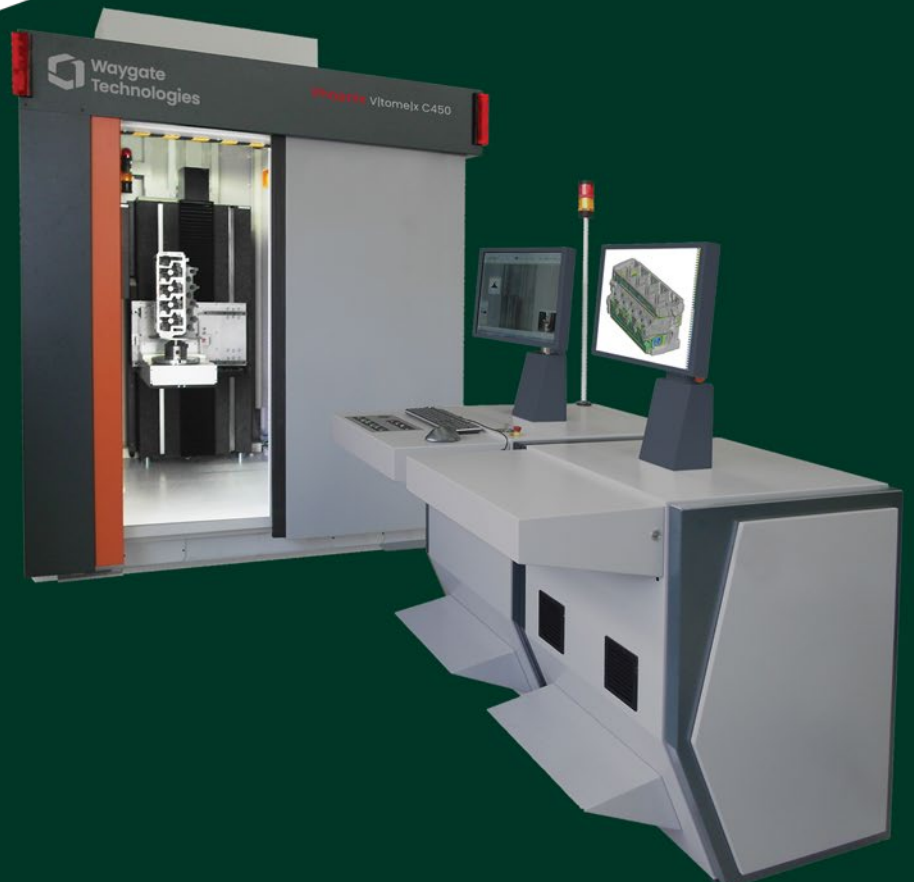


# Phoenix V|tome|x C450

Compact industrial 450 kV CT inspection  
combined with premium 3D metrology of highest  
quality, faster than ever.



# Bring 3D CT inspection right to the factory floor.

As manufacturing becomes more digital and automation becomes the norm, it's more important than ever to inspect with both precision and efficiency. Waygate Technologies is revolutionizing 3D inspection for non-destructive testing (NDT) and dimensional control to make these goals a reality.

By adapting CT technology for industrial needs and combining it with powerful X-ray technology, robotic manipulators, automated software, and exclusive CT technologies, we have created a family of industrial CT products that reduce overall inspection times from hours to just minutes.

The Phoenix V|tome|x C450 offers compact production-oriented, high-throughput CT for atline 3D failure analysis and precision 3D metrology of large parts (up to 500 mm diameter / 1,000 mm height and up to 100 kg) in the aerospace and automotive industries. It boasts a robust, small footprint for statistical production process control with a low cost of ownership and ease of use – delivering the flexibility to inspect different parts from different production lines in one go, as quickly as possible.

## Applications:



**Battery cells and modules**



**Large light metal castings**



**Small steel castings**



**Additive manufactured parts**



**Composites**

# Increase throughputs to improve efficiency.

The Phoenix V|tome|x C450 offers industry-leading sample size, flexibility, and maximum penetration power for high-absorbing samples at 450 kV. It delivers extremely high quality cone beam minifocusCT with the lowest possible scatter artifact level. With new automation functionality, you can minimize operator time and influence, while highly increasing the repeatability and reproducibility of CT results. And with easy loading tools and automation features, it's easier than ever to use.

With new the Ruby|plate 240 for improved measurement, workflows and precision, as well as Helix|CT and multi beam hardening correction for improved image quality, you can increase probability of detection (POD) with efficiency and ease.



