place in metrology. We as WENZEL have brought numerous innovative solutions onto the market in recent years so as to offer our customers the right products. In addition to the product itself, we also supply you with turnkey solutions. This makes us flexible experts for innovative measurement solutions.

With our product range we are able to support all your measuring needs. As a family business, we strive to achieve long-term partnerships with our customers and for this we invest in the outstanding quality of our machines and offer you excellent service.



About WENZEL

Founded in 1968, WENZEL is today the largest family-run measurement technology manufacturer.

More than 10,000 machines installed worldwide



WENZEL Worldwide

More than 600 employees worldwide

Subsidiaries & representatives in more than 50 countries



Unser Headquarters

Wiesthal, Germany

Total area:	54.000 m ²
of which buildings:	15.500 m ²
air-conditioned:	5.000 m ²



The WENZEL Group recognized early on the potential of computed tomography and with its takeover of Volumetrik GmbH in 2008 extended its product portfolio into this important area of technology. The aim was to provide its customers with the best, fully supported dimensional measurement technology and to offer a solution that allows non-destructive measurement and testing of both external and internal features.

TYPICAL APPLICATION AREAS

Mechanical engineering
Automobile manufacturers and suppliers
Aerospace
Foundry technology
Metal and plastics processing industry
Medical technology
Mold and tool making
Electrical engineering/electronics
Inspection services
Research and Science

TYPICAL BUSINESS AREAS

Quality assurance
Product development
Material testing
Prototype creation
First article inspection
Fabrication

TYPICAL MATERIALS

Plastics (also elastomers)
Ceramics
Composite materials (e.g. CFRP, GFRP)
Light metals
Steel (thin-walled)
Wood
Gypsum, resins, model building materials

OVERVIEW

CT PRODUCT RANGE

WHAT IS VOLUME MEASUREMENT TECHNOLOGY?

Computer tomographs are best known from the field of medical technology. They represent a further development of the classical X-ray technology.

While radioscopic X-ray machines are creating two-dimensional radiographic images of objects, computed tomographic volume measurement technology from WENZEL generates three-dimensional volume data. The scanned data can be used to reconstruct a complete dataset of materials and geometry.

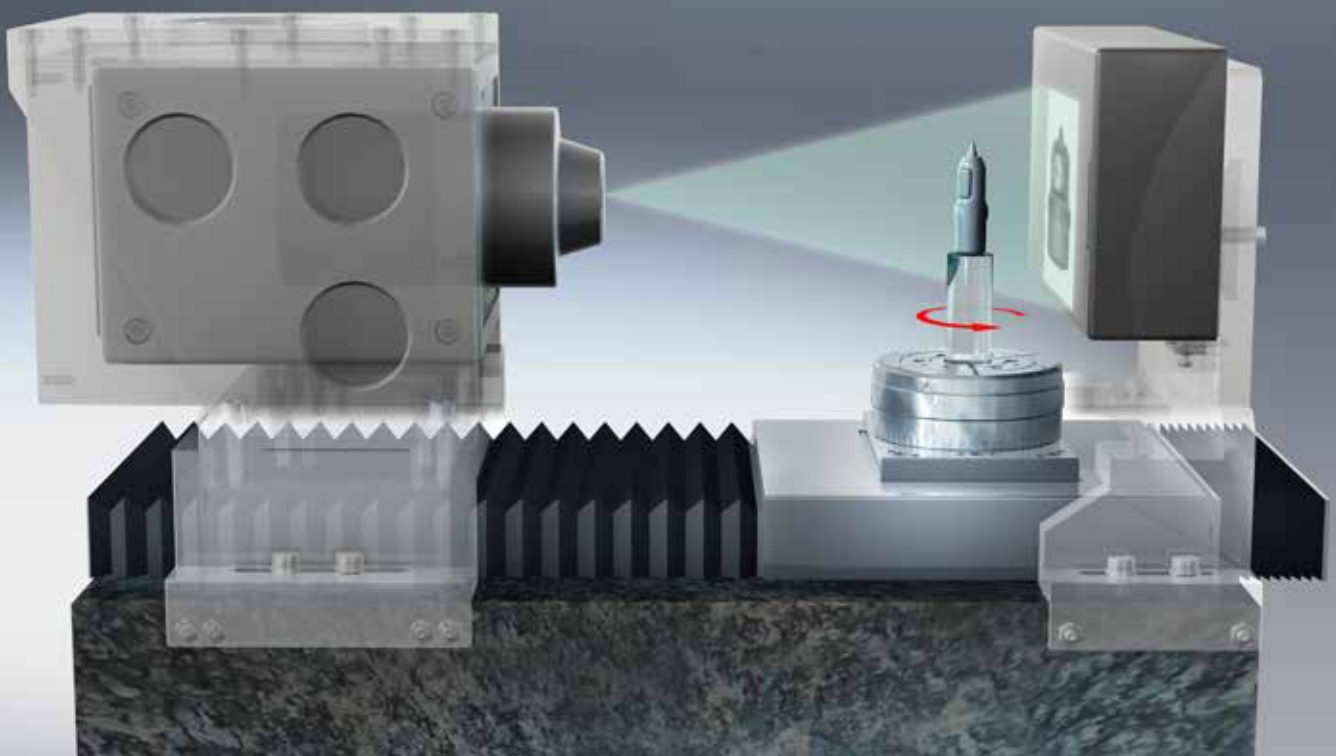
Use in the industrial sector has proven itself in practice and the market potential increases continuously. The technology in the WENZEL computer tomographs is designed for applications in a wide variety of industries where the internal and external

structures of the components are captured completely and holistically.

