



GOLDSCHMIDT

Smart Rail Solutions



TRACK INSPECTION SYSTEMS



SMART INSPECTION FOR MORE SAFETY AND QUALITY OF YOUR RAILS

There are numerous types of geometry and rail defects with a need to detect, monitor and evaluate them as early as possible. With its digital and smart solutions, application-specific devices and services, Goldschmidt is well positioned for managing diverse railway track conditions. These solutions enable the precise documentation of signs of wear and defects while taking into consideration the measures necessary for defect removal.



ONE STOP SHOP

Higher speeds, greater loads and increasing demands in terms of driving comfort – the requirements on modern track construction and a sustainable rail infrastructure are diverse. Our measuring and testing solutions guarantee a high level of safety and reliability.

A detailed diagnosis of the track condition is the basis for predictive maintenance, which guarantees the long-term economy and reliability of the track infrastructure and all rail vehicles. Measuring and testing technology from Goldschmidt enables you to carry out such detailed evaluation. In addition, we have exactly the right measuring and testing device for every application, which enables the testing of individual rails or the entire track and a precise error analysis.

Goldschmidt offers you measuring and testing solutions as well as documentation for the geometry and defect analysis of the rail infrastructure. This enables you to identify deviations and take preventive maintenance measures to prolong the lifecycle of rails, switches and wheels. In the long term, this ensures an optimal condition, lower maintenance costs, higher safety and punctuality.



LEARN MORE ABOUT OUR INSPECTION SYSTEMS
ON YOUTUBE @GOLDSCHMIDTGROUP



For Inspection Train



For Milling and
Grinding Train

TIS USE

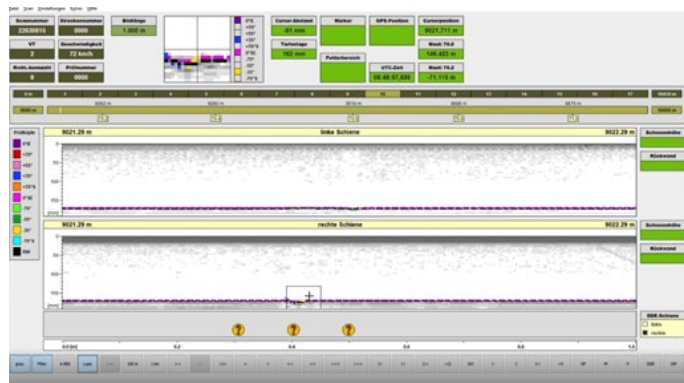
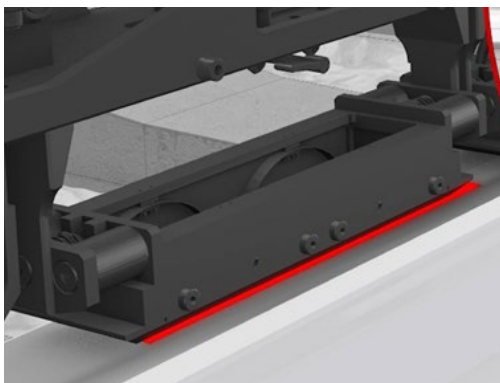
ULTRASONIC SLIDING EVALUATOR

