

WheelStar[®]

Ultrasonic Rail Road
Wheel Inspection Solutions for
Production and In-Service applications



Since 1804 when the first steam locomotive railway was built, rail travel has experienced continuous and accelerating growth with ever increasing demands for safety. Today's high-speed passenger trains operating at speeds in excess of 250km/h and the trend towards increased heavy freight hauling are taxing the limits of rolling stock. To make no compromises on the safety of rail components, rail operators, manufacturers and maintenance facilities are raising the bar for higher productivity and increased quality using nondestructive testing solutions. Train wheels are the most safety critical element of rolling stock as they are exposed to high stress with increasing speeds and loads.

Global railroad standards require these assets to be ultrasonically inspected after manufacture and during maintenance on a regular basis.

GE's WheelStar® product family provides the highest level of ultrasonic integrity inspection available with several configurations to meet the needs of individual shops. Each of these inspection solutions provides advantages in productivity, and inspection capability at low operating costs.





New machined wheels inspection: WheelStar - Batch and In-Line

Ultrasonic inspection of forged or cast wheels has become a standard in wheel manufacturing. Besides national and international standards like EN13262, ISO5948 or AAR M-107/M-208, a variety of local and company standards exist. The large number of wheel geometries and different material handling concepts at a customer side, necessitate a test system approach with a high degree of flexibility.

GE Inspection Technologies offers two different mechanics concepts for the inspection of new wheels: a tank version for batch test and an in-line version for integration into the production line. Both variants have a robust mechanical construction and use a combination of linear phased array probes (tread and face inspection) and conventional transducers (hub inspection) to perform the complete check of the wheel in a single rotation. If required, web inspection can be performed on straight or even curved web profiles with either single element probes or linear phased array probes (GE patent) for maximum productivity.

The windows based application software is easy to operate and generates A-, B- and C-Scan visualizations of the ultrasonic signals which give all useful information for a test evaluation. Fully automatic scan evaluation is available as well.

Specifications

- UTxx field proven electronics with modular architecture
- Phased array and/or conventional probes
- Wheel diameters 650-1350 mm supported
- Tread, face and optional hub inspection
- Optional straight or curved profile web inspection with industrial robots or linear mechanics
- Immersion tank or in-line capable system layouts

Flaw detectability (other specifications on request)

Section	Standard	Values
Rim inspection radial	EN 13262	1, 2, 3 mm FBH
Rim untested radial	ISO 5948	5 mm*
Rim inspection axial	EN 13262	1, 2, 3 mm FBH
Rim untested axial	ISO 5948	10 mm
Rim BWEA radial	EN 13262	-4 dB
Hub axial	EN 13262	3,5 mm FBH
Hub untested axial	EN 13262	5 mm
Hub BWEA axial	EN 13262	-4 dB & -6 dB

* forged wheel, good surface finishing

Your benefits

- Robust system design and construction for long term reliability
- High inspection productivity through single rotation scan of a wheel
- Full EN/ISO/AAR standard compliance
- Easy interpretation of results through C-Scan imaging
- Digital inspection data can be saved per wheel serial number for future reference

In-Service inspection: WheelStar - Gantry: for heavy maintenance



GE's gantry based WheelStar version is the classic solution for in-service wheel set inspection during heavy maintenance. The wheels from the removed wheel set configuration are inspected as a tandem unit with phased array probes mounted on gantry mechanics. Proper coupling is established by a local immersion probe holder (bubbler) that lowers on the tread while the wheel set is being rotated stationary.

Both wheels are being tested simultaneously for short cycle times. Optional, the bearing radius areas of axles can be inspected in the same test cycle (on request).

This machine concept is the ideal solution for high-throughput wheel set inspection with automatic material handling.