The picture below illustrates the functional principle of computer tomography: The component is X-rayed and shot in the optical path.

For the CT scan, the object is rotated 360°. During the rotation, two-dimensional radiation images are recorded by the detector using X-rays. In the computer, the component is calculated (reconstructed) as a 3D volume model from the radiographic images.

Functional principle of a computer tomograph: The component is X-rayed and rotated in the beam path and a three-dimensional model is reconstructed from multiple two-dimensional projections.





The exaCT computer tomographs from WENZEL have an innovative system concept. WENZEL has consistently focused on the needs of the user.

Surface data is generated from this solid model, which forms the basis for all subsequent evaluations. Small components are measured near the X-ray source and larger components near the detector. Even the smallest details can be resolved by magnification. From this volume data surface models are created forming the basis of all subsequent evaluations. Small components are measured close to the X-ray source and larger components nearer the detector. Due to the magnification, even the smallest details can be resolved.

Compact and powerful Computed Tomography Systems from WENZEL offer an unmatched ability to non-destructively test every aspect of a part and capture its very DNA.

CT Systems play an increasingly important role as measuring devices. The advantage over tactile or optical systems lies in the fact that the X-rays measure hidden features in a part and the measurement data is recorded non-destructively. Virtual programming and measuring of that data is supported by intelligent software products. This method of measurement offers the only solution to the quality assurance challenges of complex 3D-printed components.

OVERVIEW CT PRODUCT RANGE

VOLUME MEASUREMENT „MADE BY WENZEL“

Since 2008 WENZEL has been one of the innovators among the CT manufacturers and offers high performance and precise equipment with which 3D measurements of internal and external structures of objects can be carried out without contact and non-destructively. The WENZEL CT product range is broadly based and covers a wide range of applications.

When the name WENZEL appears on a device, this means innovation. The exaCT series combines decades of experience in measurement technology, outstanding WENZEL quality with the highest level of competence in CT development. A modular system concept and an innovative detector technology enables a large number of device variants that allows adaptation to different customer requirements.

Tactile and optical measuring systems are limited to measuring only what they can reach or see inside a component but exaCT CT technology allows the measurement of any feature in the part even, if hidden inside. Additionally, the high rate of data acquisition means that all the data from all component can be gathered in a very short length of time.

HIGHLIGHTS

■ Better performance thanks to impressive speed

Quick Scanning | Quick Reconstruction | Fast evaluation

■ Low operating costs

Precision mechanics for guaranteed high machine availability | Long calibration intervals

■ High efficiency due to low space requirement

Largest measuring volume with smallest footprint | Production-compatible setup | Desktop versions for easy loading

■ Flexible solutions

Wide range of applications | Newest technologies | Easy operation

■ One scan, many evaluations, maximum saving of time

High-precision measurement results with virtual coordinate measuring machine (CMM) | Non-destructive testing (NDT) and defect analysis | Microstructure analysis of materials

exaCT®S

The compact **desktop CT exaCT S** is designed to be the ideal solution for volume measurement of small components. It can be placed on a desk and offers the highest performance in the smallest space.

exaCT S 80

Space Requirements (L x W x H)	890 x 635 x 605 mm
X-Ray (Voltage, Power)	80 kV, 40 W
Detector Resolution	1000 x 690 Pixel, 100 µm
Max. Measuring range	Ø 83 / H 46 mm*

exaCT S 130

Space Requirements (L x W x H)	890 x 635 x 605 mm
X-Ray (Voltage, Power)	130 kV, 39 W
Detector Resolution	2300 x 1300 Pixel, 50 µm
Max. Measuring range	Ø 83 / H 46 mm*

*The measurable height depends on the component diameter

exaCT®L

The **compact power system exaCT L** is universally applicable and can scan even large components with higher densities due to its high measuring volume. The exaCT L offers a simplified, cost-effective and completely automated workflow for the entire CT analysis process.

exaCT L 150

Space Requirements (L x W x H)	1810 x 905 x 1910 mm
X-Ray (Voltage, Power)	150 kV, 75 W
Detector Resolution	3000 x 2500 Pixel, 100 µm
Max. Measuring range	Ø 235 / H 330 mm*

exaCT L 225

Space Requirements (L x W x H)	1810 x 905 x 1910 mm
X-Ray (Voltage, Power)	225 kV, 1600 W
Detector Resolution	3000 x 2500 Pixel, 100 µm
Max. Measuring range	Ø 235 / H 330 mm*