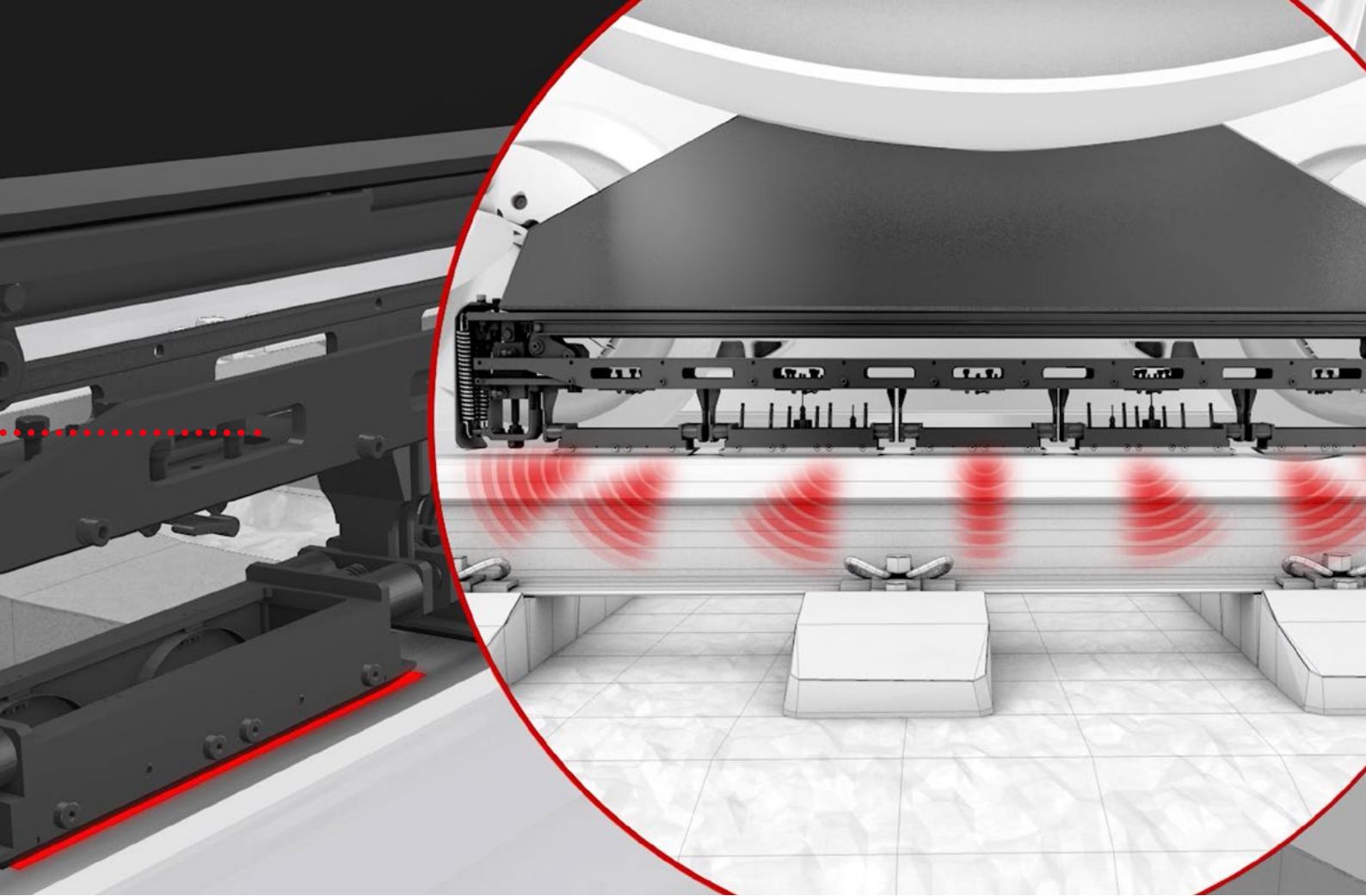
As the basic infrastructure for passenger and freight transport, railroads are of existential importance. The ever higher speeds and higher forces that occur are, among other things, triggers for damage such as squats, which can develop into transverse fractures if left untreated. To ensure safety, the rail tracks must be cyclically inspected, defects must be captured and in accordance with the applicable regulations be evaluated.

ULTRASONIC SYSTEM FOR HIGH-SPEEDS

Our TIS USE was specially developed for use on high-speed vehicles. The data is usually recorded with 20 probes at speeds of up to 70 km/h. The standard configuration of our probes features the probe angle arrangement complying to EN 16729-1. Additional probes as well as customer-specific probe angle specifications can be easily implemented. Adjusted to a basic sensitivity, the system can be monitored during data acquisition by online displays of typical echoes (e.g. lug chamber bores) and readjusted if necessary.

The data acquired during the inspection run is pre-evaluated in a downstream process by our AI-based software and presented to the evaluator in a dedicated visualization tool as a B-scan, also known as a “glassy rail”. A precise location reference and suggested defect classifications facilitate the evaluation. The classifications confirmed or made by the evaluator are transferred to a higher-level data storage. This ultimately provides you with a complete documentation of the rail condition.





