Waygate Technologies
a Baker Hughes business

Castings, Composites, Assemblies & AM Parts

Industrial Computed Tomography Solutions for Large or Dense Samples

Phoenix V|tome|x L300
Phoenix V|tome|x L450
Phoenix Power|scan HE

Advanced Solutions for CT Scanning at the Limits of Sample Size and Density

As the global industrial CT market and technology leader with more than 1500 CT installations worldwide, Waygate Technologies provides the broadest range of CT solutions to meet any inspection and metrology task - from nanoCT® with detail detectabilty in the submicron range up to powerful Linac based high energy CT.

Waygate Technologies' exclusive patented Scatter|correct technology available in its Phoenix V|tome|x L, V|tome|x C and Powerscan HE systems enables you to perform highly precise CT scans of highly radiation scattering samples with the superior image quality of fan beam CT at the hundred times faster throughput of cone beam CT. Thus, we are bringing industrial CT from the quality labs to the production floor.

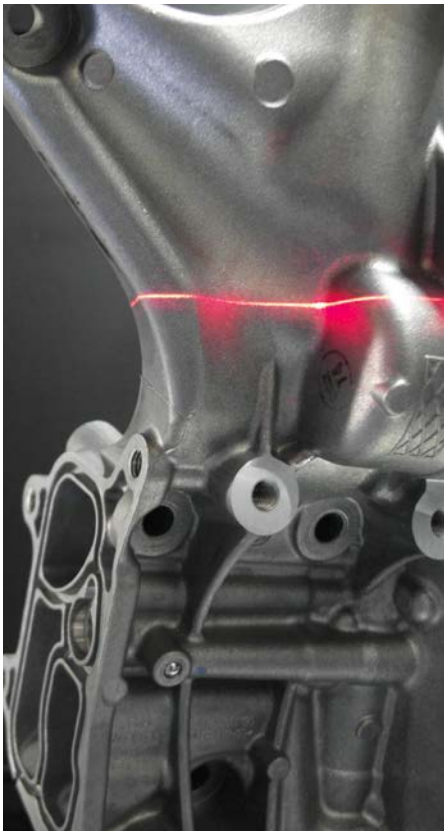
Waygate Technologies' Large and Dense Sample Scanning Solutions Range*

	V|tome|x L300	V|tome|x L450	Power|scan HE
Application	AM, castings, composites, bio, geo, metrology, batteries	AM, castings, composites, bio, geo, metrology, batteries	Large composite or high absorbing castings, weld assemblies, batteries or AM parts
Advantages	Maximum flexiblilty and precision	Maximum flexiblilty and precision	20 times more penetration energy for extraordinary large and heavy samples
Max. CT Scan Size (Ø x height)**	900 mm x 600 mm	1300 mm x 1250 mm	2000 mm x 1920 mm
Max. Sample Weight (kg / lbs)**	50 kg / 110 lbs	100 kg / 220 lbs	1000 kg / 2200 lbs
Best Detail Detectability	0.2 µm (nanofocus)	1 µm (microfocus)	~500 µm (linac)
Penetration Energy	180 kV nanofocus and 300 kV microfocus	300 kV microfocus and 450 kV minifocus	450 kV minifocus and 9 MEV linac
Opt. Metrology|edition (VDI/VDE 2630-1.3)	SD ≤ (6.8 ± L/100 mm) µm	SD ≤ (6.8 ± L/100 mm) µm	–

* For smaller part inspection and 3D metrology, the smaller footprint micro- and nanoCT® systems Phoenix V|tome|x S and M as well as Nanotom® M might be optimal choice.
** Values in the table represent the standard configuration. Additional values are available on request.

