



1 A low-cost solution for measuring railway infrastructure: Fraunhofer IPM's RTS is the first laser scanner to be used for gauging rail tracks, railhead and sleepers.

2 A rotating polygon with eight flat mirrors deflects the laser beam, creating 800 profiles per second.



RAIL TRACK SCANNER RTS

Inspection of rail tracks

Various rail track parameters need to be measured regularly in order to maintain a safe rail track infrastructure. Irregularities in geometry on the rail tracks, which are subject to tension, may lead to abrupt cracking and thus to a »domino« effect – whereby rail tracks and sleepers may break over long distances. Nowadays, the condition of the rail track infrastructure is generally recorded with the aid of camera-based systems. This entails the disadvantages of dependence on ambient light or artificial lighting, elaborate processing and evaluation of the data as well as the high memory capacity needed to store the photographic images.

Mountable on any rail vehicle

The Fraunhofer IPM Rail Track Scanner RTS gauges rail tracks quickly, reliably and safely. The optical sensor detects geometrical irregularities with the aid of a laser

scanner and generates a three-dimensional image during the process. RTS is small and compact – and can thus be mounted effortlessly on rail vehicles.

Laser scanning technology

Fraunhofer IPM's Rail Track Scanner RTS is the first laser scanner to be used for geometric gauging of rail tracks, railhead, sleepers and track bed. A specially designed optical structure allows the scanner to be mounted only 1.2 m above the track bed. The laser scans the rail tracks transversely with respect to the forward motion of the measuring vehicle over a width of approximately 1.7 meters. Two million measurements per second and 800 profiles form the basis for a very detailed, three-dimensional image of the rail tracks and the infrastructure directly linked to it. Suitable algorithms allow parameters such as distance, height and inclination of the rail track or the railhead

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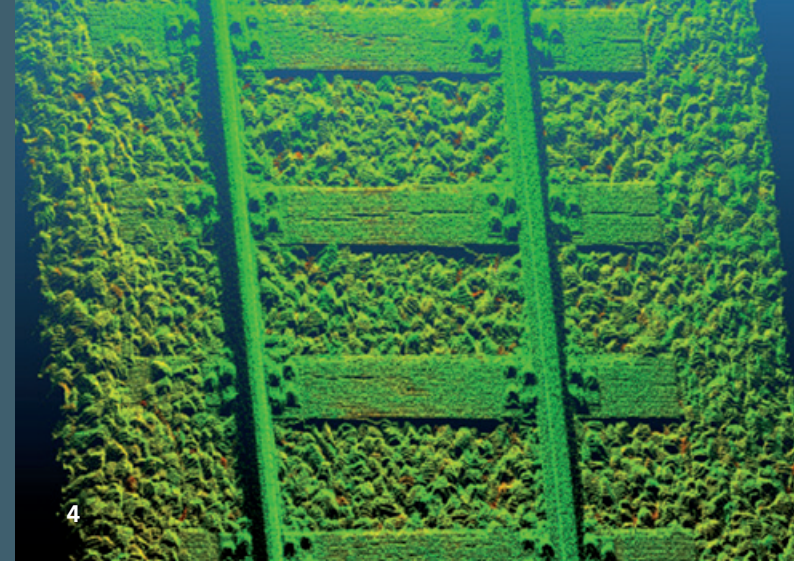
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geometry to be extracted from the 3D point cloud and to be compared with target profiles. Topographical structures or changes in structure are detected reliably with a measurement uncertainty of less than one millimeter. The scan frequency can be adapted flexibly to the relevant task. The Swiss mobile mapping service provider iNovitas AG, for instance, uses RTS for the metrological assessment of narrow gauge tracks in Switzerland.

Eye-safe and flexible

The robust, shoebox-sized scanner can be mounted on any rail vehicle. RTS therefore turns out to be a low-cost option for automatic gauging of rail track infrastructure, without the need for a special-purpose measuring vehicle. The scanner operates with an eye-safe infrared laser (laser class I) and can be used without any restriction in public places (eye-safety according to IEC60825).

3 The showbox-sized scanner operates with an eye-safe infrared laser and can be mounted on any rail vehicle.

4 Suitable algorithms are applied to extract various parameters from the 3D image acquired.

Technical Specifications

**CLASS 1
LASER PRODUCT**

Acquisition range:	
• unambiguous measurement range	1.2 m
• within a distance of minimum	1.3 m
• within a distance of maximum	5.0 m
Sampling rate: distance and intensity	up to 2 MHz
Standard deviation of the mean value of 100 points (3m mounting height),	
• 80% reflection	< 0.15 mm
• 20% reflection	< 0.3 mm
Scanning angle	70°
Scanning frequency	from 25 to 800 Hz
Data interface	Gigabit Ethernet (optical)
Scanner status indication	6 LEDs
Other interfaces	on request
IP-Class	67
Operating system	Windows XP, Windows 7, Linux
Synchronization input	yes

Infrastructure Measurement Technology at Fraunhofer IPM

Fraunhofer IPM develops optical measuring systems for monitoring the condition of rail and road infrastructure. Experts in measuring techniques and optics, designers, electrical and software engineers work together on supplying turnkey solutions for the special requirements of infrastructure operators and providers of surveying services. The robust measuring systems are deployed throughout the world and are characterized by their speed, precision and reliability.

- High-Speed Profiler HSP
- Clearance Profile Scanner CPS
- Contact Wire Recording System CRS
- Laser Pole Detection System LPS
- Wire Wear Monitoring System WWS
- Sector Profile Scanner SPS



Railroad measurement systems by Fraunhofer IPM are qualified according to TransQ-standards.

All specifications and features are subject to modification without notice.