TECHNICAL DATA

SPECIFICATIONS

Testing technology	Ultrasonic, sliding
Testing speed	0 – 70 km/h
Number of probes per mechanic	10
Standard	EN 16729-1
Testing angles according to EN 16729-1	+70°, +35°, 0° IE, 0° SE, -35°, -70°
Measurement increment	~3 mm (speed-dependent)
Couplant consumption	10 l/min Depending on the number of probes as well as environmental conditions
System mounting location	Under the vehicle, on a dedicated measuring bogie

TIS URE

ULTRASONIC ROTATING EVALUATOR

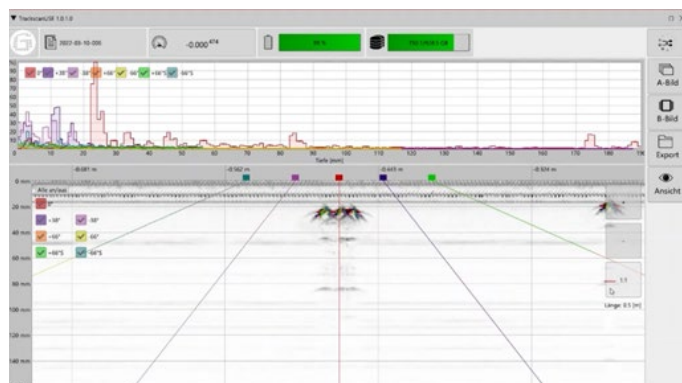
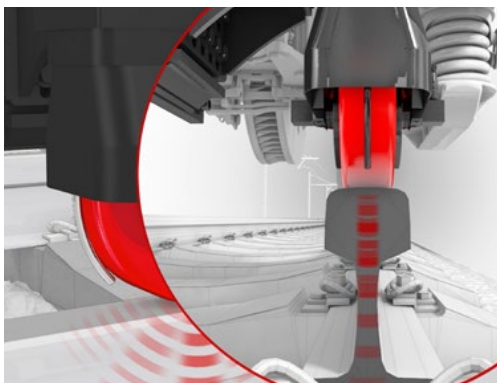
Inspection procedures are important for the track safety where internal material defects and hidden damage are detected which cannot be seen by the naked eye and would otherwise go unnoticed. Ultrasonic testing enables you to carry out a complete rail evaluation as well as the classification of internal defects. This allows you to identify, locate and monitor areas highly susceptible to flaws.