*The measurable height depends on the component diameter

exaCT®M

The **exaCT M CT workstation** is a modularly constructed system with integrated desk, where measuring and evaluation functions have been integrated in a perfectly designed workstation. Its applications are the measuring and testing of small to medium-sized components and assemblies of single or mixed materials.

exaCT M 225

Space Requirements (L x W x H)	2315 x 1275 x 1415 mm
X-Ray (Voltage, Power)	225 kV, 800 W
Detector Resolution	3600 x 1000 Pixel, 50 µm
Max. Measuring range	Ø 150 / H 250 mm*

*The measurable height depends on the component diameter

exaCT®U

The **powerful universal system exaCT U** is configurable and can be adapted to individual user requirements due to its high measuring volume large components with higher densities made of plastic, metal or multi-materials can be scanned.

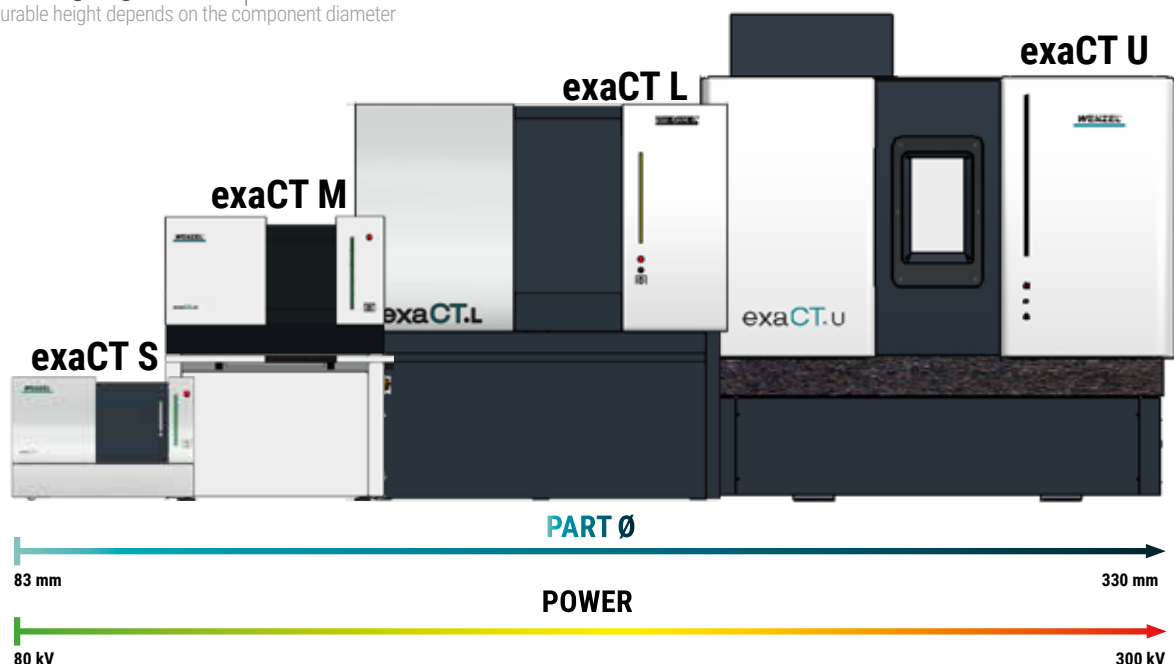
exaCT U 225

Space Requirements (L x W x H)	2315 x 1960 x 2400 mm
X-Ray (Voltage, Power)	225 kV, 350 W
Detector Resolution	2900 x 2900 Pixel, 150 µm
Max. Measuring range	Ø 330 / H 700 mm*

exaCT U 300

Space Requirements (L x W x H)	2350 x 1960 x 2400 mm
X-Ray (Voltage, Power)	300 kV, 350 W
Detector Resolution	4000 x 4000 Pixel, 100 µm
Max. Measuring range	Ø 330 / H 700 mm*

*The measurable height depends on the component diameter



FIELDS OF APPLICATION

exaCT IS THE SOLUTION FOR MANY TASKS

Computed tomography makes it possible to perform measurements on a very broad range of parts, from plastic parts to fibre composite components up to and including light metal parts. The density of the material as well as the geometry and wall thicknesses of the objects ultimately determine if they can be measured this way.

The exaCT S has a measuring volume up to 46 mm in height, 83 mm in diameter and voltage of up to 130 kV.

The exaCT M has a measuring volume of 250 mm in height, 150 mm in diameter and voltage of 225 kV.

The exaCT L has a measurement volume of 330 mm in height, 235 mm in diameter and a voltage of up to 225 kV.

The exaCT U has a measurement volume of 700 mm in height, 330 mm in diameter and a voltage of up to 300 kV.

