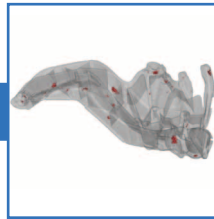


Fast industrial CT based on 4 decades of GE Healthcare CT know-how

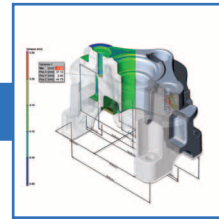
GE
Inspection Technologies

speed|scan CT 64

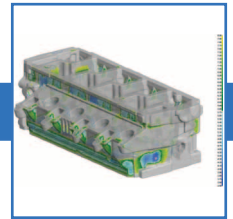
Automated high-speed Computed Tomography
for production process control and optimization



Automatic 3D defect recognition.



CAD nom./act comparison, porosity analysis and pre machining test



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

Key features & benefits

- Productivity and quality gain due to quantitative 3D automated defect recognition and dimensional control
- Cost savings due to faster product ramp up times and minimized rejects
- Up to 100% 3D production control of large castings
- 64-channel data acquisition and patented quick-slide manipulator for rapid sample throughput rate
- Scan speed down to 15 sec. for a cylinder head allows several hundred times faster 3D inspection compared to conventional industrial fan beam CT
- Max. sample size ~600 mm diameter x 900 mm length (23.6" x 35.4"); max. scan diameter ~500 mm (19.6")
- Optimized ease of use and cost of ownership due to high grade of automatization



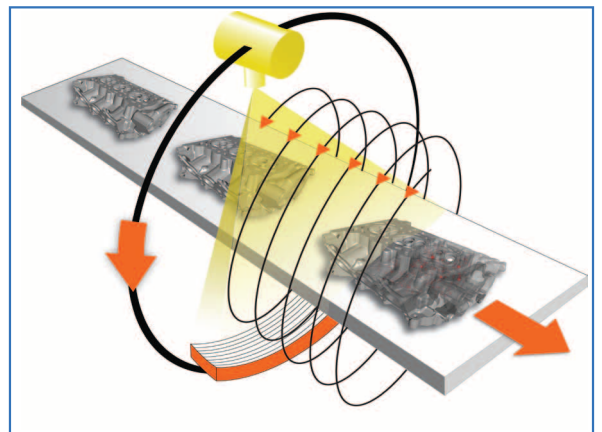
Healthcare for the industry

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

With GE's industrial speed|scan CT system, proven medical gantry based CT technology is now also available for revolutionary high-speed process control in industry. The sample is being transported through the tomograph and even cylinder heads can be scanned within down to 15 seconds. This 4x faster than the first speed|scan generation and several hundred times faster than conventional industrial fan beam CT. While the next part is loaded, the reconstructed CT data is automatically evaluated. By fast scanning of dozens of parts, quantitative production quality data is now available allowing immediate adjustment of the production process parameters, which have in the past been out of reach of conventional industrial fan beam CT.

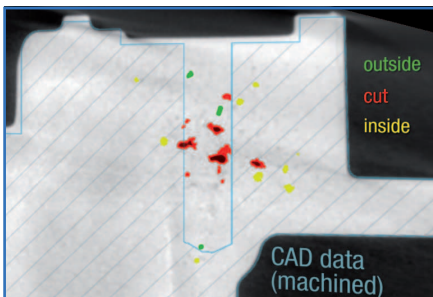
Fast gantry based helix CT

Since CT of large castings with conventional industrial fan beam 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 multiline detector acquiring up to 64 detector rows of scanning data during every gantry rotation.



With the high-speed automatic helix CT, a gantry with a X-ray tube and corresponding 64 channel 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.

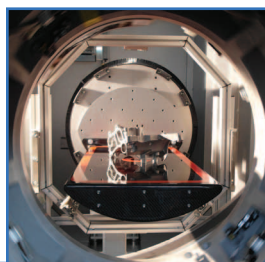
Especially for quality assurance of functional and safety relevant automotive and aviation composite parts or aluminum castings, speed|scan makes it first time possible to perform a 100% 3D inspection. The 3 key game changers in industrial quality assurance with GE's advanced speed|scan CT system are:

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

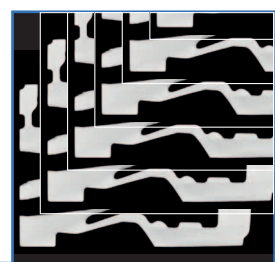
GE's speed|scan CT - a new workflow concept for up



Load work piece



Continuous CT helix scan



Volume reconstruction and optimization

Unload / load next work piece

Conti

GE's speed|scan CT system

3D evaluation parallel to the scanning process

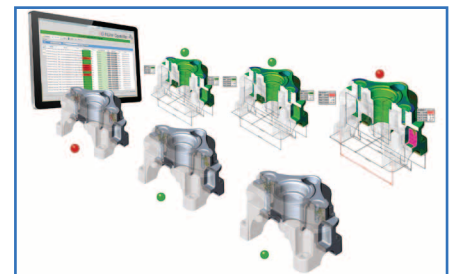
Three-dimensional analysis and process monitoring using volumetric data offer several advantages compared with conventional radioscopic 2D inspection. Depending on the sample size and X-ray penetration length, an immediate response to processing parameters may directly lead to increased productivity:

- 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 (3D speed|ADR)

Leading Volume Graphics industrial batch CT software exclusively combined with GE's powerful speed|ADR algorithms providing highly precise quantitative 3D information for industrial mass production process control and optimization.