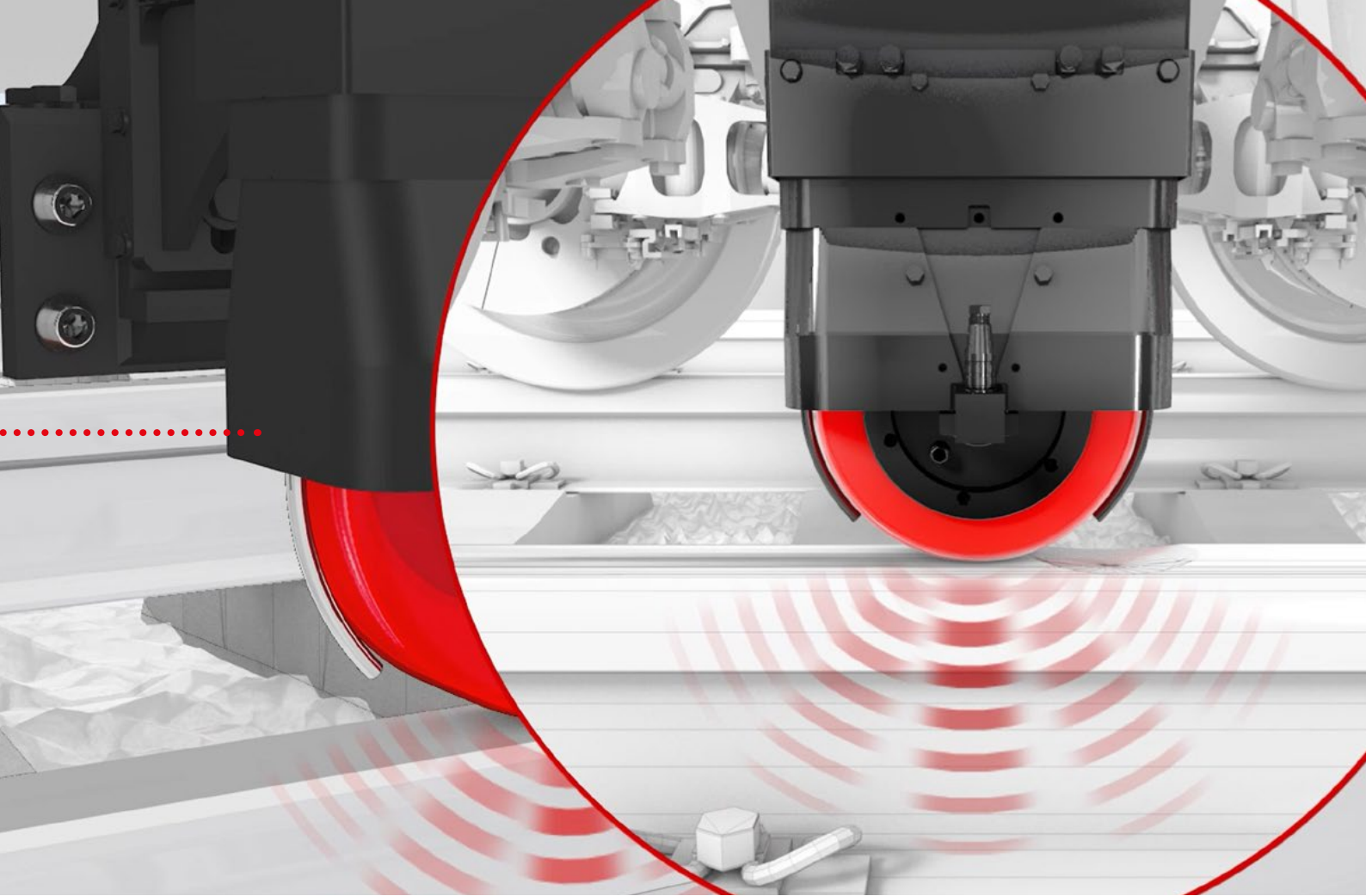


ULTRASONIC SYSTEM FOR CONFINED SPACES

Our TIS URE was specially designed for use on vehicles with confined installation spaces. The basic system consists of at least four wheels, two on each side, with space for up to 5 probes in one wheel. The standard configuration of our probes features the probe angle arrangement complying to EN 16729-1. Additional probes as well as customer-specific probe angle specifications can be easily implemented. Adjusted to a basic sensitivity, the system can be monitored during data acquisition by online displays of typical echoes (e.g. lug chamber bores) and readjusted if necessary.

The data acquired during the inspection run is pre-evaluated in a downstream process by our AI-based software and presented to the evaluator in a dedicated visualization tool as a B-scan, also known as a “glassy rail”. A precise location reference and suggested defect classifications facilitate the evaluation. The classifications confirmed or made by the evaluator are transferred to a higher-level data storage. This ultimately provides you with a complete documentation of the rail condition.





TECHNICAL DATA

SPECIFICATIONS

Testing technology	Ultrasonic, rotating
Testing speed	0 – 40 km/h
Maximum number of probes per wheel	5
Standard	EN 16729-1
Testing angles according to EN 16729-1	3 x +70°, 1 x +38°, 1 x 0° IE (forward) 3 x -70°, 1 x -38°, 1 x 0° IE (backwards)
Measurement increment	~5 mm (speed-dependent)
Couplant consumption	2 l/min per wheel Depending on environmental conditions
System mounting location	Under the vehicle, on a dedicated measuring bogie