## 1. Scatter|correct technology

Get unprecedented low artifact precision up to 100 times faster than with a comparable quality fan beam CT.

## 2. Dynamic 41 digital detector

Double CT resolution at the same speed, or double throughput at the same quality level as 200  $\mu\text{m}$  pitch DXR detectors. Compared to 16-bit detectors, the optimized 14-bit technology offers the highest efficiency with a dynamic range of 10000:1 and thus saves time in use and also generates less noise in the image.

## 3. Helix|CT

Scan with improved image quality to increase probability of detection (POD) with efficiency and ease.

## 4. Offset|CT

Scan even larger parts with up to ~70% larger scanning volume.

## 5. Multi|bhc

The Multi|bhc tool corrects streaking artifacts which typically occur as multiple dark streaking bands positioned between dense areas in multi-material samples.

## 6. One-button|CT automation

Scan with the click of a button for high throughputs and efficiency.

## 7. Quick|pick manipulator

Scan larger batches with the automated high-speed configuration HS.

## 8. Filter|changer (optional)

Increased productivity for automated batch CT inspection.

## 9. Metrology|edition (optional)

Leading measurement accuracy referring to VDI/VDE 2630-1.3 for reliable revalidation of system performance and reproducible metrology applications.

# Premium performance for a range of applications.

The Phoenix V|tome|x C450 is a compact 450 kV CT system specially designed for high throughput NDT and quality assurance labs, allowing both combined semi-automated NDT and 3D metrology. With its granite based manipulation and specific 3D metrology package, the Phoenix V|tome|x C450 includes all essential features for CT measurements with a measurement accuracy of  $SD \leq (15 \pm L/50 \text{ mm}) \mu\text{m}^*$ . For higher resolution the V|tome|x C 450 is also available with Mesofocus tube.

In HS configuration\*\* this low-maintenance, production-oriented solution delivers high throughput for atline operations with high flexibility and even higher image quality. It enables you to inspect different parts from different production lines in one go, at the highest possible speed, without compromising quality. And with the optional Offset|CT capability, you can scan even larger parts with up to 70% larger scanning volume.

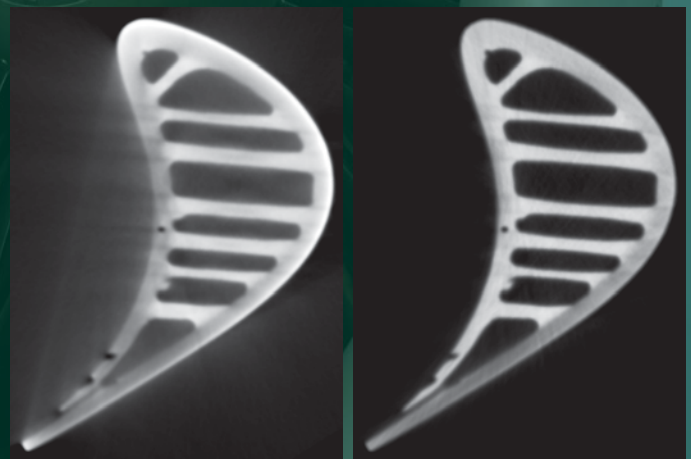
## Scan up to 100 times faster

The Phoenix V|tome|x C450 is the first industrial CT scanner with the patented breakthrough Scatter|correct technology.

This option automatically removes scatter artifacts from the CT volume, allowing you to gain significantly improved CT results compared to conventional cone beam CT.

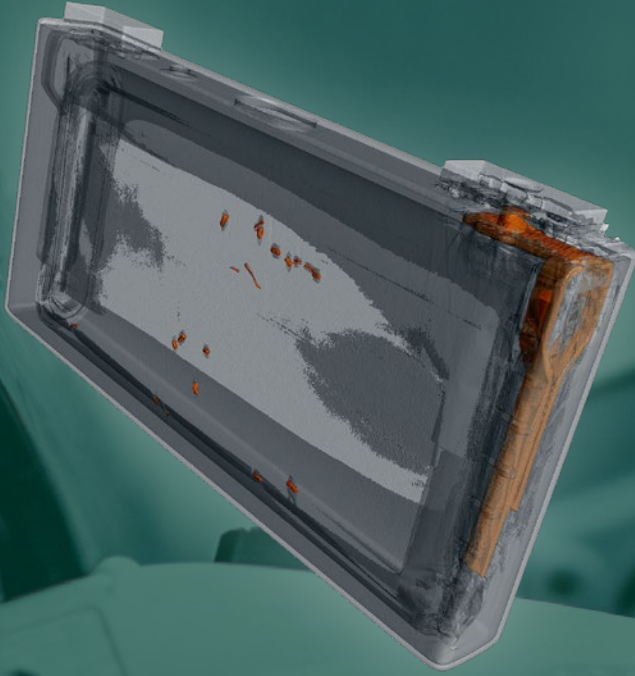
It delivers a low scatter artifact CT quality level never before reached, at a speed faster than previously possible.

