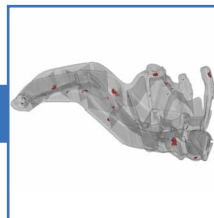


Fast industrial CT based on 4 decades of GE Healthcare CT know-how

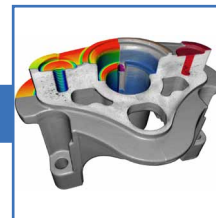
GE
Measurement & Control

speed|scan atlineCT

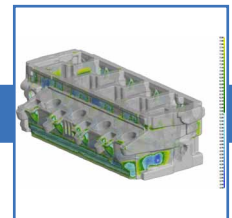
New high-speed Computed Tomography system for 3D mass production process control



Automatic 3D defect recognition.



Comparison between CT and CAD data showing non critical defects in a region to be removed later.



3D wall thickness analysis on a cylinder head volume data set.

Key features & benefits

- First time that fast CT will be available for up to 100 % 3D production control of large castings
- Typical scan speed of ~1 minute for a cylinder head instead of several hours with conventional CT
- > 200x faster 3D inspection compared to conventional industrial CT
- Max. sample size ~300 x 400 x 800 mm (12" x 16" x 31")
- Optimized ease of use and cost of ownership due to high grade of automatization
- Productivity and quality gain due to quantitative 3D automated defect recognition and metrology
- All relevant hard- and software components incl. evaluation algorithms are proprietary GE technology
- Robust design for 24/7 at line operation



GE imagination at work

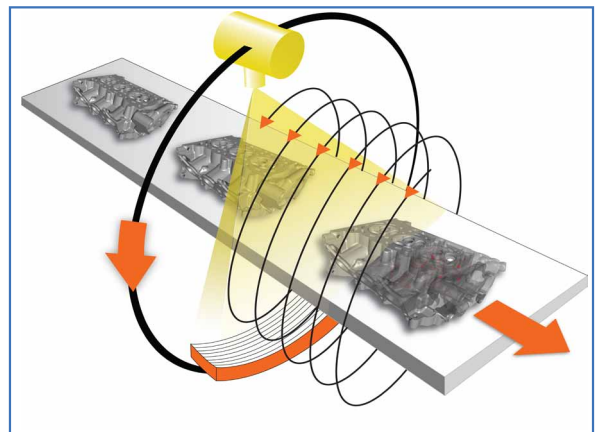
Healthcare for the industry

Over 35 years of GE's CT know-how – now available for NDT

Advanced medical GE gantry based computed tomography provides technology that has been established over a period of nearly four decades. With GE's new industrial speed|scan CT system, this proven technology is now going to be also available for high-speed at line process control. The sample is being transported through the tomograph and scanned within 10-90 seconds for a typical casting. While the next part is loaded, the reconstructed CT data is automatically evaluated. Since this offers inspection times > 200x faster than conventional industrial CT, this technology opens up a lot of new applications for inline process controls, which have in the past been out of reach of conventional industrial CT.

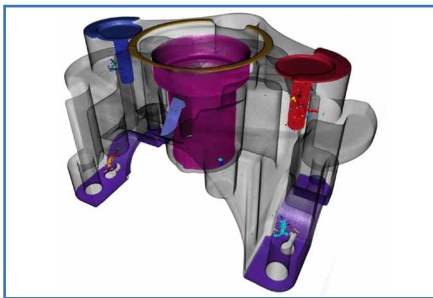
Fast gantry based helix CT

Since CT of large castings with conventional industrial CT typically takes hours, it is not suitable for inspection parallel to the production cycle time. With helix multi-line technology, the work pieces are continuously scanned and automatically inspected with GE's own high-speed 3D evaluation algorithms. To ensure the required image quality with short measuring times and low scattering artifacts, the system is equipped with a high performance X-ray tube and a highly sensitive multi-line detector.



With the high-speed automatic helix CT, a gantry with a X-ray tube and corresponding multi-line detector rotates around the work piece being forwarded on the conveyor belt.

Automatic non-destructive 3D testing and measuring

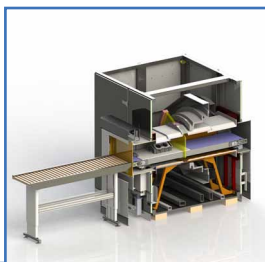


Automated 3D porosity analysis and visualization of machined areas in an automotive casting.

Especially for quality assurance of functional and safety relevant automotive and aviation composite parts or aluminum castings, speed|scan makes it first time possible to perform a 100% 3D inspection. The 3 key game changers in industrial quality assurance with GE's advanced speed|scan CT system are:

- Exact 3D defect location & classification
- Dimensional control: e.g. analysis of the wall thickness
- Actual to CAD data comparison

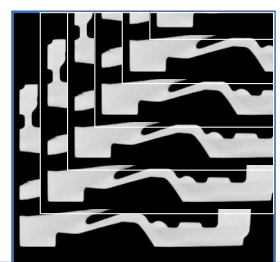
GE's speed|scan CT - a new workflow concept for up