APPLICATION AREAS

MEASURING TECHNOLOGY

Dimensional checks

Measurement of standard geometries and freeform surfaces including shape and position tolerances

Wall thickness analysis

Color representation of component wall thickness distribution

Nominal-actual comparisons

Representation of deviation from CAD model or master component

Tool and component optimization

Compensation of shrinkage and warpage

Development, Rapid Prototyping and

Reverse Engineering

Creation of CAD models from the scan data

TESTING TECHNOLOGY

Material defect analyses

Non-destructive testing for e.g. blowholes, pores or cracks

Structural analysis

Visualization of material and component structures

Assembly checks

Control of assembly results, functional and error analyses

Joining technology tests

Checking errors in welded, soldered, glued or riveted joints

Electronics testing

Inspection of soldered and glued joints

FIELDS OF APPLICATION

exaCT

Real life applications demonstrate the strengths of the exaCT systems. Here we show typical applications, which demonstrate the advantages of computer tomography. With exaCT volume

measurement technology, both material and geometry data of the entire component are available, multiple measurements and evaluations can be carried out on the basis of only one measurement.

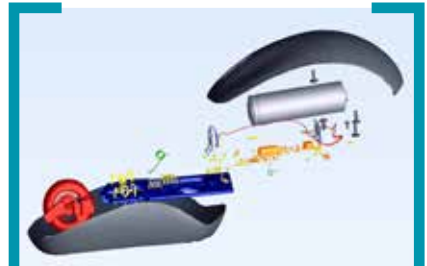
Assembly control of a PC wireless mouse



PC wireless mouse



Side view into the partially opened housing. The position of the individual parts in relation to each other can be analyzed in the assembled state.

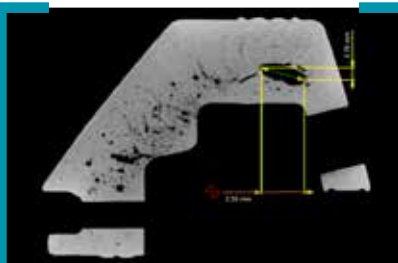


Exploded view of the wireless mouse. The individual parts can be virtually rearranged for better visualization.

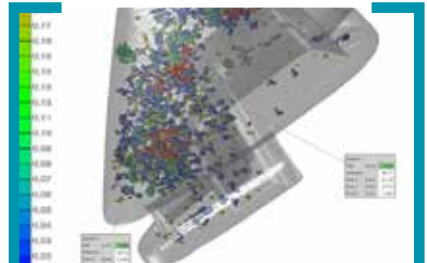
Blowhole analysis of an aluminium casting



Aluminium casting



The 2D section shows blowholes and porosity in the component

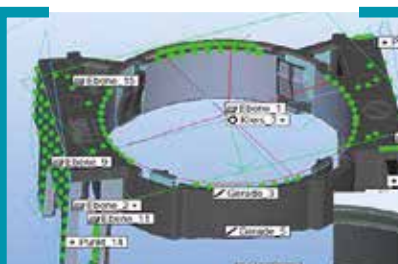


The 3D blowhole analysis shows the size, distribution and position of the blowholes in the component

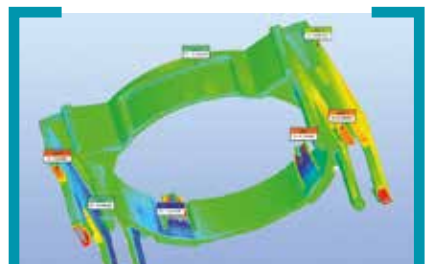
Dimensional measurement technology on a plastic injection-molded component



Injection-molded component with complex internal structures.



The measuring program includes internal and external structures. Virtual touch points are set for dimensional measurement.



Nominal-actual comparison determines the deviations of the manufactured component from the CAD and makes them visible in a color-map.

WENZEL exaCT® S SERIES

NON-DESTRUCTIVE MEASURING & TESTING

The compact desktop CT exaCT S is the ideal solution for volume measurement of small components. It fits on any desk and offers maximum performance in the smallest space. The high resolution enables detailed evaluations of even the smallest components, ranging from micro-measurement to micro-material testing.

The exaCT S in compact design and sophisticated ergonomics combines performance and flexibility in the smallest space. The maintenance-free radiation source ensures low operating costs with high reliability.

APPLICATIONS

The exaCT S is the first choice for measuring and testing components with low material densities. Despite its compact system size, the system offers a measuring volume of up to 46 mm in height and 83 mm in diameter. The exaCT S is particularly suitable for non-destructive testing (NDT) of plastics, composites and multi-materials.