Find your optimal CT Solution

Applications	V|tome|x L300	V|tome|x L450	Power|scan HE	V|tome|x C450*
Large plastics moldings & composites	●	●	●	●
Complex composites	●	●	●	●
Small light metal castings	●	●		
Large light metal castings	●	●	●	●
Small steel castings / AM parts	●			●
Large steel castings / AM parts		●	●	●
Battery cells & modules	●	●	●	●
Battery packs			●	
Science /R&D / Cultural / Exploration	●	●	●	
Precision Metrology: Medium parts	●	●		●
Precision Metrology: Large parts		●	●	●



Alternative Phoenix CT System to Scan Large Samples:

V|tome|x C450*

Application	AM, large light metal and small steel castings, composites and batteries
Advantages	Small footprint with high power and large sample size
Max. CT Scan Size (Ø x height)	900 mm x 600 mm
Max. Sample Weight (kg / lbs)	50 kg / 110 lbs (optional 100 kg / 220 lbs)
Max. Detail Detectability	~100 µm
Penetration Energy	450 kV minifocus
Opt. Metrology|edition (VDI/VDE 2630-1.3)	SD ≤ (15 ± L/50 mm) µm

* For more information, please see the separate V|tome|x C450 brochure

Phoenix V|tome|x L300

The Phoenix V|tome|x L 300 is a versatile, high-resolution walk-in cabinet microfocus system for 3D computed tomography (microCT) and 2D non-destructive X-ray inspection.

It is equipped with a unipolar 300 kV/500 W microfocus source and optional nanoCT capability in Dual|tube combination with a 180kV/20W high-power nanofocus X-ray tube. Able to handle large samples up to 50 kg and up to 500 mm in diameter, the V|tome|x L300 is your best solution for void and flaw detection, structural analyses and 3D metrology of composites, castings and precision parts, e.g. turbine blades.

Phoenix V|tome|x L300

Key Features & Benefits of the V|tome|x L Family

- Great flexibility for 2D and 3D inspection on a wide application range
- Fast CT acquisition and brilliant images by next generation highly sensitive Dynamic 41 detectors
- Leading exclusive Waygate Technologies core components such as X-ray tubes, detectors, software
- Patented optional features such as High-flux|target or Scatter|correct technology
- Leading measurement accuracy referring to VDI/VDE 2630-1.3 for reliable revalidation of system performance and reproducible metrology applications

Typical Applications

- Highest precision micro- and nanoCT
- Medium sized light alloys samples: Aluminum, Magnesium, Zinc
- Electronics: Complex/molded assemblies, sensors, actuators, battery cells and modules
- Complex assemblies (electrical/mechanical/medical)
- Structural inspection of 3D printed parts, composites, ceramics
- Reverse engineering: Metal, plastics, rapid prototyping, bio-mechanics
- Scientific research (Plants, animals, geo- and materials sciences)

Casting CT with the powerful 300 kV microfocus X-ray tube

Flexible Dual|tube micro- and nanofocus inspection

Tilt axis for 2D inspection & 3D precision CT axis

Phoenix V|tome|x L450

The Phoenix V|tome|x L450 is the result of consistent further development of versatile CT system technology, combining laboratory and production-oriented 2D and 3D inspection tasks at a very high level of accuracy and detail capability.

As the "big brother" of the L300 system, it provides even more flexibility, sample size and with its 450 kV / 1500 W minifocus tube it is an excellent solution for void and flaw detection and 3D metrology (e.g. first article inspection) of castings, large assemblies and AM parts. An optional second 300 kV microfocus X-ray tube combined with an optional High-flux|target allows the Phoenix V|tome|x L450 to adapt to any kind of industrial and scientific CT application. Its technical innovations make the difference: faster scan time, improved image quality, sample automation, connectivity, low operational costs.

Phoenix V|tome|x L450

Phoenix V|tome|x L450: Movement of all axes for scanning a large crash spant. Courtesy of German Space Agency DLR.

Typical Applications

- High precision micro- and minifocusCT
- Large Light alloys: Aluminum, Magnesium, Zinc (e.g. E-engine housings, gear boxes, large structure parts)
- Higher density alloys: Iron castings, titanium, nickel, cobalt
- Composite materials, large assemblies, AM parts
- Research: 3D printing, composites, battery cells and modules, ceramics, medical industry
- Reverse engineering: Metal, plastics, rapid prototyping, bio-mechanics
- Scientific research (Plants, archaeology, animals, geo- and materials sciences)

Phoenix Power|scan HE

The very first of its kind, our 9 MeV linear acceleration (LINAC) CT scanner Phoenix Power|scan HE leverages cutting-edge technological advancements.