TIS MIRA

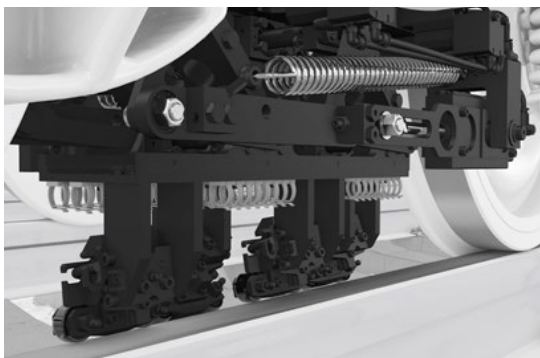
MULTI INDUCTIVE RAIL ARRAY

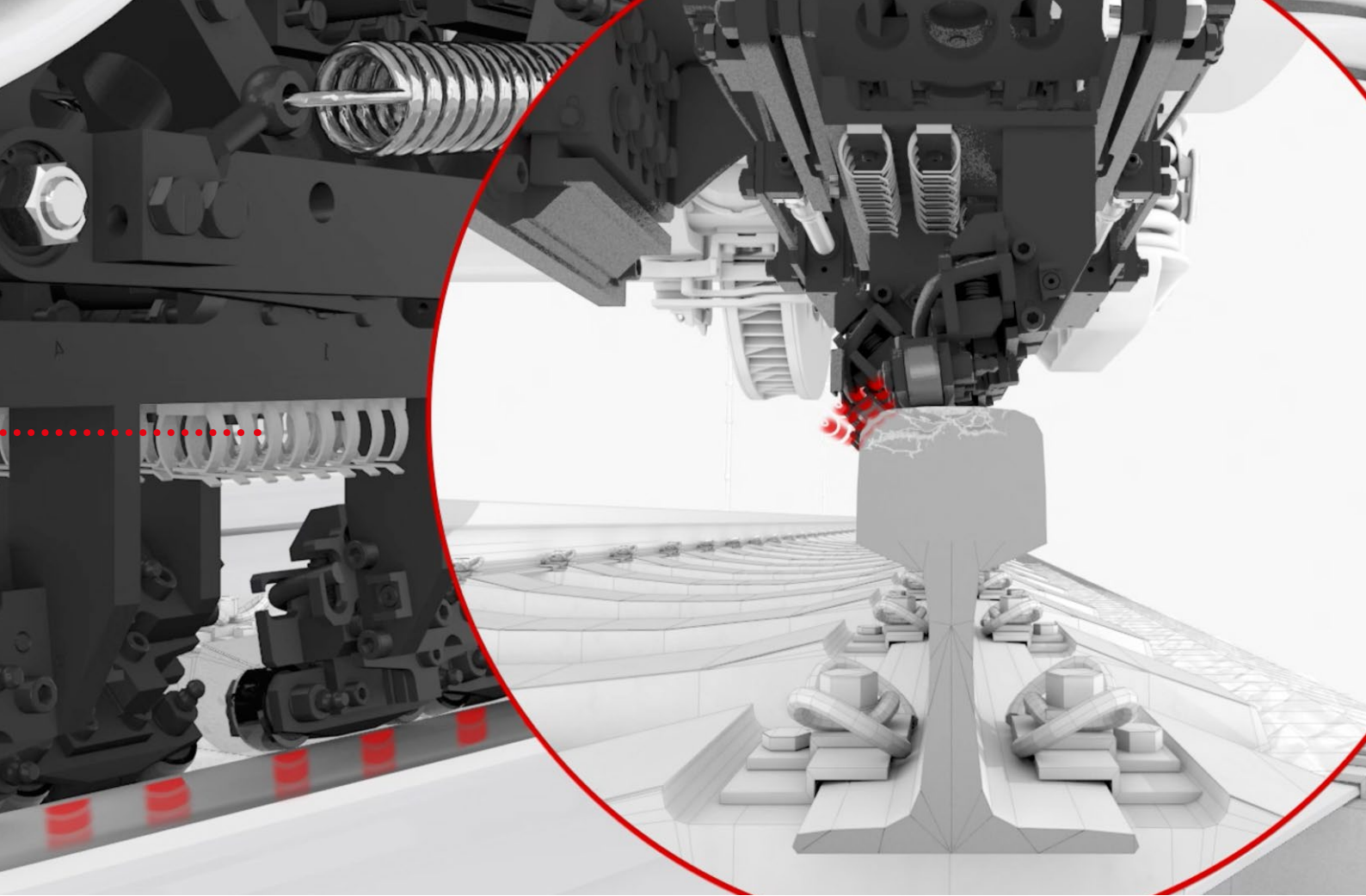
Higher speeds, greater loads and increasing demands in terms of driving comfort – the requirements on modern track construction and a sustainable rail infrastructure are diverse. To ensure economical operation and achieve a long service life, rails must be inspected and maintained on a cyclical basis. Get a complete evaluation of your rail with Goldschmidt's most modern and innovative eddy current testing system TIS MIRA.

SURFACE INSPECTION ON INSTALLED RAILS



Usually, up to 16 test probes are guided along the running edge and the running surface of the rail with a resolution of 1 mm and speeds up to 90 km/h. By using vehicle-specific mechanics, we ensure the exact tracking of our probes to a constant distance of 1 mm for different rail profiles and profile conditions. Due to this and the very high data rate, our eddy current testing system sets standards in the evaluation of head checks, squats and other surface defects.