Connectors



Non-Destructive Testing (NDT)

Hearing aid



Assembly inspection

Insert ring



Metrology



FEATURES

- Space-saving table installation**
 Integration of electronics and control in a compact system | No need for a separate control cabinet | Perfectly thought-out work ergonomics
- One scan, maximum time saving**
 Measurement with virtual CMM | NDT and error analysis | Microstructure analysis
- Flexible 'Plug and Play' solution**
 Micro metrology | Software for all applications | Quick set-up of workpieces
- Best performance through high efficiency**
 Optimized ratio of measuring volume to floor space | Efficient scanning and reconstruction processes | Suitable for workshops
- Low operating costs**
 Maintenance-free radiation source | Precision mechanics for higher availability | Longer calibration intervals

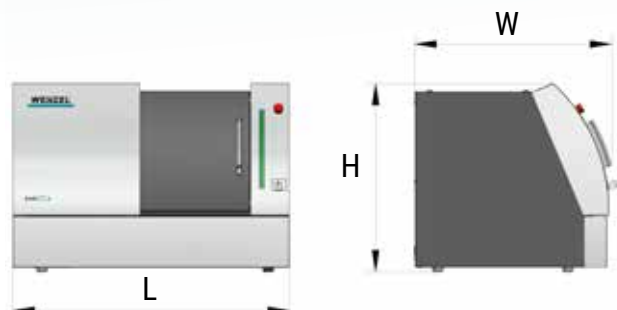
MACHINE PROFILE

exaCT S 80

Space Requirements (L x W x H)	890 x 635 x 605 mm
X-Ray (Voltage, Power)	80 kV, 40 W
Detector Matrix, Pixel Size	1000 x 690 Pixel, 100 µm
Detector Matrix, Pixel Size	Ø 83 / H 46 mm*
Device weight	380 kg

exaCT S 130

Space Requirements (L x W x H)	890 x 635 x 605 mm
X-Ray (Voltage, Power)	130 kV, 39 W
Detector Matrix, Pixel Size	2300 x 1300 Pixel, 50 µm
Detector Matrix, Pixel Size	Ø 83 / H 46 mm*
Device weight	380 kg



* The measurable height depends on the component diameter.

WENZEL exaCT® M

NON-DESTRUCTIVE MEASURING & TESTING

The exaCT M is based on a workstation-concept, which unites high X-ray performance and high scan speeds on a small footprint.

The exaCT M workstation has an integrated evaluation unit in a common desk workstation. The compact design, the well thought-out ergonomics and the idea to combine more power

and flexibility with less space requirements characterize the system. The workstation version enables easy loading and is ideally suitable for automating measuring and testing processes.

APPLICATIONS

With a measuring volume of 250 mm in height and 150 mm in diameter, the exaCT M workstation is used for measuring and testing technology for small to medium-sized components. The exaCT M is particularly suitable for non-destructive testing (NDT) of plastics, light metals, composites and multi-materials.



Remote control



Assembly inspection

Aluminum casting

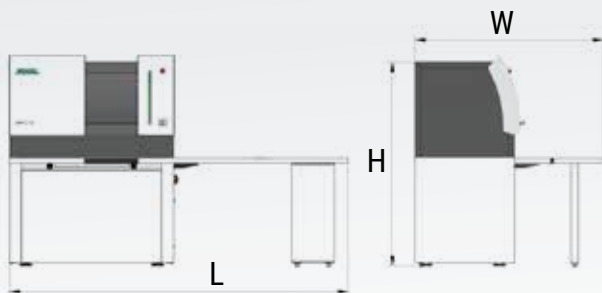


Blowhole test

Hose Connectors



Measurement Technology



MACHINE PROFILE

exaCT M 225

Space Requirements (L x W x H)	2315 x 1275 x 1415 mm
X-Ray (Voltage, Power)	225 kV, 800 W
Detector Matrix, Pixel Size	3600 x 1000 Pixel, 50 µm
Max. Measuring range	Ø 150 / H 250 mm*
Device weight	1500 kg

FEATURES

- Flexible compact system**
 Scanning of plastics, light metals and multi-materials | Integrated computer and control cabinet
- Reliable measurement results**
 High resolution | Powerful application software | Integrated vibration damping
- High performance on a small footprint**
 Best performance during scanning and reconstruction | Workstation version for easy loading | Suitable for workshops
- Optimized operating costs**
 Low-maintenance radiation source | High availability due to precision mechanics | Longer calibration intervals
- One scan, maximum time saving**
 Measurement with virtual CMM | NDT and error analysis | Microstructure analysis

* The measurable height depends on the component diameter.

WENZEL exaCT® L

NON-DESTRUCTIVE MEASURING & TESTING

The exaCT L offers a simplified, cost-effective and completely automated workflow for the entire CT analysis process. Due to its high X-ray performance in combination with a fast detector, the exaCT L enables the measurement and inspection of components in a short time. Due to the intuitive user guidance, exact measurement results can already be generated after a short training period. The exaCT L thinks ahead: Measuring parameters are automatically optimized by the system. In its performance class,

the exaCT L is one of the most compact computed tomographs on the market. It has three independent axes and offers an impressive X-ray performance. Hardware and software offer the possibility of automated integration into the production line and are the appropriate answer to questions regarding Industry 4.0 solutions.

WENZEL was awarded the Global New Product Innovation Award 2020 from Frost & Sullivan for the exaCT L.