The combination of penetration power and Waygate Technolgies advanced CT features such as Scatter|correct technology makes this CT system predestined to scan extremely large, heavy and high absorbing complex parts and assemblies with unmatched speed, precision, and ease of use — enabling faster, more precise inspections than ever before. When it comes to fast and powerful, but precise and reliable high quality CT with maximum flexibility, Power|scan HE is the ultimate solution.

Key features & benefits

- 9 MeV LINAC source, 20 times more powerful than the optional 450 kV minifocus X-ray tube
- Part weight up to 1000 kg and part size up to 1920 mm in diameter x 2000 mm tall
- Line or flat panel detector with up to 4x detector shift, combined with advanced scatter correction technology ensure high througput at premium image quality
- Flexibility to add additional features such as metrology

An integrated crane makes loading and unloading of parts that weigh up to 1000 kg simple

Dual X-ray source 450 kV minifocus /9 MEV linac

Typical Power|scan HE Applications

The Phoenix Power|scan HE System has been designed to meet the fast-growing demand for applications requiring much more than traditional CT machines can offer. Driving the requirements is the need for high quality CT scans of

- complex castings
- high-density metal alloy additive parts
- large composites components with complex internal structures

This system is capable of analyzing these types of components with a significant scan time reduction at highest image quality.

Line and flat panel detector with 4x virtual enlargement

Superior CT Performance with Award-Winning CT Technology

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

Dynamic 41 digital detector
Double CT resolution at the same speed, or double throughput at the same quality level as 200 µm pitch DXR detectors.

Filter|changer
In combination with the Sample|changer, the optional Filter|changer allows to perform batch CT scans.

Sample|changer
This easily removable holder allows automatic change of different samples.

High-flux|target
Improve efficiency with faster microCT scans or doubled resolution with higher power on a smaller focal spot.

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.

ASC|filter
Adaptive scatter correct filter offer unrivaled image quality by significantly reducing artifacts caused by reduced grey values in high absorbing sample CT datasets

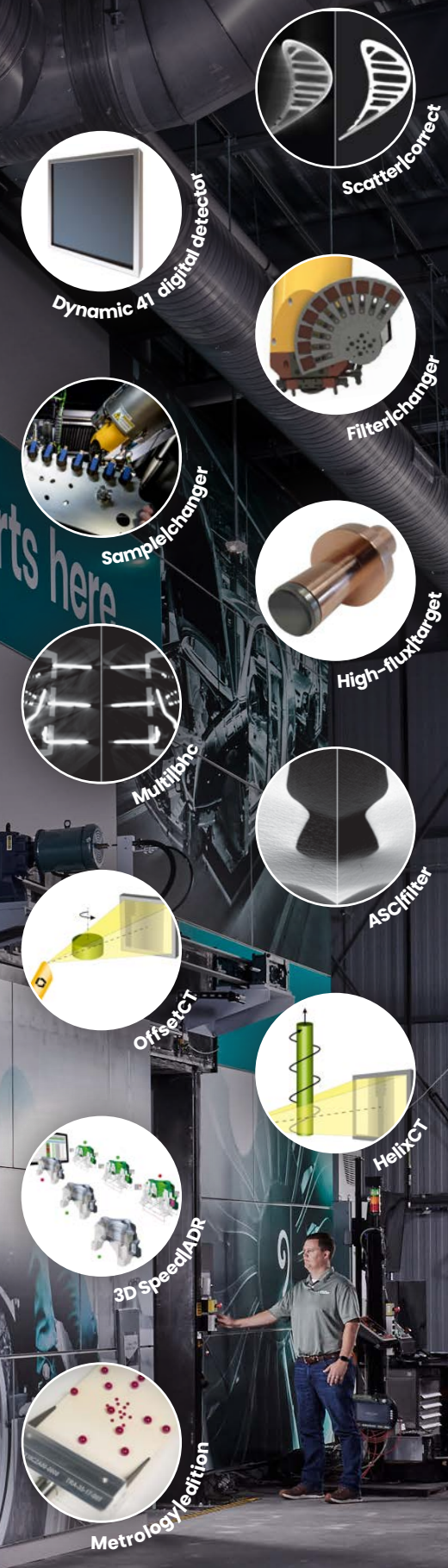
Offset|CT
Scan even larger parts with up to 100% larger scanning volume.