The data obtained in this way is made available through an AI-supported evaluation as a result file for higher-level visualization tools, which can be adapted to the system interfaces of our customers. At the same time, our AI not only filters the raw data but also classifies it into damage classes Head Checks and other surface defects like Squats. This classification provides our customers with the basis for an effective maintenance strategy. Whereby the targeted and adapted use of machinery can extend the service life of rails and increase the availability of rail infrastructure routes.





TECHNICAL DATA

SPECIFICATIONS	MIRA 44		MIRA 88	
	TIS MIRA 44 LS	TIS MIRA 44 HS	TIS MIRA 88 LS	TIS MIRA 88 HS
System				
Number of probes	 8		 16	
Testing technology	Eddy Current			
Testing speeds up to	16 km/h	90 km/h	16 km/h	90 km/h
Testing range	-45 ... -3.9°		-45 ... +10°	
Standard	EN 16729-2			
Measurement increment	1 mm			
System mounting location	Under the vehicle <ul style="list-style-type: none"> · on the frame · between the wheelsets of a non-driven bogie · outside (offset) of a non-driven bogie · on a special measuring bogie 			

TIS CORE

CORRUGATION EVALUATOR



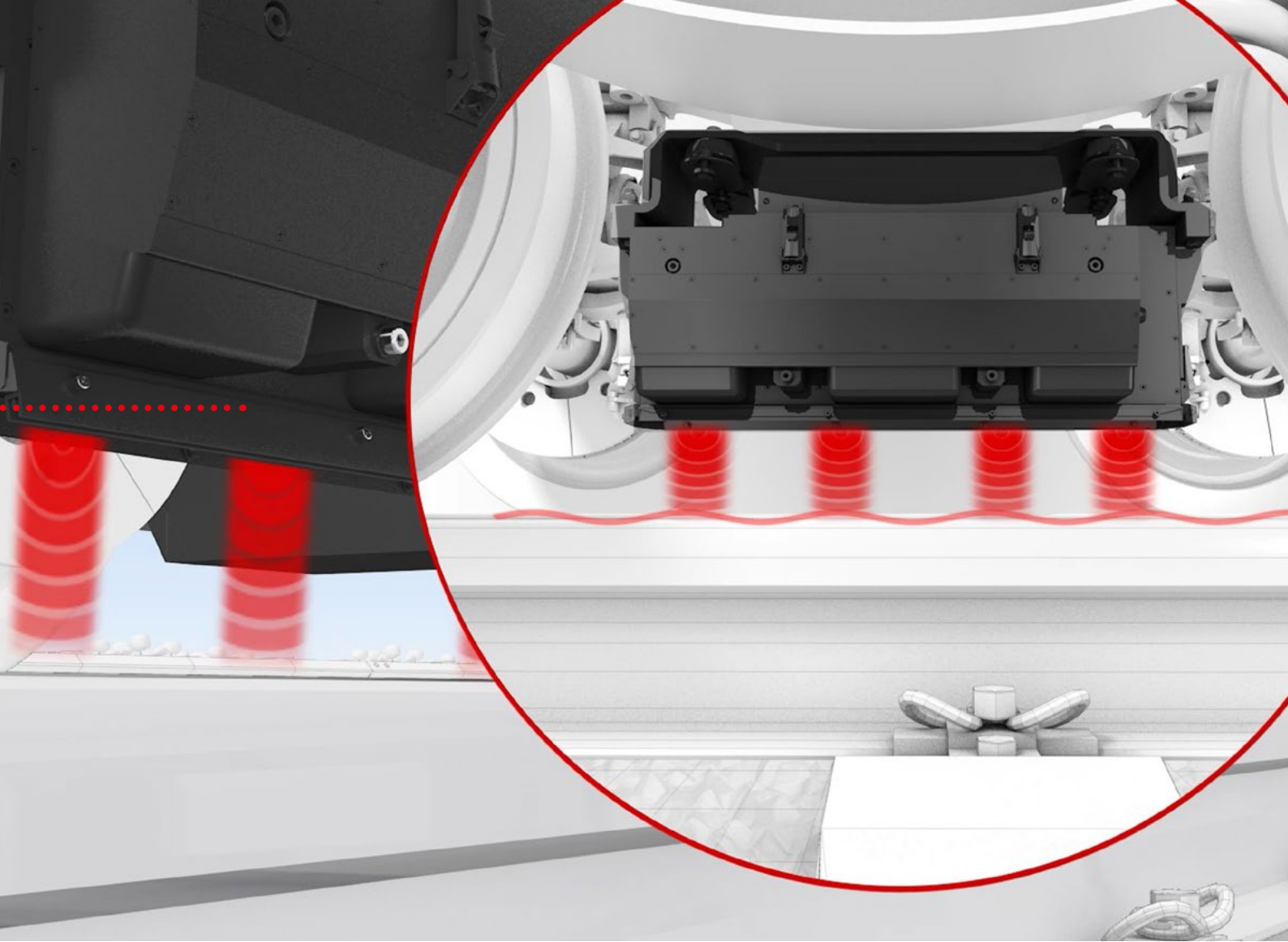
CORRUGATION EVALUATOR MODULE

The Corrugation Evaluator Module is a cutting-edge tool designed for accurate and efficient measurement of rail corrugation. With a speed range of 0 – 140 km/h, this module utilizes non-contact sensor assemblies that are mounted above both rails, providing precise measurements with close proximity to the wheel. This advanced technology fully complies with the EU standard, EN 13231-3, and is possible thanks to the adaptive rail axis detection subsystem.