Specifications

- UTxx field proven electronics with modular architecture
- Phased array probes for short dimension change
- Wheel diameters 650-1350 mm supported
- Tread; optional axle inspection (bearing radius areas)



Flaw detectability (other specifications on request)

Section	Standard	Values
Rim inspection radial	EN 13262, AAR	1, 2, 3 mm FBH
Rim untested radial	ISO 5948	5 mm
Axle (solid)	≥ 2 mm circumferential notch, max. 30 inches from outboard journal	

Your benefits

- Robust solution
- High inspection productivity through single rotation scan
- Full AAR compliant inspection (other standards on request)
- Heavy freight train axle inspection integrated (on request)
- Easy interpretation of results through C-Scan imaging
- Digital inspection data can be saved per wheel serial number for future reference

In-Service inspection: WheelStar - Underfloor ("UFPE")

The under-car version of the WheelStar (type "UFPE") marks the optimum in productivity when testing high speed train wheels in service, as there is no need to remove the wheel set from the train before inspecting the wheel: the wheel set is lifted from the rail and rotated during the test by an integrated mechanical device.

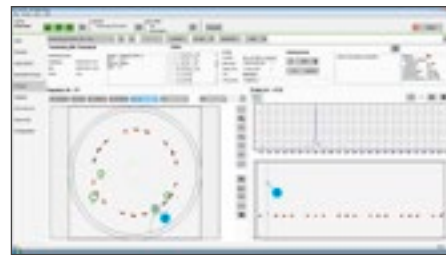
A combination of single crystal and phased array transducers ensures ideal adaptation to the inspected areas: the UFPE inspects the tread, face, flange and (straight) web areas of the wheel and visualizes the results in a projection view including automatic defect recognition or for easy interpretation by the operator.

The UT signals are being transferred via an industrial wireless connection to the operator center for maximum flexibility.

The test mechanics are moved from wheelset to wheelset by integrated, battery powered drive motors.

Specifications

- USIP|xx high-end electronics with modular architecture
- 8 phased array probes, 6 Conventional probes, 2 - 4 MHz
- Phased array: radial and axial angle sweep
- Battery powered, movable test mechanics, length ~ 4.5 m
- Industrial Wi-Fi 802.11 g/n signal transmission between test mechanics and operator center
- Workflow based software concept with integrated PLC control



Flaw detectability (other specifications on request)

Flaw type	Values
Volumetric	FBH 2 mm
Surface	Crack \geq 5 mm length Crack \geq 1 mm depth

Inspected area: Tread, face, flange, (planar) web

Your benefits

- Maximized productivity: No wheel set removal required, short inspection time
- Fully automated inspection with highest reproducibility of the results
- Automatic defect recognition - reduced Human Factor
- Battery powered, remote controlled movement of the trolley for flexibility
- Innovative, workflow based software concept – short operator training

In-Service inspection: WheelStar - Portable Phased Array

GE's portable alternative for wheel tread inspection was developed as a cost effective solution for low production volume shops and as a prove up tool for shops employing automated inspection solutions. The test is being carried out with a phased array probe embedded in a mechanical fixture which guarantees stable coupling conditions by local immersion technique ("bubbler"). Integrated magnetic pads keep the fixture on track and provide for easy handling.

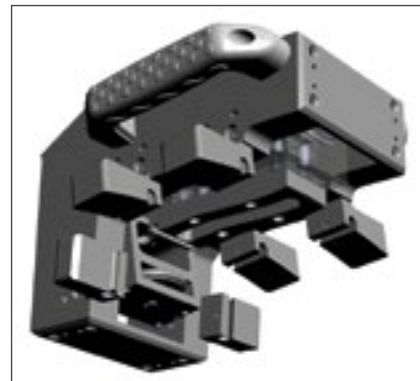
By default, the probe setup comes with either a manual UT instrument like GE's Phasor XS or USM Vision+. For higher requirements on performance and data analysis, GE's UTxx system electronics is available - this guarantees as well perfect comparability of the inspection results with GE's fully automated wheel inspection systems.



Specifications

- Compatible with Phasor XS, USM Vision+, or UTxx system electronics
- 64 element phased array probe, local immersion coupling
- C-Scan imaging of test results (Top View)
- Compatible with European or US wheel tread geometries

Flaw detectability [\(other specifications on request\)](#)



Section	Standard	Values
Rim inspection radial	EN 13262, AAR	1, 2, 3 mm FBH
Rim untested radial	ISO 5948	10 mm

Your benefits

- Field deployable or mobile ultrasonic wheel tread inspection
- Cost effective solution for low production volume shops
- Easy handling through mechanically guided inspection
- Cost savings through short operator training
- High reproducibility of the results
- Optional Axle Inspection Arrays for testing bearing radius locations from bearing cap regions





Imagination at work

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