Helix|CT
Scan longer samples with improved image quality to increase probability of detection (POD) with efficiency and ease.

Orbit|scan
Define a virtual scan rotation axis for ease of scan adjustment and flexible ROI scans

3D Speed|ADR
Proprietary speed-optimized 3D volume analysis and defect detection for industrial mass production process control

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



Key Specifications & Features

	Phoenix V|tome|x L300	Phoenix V|tome|x L450	Phoenix Power|scan HE
Primary X-ray source	300 kV / 500 W microfocus	450 kV / 1500 W minifocus	9 MeV linear accelerator
Optional additional X-ray source for higher resolution	180 kV / 20 W nanofocus	300 kV / 500 W microfocus	450 kV / 1500 W minifocus
Max. CT scanning volume (Ø x height) *	900 mm Ø x 600 mm	1300 mm Ø x 1250 mm	1920 mm Ø x 2000 mm
Max. sample weight *	50 kg	100 kg	1000 kg
Min. focal spot (F) / Max. detail detectability (D)	D <1 µm with 300 kV tube, optional 200 nm with 180 kV tube	F 1 mm @ 1500 W, optional D <1 µm with 300 kV tube	F <1.5mm @ 20 Gy/min/m, optional 1 mm @ 1500 W with minifocus tube
Geometric magnification	1.25x - 238x (2D)/187x (3D)	1.25x - 400x (2D)/242x (3D)	4.5x
Granite based Manipulation	7 axes	7 axes	11 axes
Focus detector distance (FDD)	400 - 1500 mm	600 - 2500 mm (microfocus) 990 - 2810 mm (minifocus)	5300 mm
Cabinet dimensions (W x H x D) in mm)	4100 x 2600 x 2800 mm (without console & switch cabinet)	6400 x 3900 x 4300 mm (without console & switch cabinet)	Manipulator 8000 x 4300 x 3800 mm (without bunker, console & switch cabinet)
Weight approx. without / with cabinet *	8.5 t / 22.7 t	15 t / 63 t	~48 t / bunker required
Flat panel detector (DDA)	16" Dynamic 41|100 100µm for high contrast high resolution or 16" Dynamic 41|200 200 µm for high contrast high througput		High radiation proof DXR S200 HE 200 µm pitch detector
Optional line detector (LDA)	614 mm length at 0.4 mm pixel pitch, 2x detector shift		820 mm length at 0.4 mm pixel pitch, 2x shift
Flat panel detector shift	2x	3x	4x
Offset|CT	Scan bigger parts or the same size parts with higher resolution		
Optional Orbit|scan	Define a virtual scan rotation axis for ease of scan adjustment and flexible ROI scans.		–
Helix|CT	Scan long samples with improved image quality		
High-flux|target	Faster microCT Scans or doubled scan resolution		-
Multi|BHC	Beam-hardening correction in multi-material scans		
Scatter|correct	Patented scatter radiation artifact reduction		
ASC|filter	Adaptive filter optimization		-
2D inspection capability	Additional tilt/rotate axes + Flash!™ image optimization software		-
Opt. Metrology|edition	SD ≤ (6.8 ± L/100 mm) µm	SD ≤ (6.8 ± L/100 mm) µm	-

* Values in table represent the standard configuration. Additional values are available on request.

WaygateTechnologies
Niels-Bohr-Str. 7
31515 Wunstorf
Germany
Tel.: +49 5031 172 100
Fax: +49 5031 172 299

WaygateTechnologies
Bogenstr. 41
22926 Ahrensburg
Germany
Tel.: +49 4102 807 0
Fax: +49 4102 807 277

Waygate Technologies USA, LP
11988 Tramway Dr
Cincinnati, OH 45241
USA
Tel.: 1 844 991 0474

For more detailed information or to request a demo, please visit our website or contact us.
phoenix-info@bakerhughes.com

waygate-tech.com/CT

Baker Hughes

BHFF31363-EN (11/2023)