With the V|tome|x C450, you get significant quality improvements not only for high-scattering materials like steel and aluminum, but also for composites and multi-material samples.



Conventional cone beam CT with scatter radiation artifacts

Advanced Scatter|correct cone beam CT



Detection of inclusions with CT inspection of a prismatic battery cell

## Industrial non-destructive (NDT) 3D failure analysis

With X-ray CT for 3D NDT tasks like internal defect analysis, 3D quantitative porosity analysis, porosity/inclusion pre-machine testing, and assembly control, you can find the exact 3D location and quantitative evaluation of defects. The Phoenix V|tome|x C450 provides information on inclusion and cavity size, volume, and density. With this information, you can optimize your production process parameters to increase quality and reduce scrap costs for:

- Small and medium sized electronic components and battery cells and modules
- Small and medium sized steel castings, like turbine blades
- Complex composite parts, like fan blades
- Large complex light metal castings, like cylinder heads

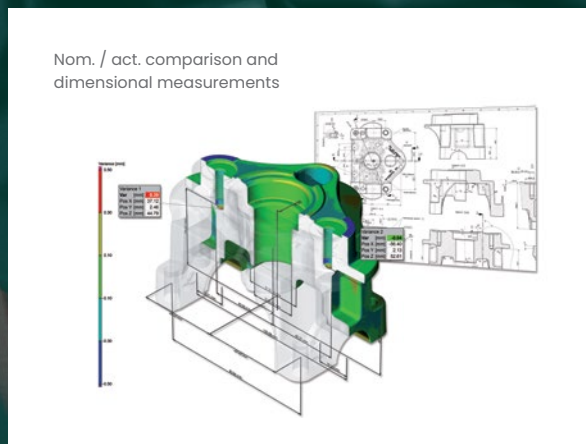
## Dimensional production and process control with Metrology

3D CT offers big advantages over conventional tactile or optical coordinate measuring machines (CMM) – especially if there are complex parts with hidden or difficult surfaces.

The new largest known Ruby|plate 240 calibration phantom and compensation of thermal drift effects by using temperature sensors bring automated metrology workflows and precision to a new performance level for even larger parts.

This allows improved VDI 2630 conform accuracy specification and three times faster performance verification of multiple positions – reliable and reproducible.

- Nominal-actual CAD comparison
- Dimensional measurements / wall thickness analysis
- Reverse engineering / tool compensation
- $SD \leq (15 \pm L/50 \text{ mm}) \mu\text{m}$  referring to VDI 2630 guideline



Nom. / act. comparison and dimensional measurements

\* Measured as deviation of sphere distance in tomographic static mode SD (TS), method details referring to VDI 2630 guideline on request. CT performance specified refers to ASTM E 1695 guideline