Load work piece



Continuous CT helix scan



Volume reconstruction and optimization

Unload / load next work piece

Conti

GE's speed|scan atlineCT system

3D evaluation parallel to the scanning process

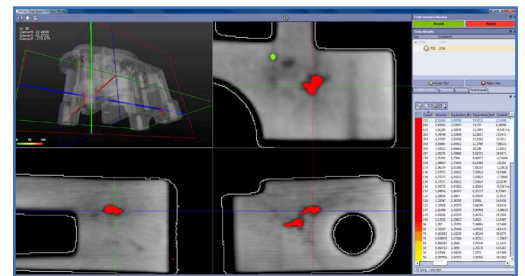
Three-dimensional analysis and process monitoring using volumetric data offer several advantages compared with conventional radioscopic 2D inspection. Depending on the sample size and X-ray penetration length, an immediate response to processing parameters may directly lead to increased productivity:

- Reducing the reject rate by analyzing the 3D position, form and size of the defects taking into account the subsequent processes the products must undergo.
- Depending on their size and absorption behavior, foreign materials like inclusions or sand core remains in castings or composite delaminations may be detected, located and classified according to its density and position
- Checking the scanned work piece geometry for anomalies by using the nominal CAD data ensuring that form and size deviations can be identified at an early stage of the production process.

3D automated defect recognition solution (3D ADR)

The evaluation processes programmed for the particular work piece are carried out automatically on the reconstructed 3D volume parallel to the scanning process.

- Production oriented workflow approach optimized for throughput and part diversity
- Proprietary speed optimized 3D volume analysis and defect detection
- Customizable user interface and visualization including 3D defect result table.

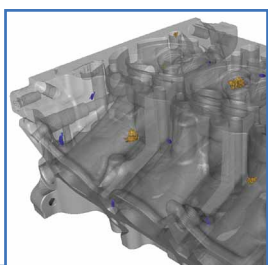


Automatic porosity analysis carried out with GE's new 3D ADR software.

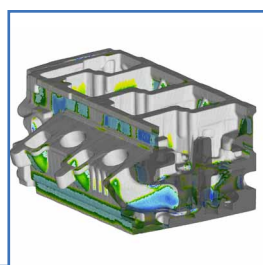
speed|scan atlineCT - your advantages

- Up to 100 % 3D production process control of complex castings
- Proven, gantry based computed tomography offers > 200x faster inspection compared to conventional industrial CT
- Much faster CT scanning (better statistics) substituting other NDT inspection and metrology processes
- Fast 3D inspection and measurement of complex parts & complete feedback for improved reaction on process fluctuations
- Early scrap detection before any further processing steps
- Optimization of plant equipment and tool maintenance intervals

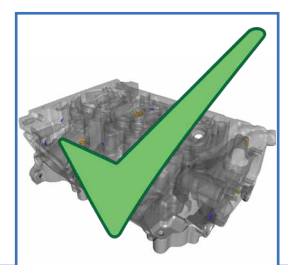
to 100% 3D production process control



Automatic 3D defect recognition



3D metrology evaluation tasks



Good/fail decision

Continuous CT helix scan

Volume reconstruction and optimization

Automatic 3D defect recognition

3D metrology

Unload / load next work piece

Continuous CT helix scan

Volume reconstruction and optimization

Technical Specifications



	speed scan atlineCT system
Inspection Concept	Manual loading & inspection for statistical process control
Max. sample size	appr. 300x400x800 mm (12" x 16" x 31")
Max. penetration length	Up to 300 mm Al, depending on part geometry
Min. detectable defect size	>0.5 mm, depending on part size
Detail detectability	>0.325 mm
Sample weight	Up to 50 kg (110 lbs)
3D Metrology	Fast CAD nominal/actual analysis for process control
Scan speed	5 mm/s - 35 mm/s (overview scout scans up to 100 mm/s)
Geometric parameters	Focus to detector: 950 mm; focus to isocenter: 540 mm; max. scan field of view: 500 mm (aperture: 700 mm)
Scan parameters	kV: 80 kV - 140 kV mA: 10 mA - 440 mA Power: 0.8 kW - 53kW
Dimensions basic cabinet	2,500 mm wide x 2,200 mm deep x 2,300 height (98" x 87" x 91")
Design	Suitable for industrial environment with dust protection, thermal isolation, shock absorbers
Air condition	7.3 kW industrial climate control (air/water heat exchanger); temperature: 15°-40°C
Belt conveyor	Automatic height adjustment: 0-185 mm Horizontal scanable range: 800 mm Speed: 5 mm/s to 100 mm/s (loading & unloading up to 200 mm/s)
Control unit	Industrial operation console for scanner & conveyor operation
Radiation protection	Lead thickness: 3 mm (door, walls, floor). The radiation safety cabinet is a full protective installation without type approval according to the German RöV and the US Performance Standard 21 CFR 1020.40. For operation, other official licenses may be necessary.
Software user level	Designer features (Level 3 operator): <ul style="list-style-type: none"> • Definition of new inspection tasks based on reference datasets • Setting of visualization and computational tasks • Region specific setup of inspection parameters • Definition of visual and semiautomatic inspection
	Inspector and reviewer features (Level 2 operator): <ul style="list-style-type: none"> • Automatic execution of the tasks defined in the designer • Automatic region specific calculation of 3D defect parameters (size/volume, position, distances, equivalent surface and diameter...) • Visualization and result presentation
Pass/fail decision	By operator

www.ge-mcs.com



GE Sensing & Inspection Technologies GmbH
Bogenstr. 41
22926 Ahrensburg
Germany

Tel.: +49 4102 807 0
Fax: +49 4102 807 277
E-mail: xray.info@ge.com

GE Inspection Technologies, LP
50 Industrial Park Rd
Lewistown, PA 17044
USA

Tel.: 717 242 03 27
Fax: 717-242-2606
E-mail: phoenix-usa@ge.com

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