APPLICATIONS

The exaCT L is widely applicable and is able to scan even large components with high densities due to its large measuring volume. It is best suited for measuring and testing parts made of plastic, light metal, composite materials or multi-materials. With its closed microfocus X-ray tube, the exaCT L 150 impresses above all with its very high detail resolution. The exaCT L 225 ensures minimum scan times with a closed variofocus X-ray tube with up to 225 kV and a power of up to 1600 W.



Remote control



Non-Destructive Testing (NDT)

Automotive interior equipment

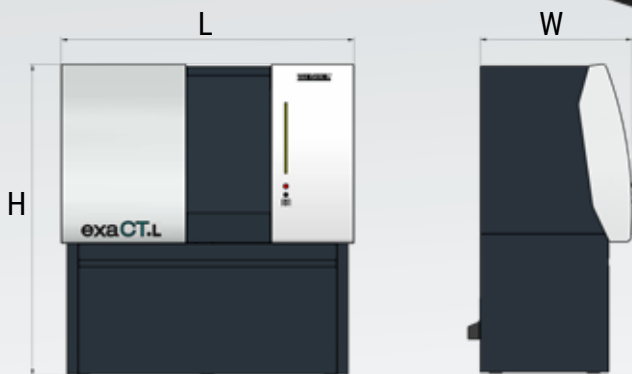


Assembly inspection

Titanium-ceramics implant



Defect analysis



MACHINE PROFILE

exaCT L 150

Space Requirements (L x W x H)	1810 x 905 x 1910 mm
X-Ray (Voltage, Power)	150 kV, 75 W
Detector Matrix, Pixel Size	3000 x 2500 Pixel, 100 µm
Max. Measuring range	Ø 235 / H 330 mm*
Device weight	2950 kg

exaCT L 225

Space Requirements (L x B x H)	1810 x 905 x 1910 mm
X-Ray (Voltage, Power)	225 kV, 1600 W
Detector Matrix, Pixel Size	3000 x 2500 Pixel, 100 µm
Max. Measuring range	Ø 235 / H 330 mm*
Device weight	2950 kg

FEATURES

- Best results through high performance**
 Fast scanning |
 Fast reconstruction |
 Fast evaluation
- High flexibility**
 Three independent axes | Software for all applications |
 Powerful radiation source for different material densities
- One scan, many evaluations, maximum time saving**
 Metrology with virtual CMM | NDT and failure analysis
- Low operating costs**
 Precision mechanics for higher availability | Longer calibration intervals |
 Low maintenance X-ray technology
- High efficiency due to small space requirements**
 Large measuring volume |
 Suitable for workshops |
 Automation solutions

* The measurable height depends on the component diameter.

WENZEL exaCT® U SERIES

NON-DESTRUCTIVE MEASURING & TESTING

The exaCT U offers a simplified, cost-effective and fully automated workflow for the entire CT analysis process. Due to its high performance combined with a large measuring volume, the exaCT U enables the measurement and testing of large components with higher densities.

Due to intuitive user guidance, exact measurement results can be generated after a short training period. The exaCT U thinks along with you: Measurement parameters are automatically optimized by the system.

In its performance class, the exaCT U is one of the most compact computer tomographs on the market. It has five independent traversing axes and offers impressive resolution. Hardware and software offer the possibility of automated integration into the production line and deliver market-driven answers to questions about industry 4.0.

WENZEL was awarded the Customer Value Leadership Award 2017 from Frost & Sullivan for the exaCT U.

APPLICATIONS

The exaCT U is universally applicable and can also scan large components with higher densities due to its high measuring volume. It is ideally suited for measuring and testing parts made of plastic, light metal, composite materials or multi-materials. The exaCT U 225 ensures short CT scans with its fast detector. With its high-resolution detector, the exaCT U 300 impresses above all with maximum detail detectability. With its 300 kV, it also penetrates denser materials.



Vehicle headlamps



Assembly inspection

Internal combustion engine

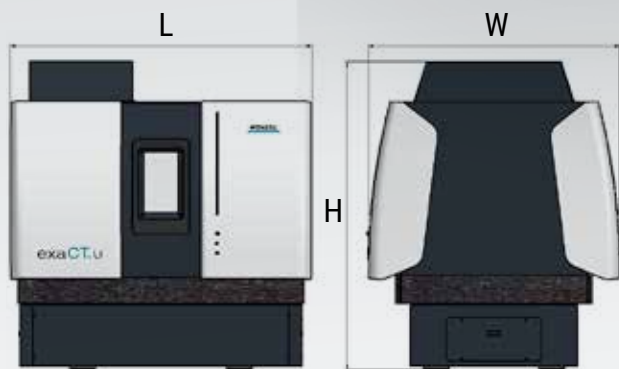


Defect analysis

Titanium-ceramics implant



Metrology



MACHINE PROFILE

exaCT U 225

Space Requirements (L x W x H)	2350 x 1960 x 2400 mm
X-Ray (Voltage, Power)	225 kV, 350 W
Detector Matrix, Pixel Size	3000 x 3000 Pixel, 150 µm
Max. Measuring range	Ø 330 / H 700 mm*
Device weight	10200 kg

exaCT U 300

Space Requirements (L x B x H)	2350 x 1960 x 2400 mm
X-Ray (Voltage, Power)	300 kV, 350 W
Detector Matrix, Pixel Size	4000 x 4000 Pixel, 100 µm
Max. Measuring range	Ø 330 / H 700 mm*
Device weight	10200 kg

* The measurable height depends on the component diameter.