The Corrugation Evaluator Module allows for the planning of grinding works and a percentage analysis of exceedances on predefined sections with lengths such as 10, 100, and 1000 meters. The results of the RMS amplitude and PEAK to PEAK are presented in both graphical and tabular forms, with exceedances marked for easy analysis. This tool is the ideal solution for rail professionals looking to achieve accurate corrugation measurements and improve the overall maintenance of their rail network.

In conclusion, the Corrugation Evaluator Module is a must-have tool for rail professionals looking to improve the accuracy of their corrugation measurements and plan effective grinding works. With its advanced technology and EU standard compliance, this module is the solution you need to keep your rail network in top condition.





TECHNICAL DATA

Measurement technology	Contactless
Cameras	Two sensor assemblies mounted above each rail
System mounting location	Between the wheelsets of the bogie
Standard	EN 13231-3
Wavelength ranges	$10 \text{ mm} \leq \lambda \leq 30 \text{ mm}$ (for speeds up to 60 km/h only) $30 \text{ mm} < \lambda \leq 100 \text{ mm}$ $100 \text{ mm} < \lambda \leq 300 \text{ mm}$ $300 \text{ mm} < \lambda \leq 1000 \text{ mm}$

SPECIFICATIONS

- Presentation of the results of the RMS amplitude and PEAK to PEAK – in the graphical and tabular forms with exceedances marked
- RMS amplitude accuracy min $\pm 10 \mu\text{m}$ for waves from the range of up to 30 mm
- RMS amplitude accuracy min $\pm 30 \mu\text{m}$ for waves from the range of up to 100 mm
- RMS amplitude accuracy min $\pm 100 \mu\text{m}$ for waves from the range above 100 mm
- Measurement speed with required parameters in the range of 0 – 140 km/h for wavelengths of $\lambda = 30 - 100 \text{ mm}$ and $\lambda = 100 - 300 \text{ mm}$ and $\lambda = 300 - 1000 \text{ mm}$