- 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

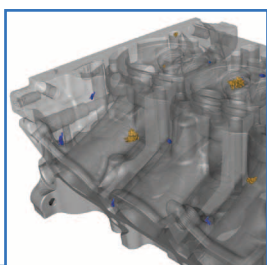


Automated industrial CT mass inspection and metrology tasks with 3D speed|ADR.

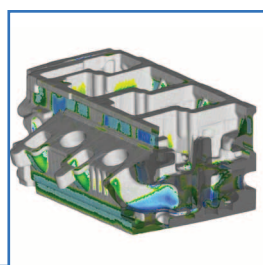
speed|scan CT - your advantages

- Up to 100 % 3D production process control e.g. in production of safety critical components
- Central fast CT surveilling unit controlling the output of many production lines
- Proven, gantry based 64 channel CT acquisition offers several hundred times faster inspection compared to conventional industrial fan beam CT
- Much faster CT scanning (better statistics) substituting other NDT inspection and metrology processes
- Fast 3D inspection and dimensional control 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

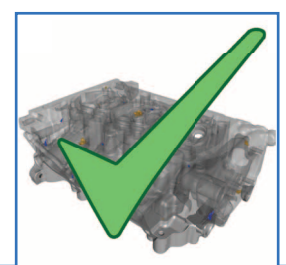
to 100% 3D production process control



Automatic 3D defect recognition



3D metrology evaluation tasks



Good/fail decision

Continuous CT helix scan

Volume reconstruction and optimization

Automatic 3D defect recognition

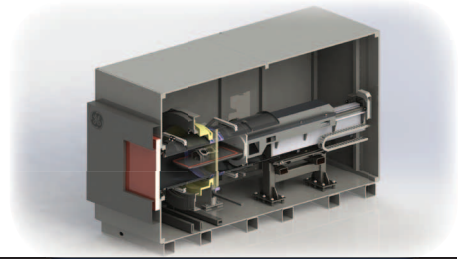
3D metrology

Unload / load next work piece

Continuous CT helix scan

Volume reconstruction

Technical Specifications



speed scan CT 64	
Inspection Concept	Manual loading & operator based inspection or semi-automated inspection with automated 3D failure detection speed ADR and 3D dimensional control for statistical process control
Max. sample size	~ Ø600 mm x 900 mm (23.6" x 35"); max scan diameter ~ Ø500 mm x ~ 888-979 mm (19.6" x 35-38.5")
Penetration length	Allowing inspection of Al gear cases and engine blocks depending on part geometry
Min. detectable defect size	≥ 0.5 mm ³ , depending on part size
Detail detectability	≥ 300 µm
Sample weight	Up to 50 kg (110 lbs)
3D Metrology	Fast automated CAD nominal/actual analysis and measurement tasks for process control
Scan / reconstruction / cycle speed	10,62 - 61,25 mm/s / reconstruction speed up to 16 layers/s inspection / typical cycle time ~1 min. per part
High dynamic multi-line detector	64-layer parallel acquisition. The detector embodies the patented HiLight™ material from GE, a ceramic scintillator specially developed for CT applications
High performance rotating anode X-ray tube	Max. 140 kV, 515 mA current, typical inspection parameters: 140 kV, 100 mA. The duty cycle of the X-ray tube (ratio between X-ray on and cooling time) depends on the selected parameters. Generator output of max. 72 kW with 515 mA
CT gantry	Advanced GE Healthcare continually rotating generator, X-ray tube, detector and data acquisition system around the test specimen. The rotation speed can be adapted within the range of 0.5 - 1 revolutions per second, depending on the required data quality and specimen throughput rate
Dimensions basic cabinet	2,500 mm (W) x 4,000 mm (T) X 2,500 mm (H) (98" x 157" x 98") / weight ca. 13,000 kg (28,660 lbs)
Design	Suitable for industrial environment with dust and foreign body protection
Air condition	Active air conditioning system to safely remove the heat created during the test procedure
Patented quick-slide manipulator	Speed: 10,62 to 61,25 mm/s for data acquisition, up to 400 mm/s for loading & unloading procedure
Control unit	Operator console with 2 flat screen monitors close to the system to facilitate speedy loading and unloading by the operator. Touch panel for visualization of PLC / control
Radiation protection	The radiation safety cabinet is a full protective installation without type approval according to the German RöV. It complies with French NFC 74 100 and the US Performance Standard 21 CFR Subchapter J. For operation, other official licenses may be necessary
3D data analysis and visualization	Automated DICOM image transfer to analysis station. CT visualization and evaluation: <ul style="list-style-type: none"> - 3D detection and classification of pores and inclusions (GE speed ADR) combined with Volume Graphics InLine CT software is exclusively available for VG customers using speed scan - Dimensional control tasks like wall thickness determination and - Actual/nominal CAD comparison (VG StudioMAX)
Software user level	<ul style="list-style-type: none"> - <i>Designer</i> for creating and modifying 3D inspection programs on- or offline - <i>Inspector</i> for semi- or fully automated CT data analysis based on inspection programs - <i>Reviewer</i> for interactive software for visualization and review of automated inspection results

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