FEATURES

- Best results through high performance**
 Fast scanning |
 Fast reconstruction |
 Fast evaluation
- High flexibility**
 Various volumes and configurations | Software for all applications | Choice of radiation sources and detector resolutions
- One scan, many evaluations, maximum time saving**
 Metrology with virtual CMM | NDT and error analysis | Microstructure analysis
- Low operating costs**
 Precision mechanics for higher availability |
 Longer calibration intervals
- High efficiency due to low space requirements**
 Large measuring volume |
 Suitable for workshops |
 Automation solutions

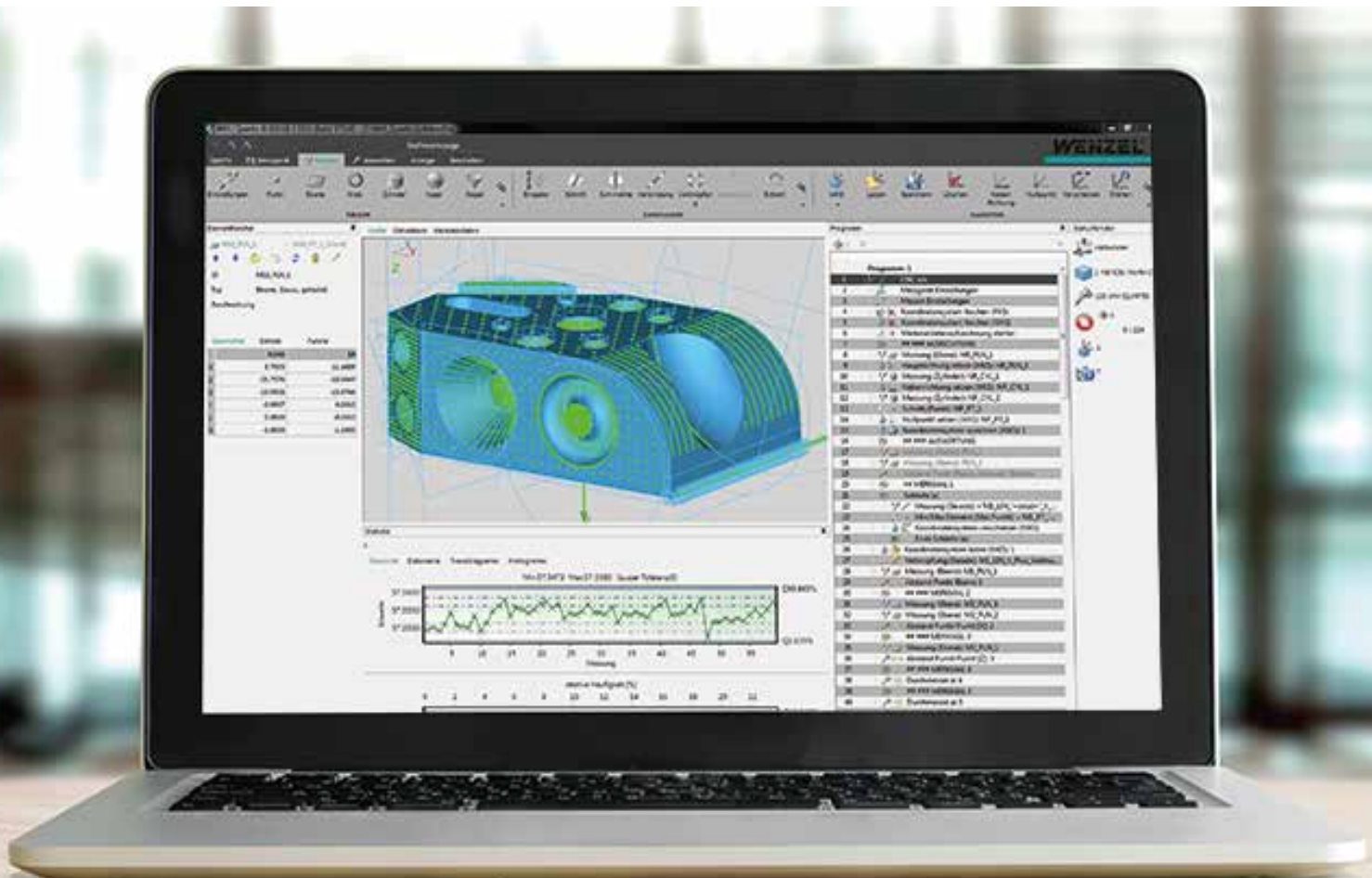
exaCT SOFTWARE FAMILY

A SOLUTION FOR THE CUSTOMER

In order to operate a CT from WENZEL, you do not need to be a computed tomography specialist. The intuitive user guidance can provide good measurement results after a short training period. High precision and a fast scanning time is ensured by the special CT control and monitoring system developed for industrial applications. Reconstruction software from WENZEL will ensure that individual components are optimized to ensure that high quality standards are achieved.