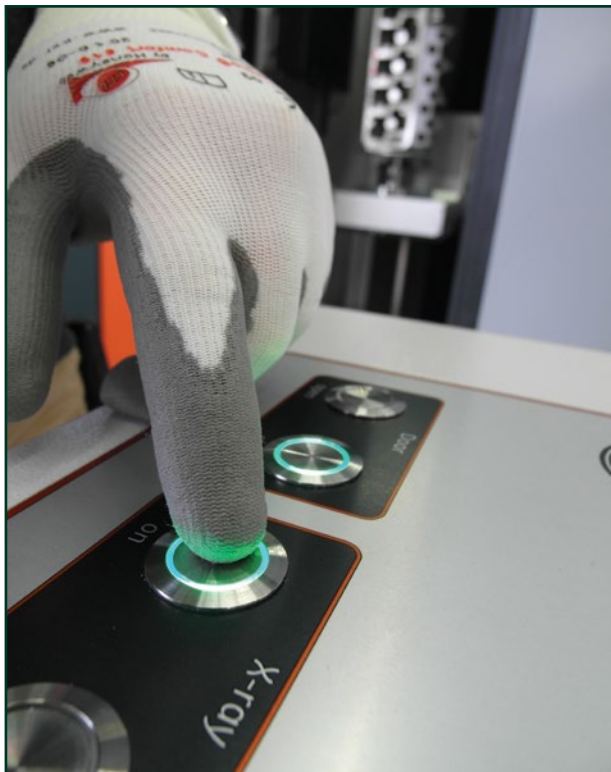
\*\* With Quick|pick

# Automate your entire CT process chain.

Drive inspection productivity with a highly automated batch CT system. By automating inspections with the V|tomex C450, you can increase efficiency by reducing operator time, as well as the risk of human error. This system delivers the highest throughput batch CT possible – scanning up to 25 turbine blades in less than two hours without any operator action. One operator can run several systems parallel instead of just one with less training, which can quadruple productivity and reduce operational costs.

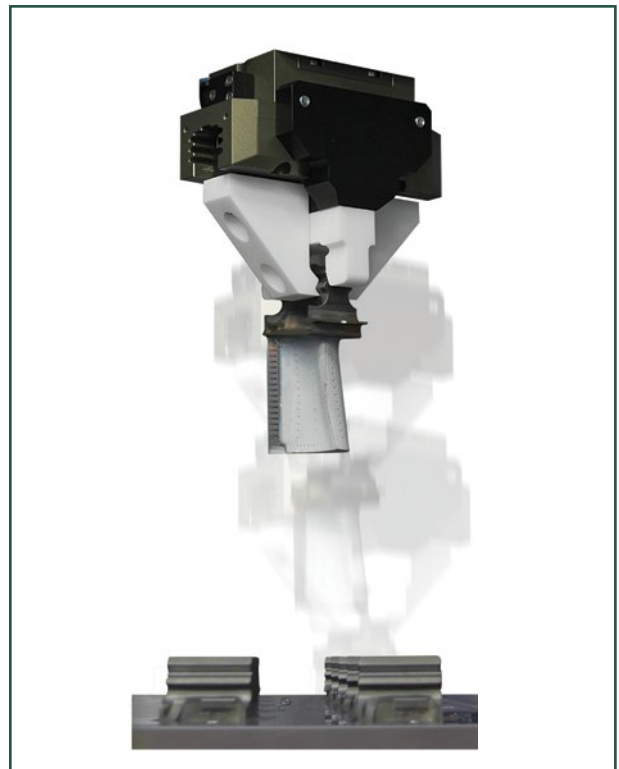
## One-button|CT

One-button|CT functionality enables your entire CT process chain to be fully automated with the push of a single button. It reduces operator time and influence, while dramatically increasing repeatability and reproducibility of your CT results.



## Quick|pick manipulation

In the high-speed (HS) configuration, the Phoenix V|tomex C450 HS comes with Quick|pick manipulation functionality for fully automated blade inspection with an additional box axis and pneumatic gripper manipulation. Just place a new box with various parts in the scanner, close the door, and press the “Start CT ”button.



The V|tomex C450 HS comes with the additional high speed Quick|pick manipulator for high throughput automated large batch CT e.g. of turbine blades

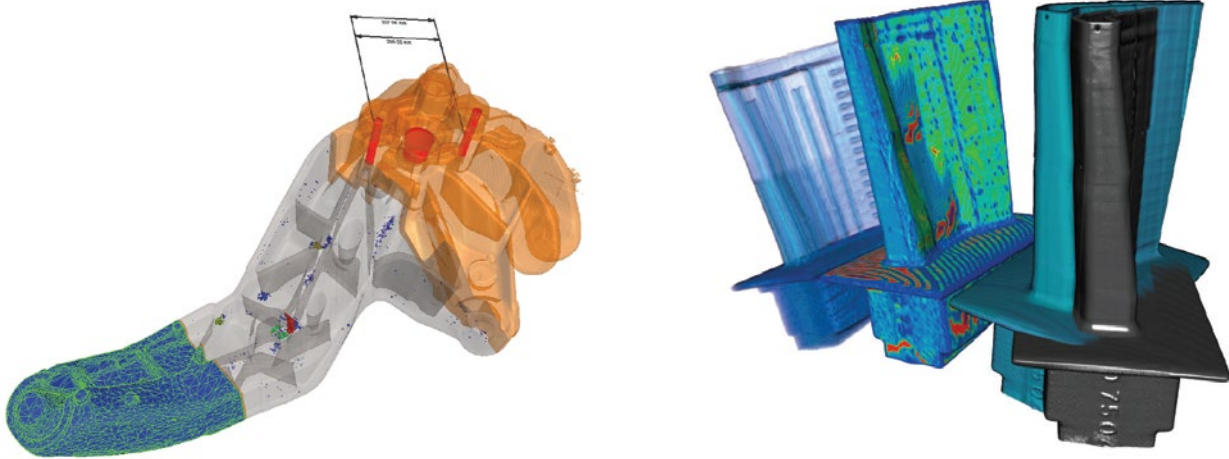
# General specifications

	Phoenix V tome x C	V tome x C Scatter correct / HS
Minifocus X-ray tube	Closed ISOVOLT 450 M2/0.4-1.0HP (optional 450 kV Mesofocus)	
Max. voltage / power	450 kV @ 700 W/1,500 W	
Focal spot	0.4 mm (max. power 700 W) / 1.0 mm (max. power 1,500 W)	
Focus Detector Distance (FDD)	1,300 mm	1,150 mm
Voxelsize range	100-146 µm	87-139 µm
Geometrical magnification (3D)	1.37-2x	1.44-2.3x
Spatial CT resolution	2.5lp/mm at 130 µm voxel resolution referring to ASTM E1695	
Detail detectability	Down to ~50 µm with ISOVOLT Minifocus / ~20 µm with Mesofocus	
Opt. Metrology edition measurement accuracy	SD ≤ (15 ± L/50 mm) µm referring to VDI 2630-1.3 guideline*	
Cone beam CT Dynamic 41 200 detector (on request)	Dynamic 41 200 large area detector with superior image and result quality, 410 x 410 mm (16" x 16"), 200 µm pixel size, 2,036 x 2,036 pixels (4 MP), virtual detector enlargement for large samples, 14 bit high-contrast with extremely high dynamic range >10,000:1	
Cone beam CT Dynamic 41 100 detector (on request)	Dynamic 41 100 detector 410 x 410 mm (16" x 16"), 100 µm pixel size, 4,048 x 4,048 pixels (16MP) for doubled CT resolution, virtual detector enlargement for large samples, 14 bit high-contrast with extremely high dynamic range >10,000:1	
Dual detector configuration (option)	Alternative detector package „cone & fan“: Combination of LDA and flat panel detector, each with detector shift and easy switching between fan beam and cone beam CT mode	
Granite based high precision Manipulation	4 automated axes R, Y, Z, X	
Max. 3D scan area d x h / max. weight	500 x 1,000 mm (270 x 1,000 mm Scatter correct) / up to 50 kg (110 lbs.) or optionally up to 100 kg (220 lbs.)	
Max. 3D scan area d x h / max. weight HS		270 x 310 mm / up to 10 kg (rotation unit HS) 100 x 125 mm / up to 3 kg (Quick pick gripper)
Focus object distance	650-950 mm	500-800 mm
System dimensions W x H x D	2,310 mm x 2,750 mm x 2,870 mm (91" x 108" x 113") excluding console	
System weight	~15,000 kg / 33,070 lbs.	
Phoenix Datos x CT software	For highly automated One-button CT including multiple modules for CT data and workflow optimization. Different 3D evaluation software packages for 3D metrology, failure or structure analysis on request	
Phoenix Datos x measurement package (option)	Surface extraction – automatic generation of surface data   Easy calib – module for CT system calibration   Calibration object – 1 calibration tool with certificate	
Velo CT II package (option)	For ultrafast volume reconstruction	
Filter changer (option)	Automated change of up to 4 filters for maximum flexibility and quality at automated batch CT	
Cabinet crane (option)	For ergonomic handling of heavy samples up to 50 kg (110 lbs.) or optionally up to 100 kg (220 lbs.)	
Barcode reader (option)	For easy sample identification	
Radiation protection	Radiation safety cabinet for full protective installation without type approval according to German StrSchG/StrSchV. It complies with French NFC 74 100 and the US Performance Standard 21 CFR Subchapter J. For operation, other official licenses may be necessary	

\* Measured as deviation of sphere distance in tomographic static mode SD(TS), method details referring to VDI 2630 guideline on request

# A partnership for improved performance.

The high-throughput production control optimized Phoenix V|tome|x C450 is just one example of how we are revolutionizing digital inspection to make manufacturing processes more efficient. With our entire CT product family, a variety of optional innovations, and expert service, we are committed to enhancing precision, automation, and productivity for your operations.



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