The data acquisition software provides optimized control of the computer tomograph. Reconstruction software guarantees the exact calculation of the volume data. On the basis of a single measurement metrological evaluations, material testing, nominal-actual comparisons against a master component or CAD data, reverse engineering and shrinkage compensation within the shortest possible time.

WM | Quartis – Dimensional Metrology

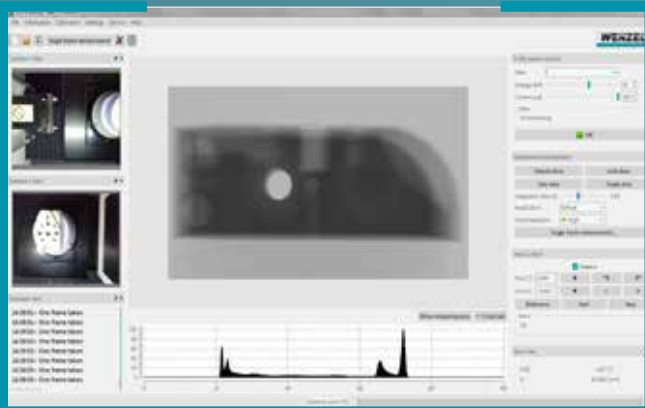


WENZEL CT SOFTWARE

AT A GLANCE

WM | exaCT CONTROL – CONTROL SOFTWARE

- User friendly control of the system hardware
- Simple preparation of CT scans and automatic optimization of the measuring parameters



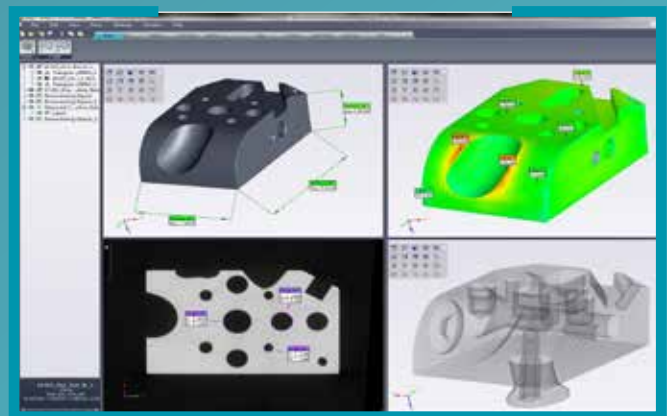
WM | CT Control - Control software

WM | QUARTIS – DIMENSIONAL METROLOGY

- Non-destructive and non-contact metrological analysis of all data at component surfaces as well as the internal structures of workpieces.
- Clearly arranged, flexible and result-oriented user interface with proven design and alignment functions
- Complete functionality for the evaluation of form, position and dimensions with simple display of the measurement results in meaningful measurement reports
- Intuitive measurement programming for automation of measurement processes including statistical functions

WM | POINTMASTER FOR CT – EVALUATION SOFTWARE

- Powerful analysis software for visualization and processing of voxel and surface data
- Surface generation tools for the generation of exact freeform surfaces and standard geometries
- NDT functions, such as 3D shrinkage analysis, testing for inclusions, wall thickness analysis as well as segmentation and visualization of composite materials with different densities
- Reverse engineering
- Nominal-actual comparisons to 3D CAD models displayed via color maps
- Innovative functions for iterative compensation of material shrinkage in the case of injection tools and casting molds



WM | CT Analyzer – Evaluation Software

“WENZEL's exaCT workstation is the optimal solution for the requirements of our customers. The coordinated process chain and last but not least the use of the same software for our coordinate measuring machines and industrial computer tomograph have convinced us of this.

Hermann Rodler, CEO, Wild Hi-Precision GmbH

INNOVATION MEETS TRADITION

The WENZEL Group is one of the leading suppliers in the field of industrial metrology and styling solutions. WENZEL's product portfolio includes coordinate and gear measuring machines with tactile and optical sensors, multi-sensor systems, optical high speed scanning and 3D X-ray measuring technology based on computer tomography. In addition to these systems WENZEL also offers comprehensive metrology software, which is used by many thousands of users for the measurement and analysis of parts. WENZEL's measuring solutions

are used in various industries, including the automotive sector, aerospace, power generation and medical devices. Our solutions also support reverse engineering, inspection, and analysis for a variety of fields including power generation, vehicle electrification, and additive manufacturing. Over the years WENZEL has installed more than 10,000 machines worldwide. Subsidiaries and agencies in more than 50 countries support the sales and ensure the after sales service for our customers. The WENZEL Group employs more than 600 people worldwide.



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We are there for you worldwide. You can find our subsidiaries, sales and service partners at **www.wenzel-group.com**.

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