TIS SAM

SWITCH ASSESSMENT MODULE



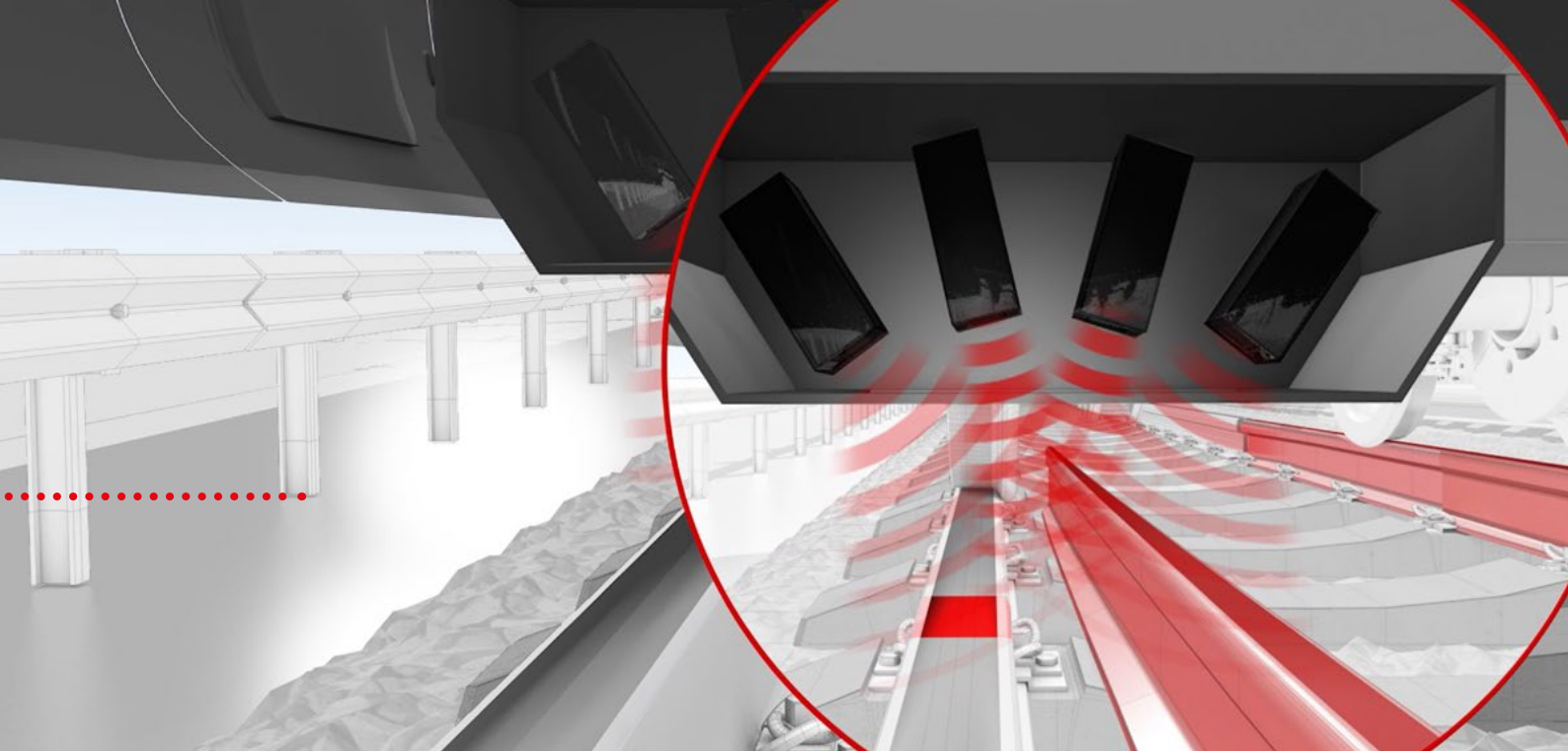
NON-CONTACT SWITCH ASSESSMENT MODULE

The Switch Assessment Module is designed with a main optical axis and four optical sensors per rail, enabling measurement of the full transverse section of the rail in track and turnout. This technology allows for calculation of parameters, with measurement increments of 20 mm at speeds up to 60 km/h. It can detect the starting point and mathematical point of a turnout and analyze moveable point frogs (MPF).

The module detects and eliminates profile discontinuities and presents measurement data in photos, 3D and 2D images. The turnout measurement database allows for easy management of definitions and detection of sections. The AI module assesses the completeness and reliability of the turnout evaluation, enabling analysis of 10 000 turnouts per year by two maintenance engineers. The module also measures rail and turnout wear and flow, frog point conditions, and flangeways and heights of turnout elements.

EXAMPLES OF MEASURED PARAMETERS

Rail type	Check rail gauge
Rail inclination	Switch rail to stock rail fit
Vertical wear	Relative height of switch rail to stock rail
Horizontal wear	Relative height of the check rail to the rail
Wear angle	Frog point condition
Metal/lip flow	Relative height of frog point to wing rail
Gauge	Flangeway depth
Switch rail and Stock rail in reference to different wheel profiles (new wheel, worn wheel etc.)	Flangeway width
Switch rail condition including switch rail edge damage	Check rail entrance
Gauge point face angle	Switch rail entrance
Gap between open switch rail and stock rail	Rail sections match through turnout



TECHNICAL DATA

Measurement technology	Optical, contactless, using the light sectioning method
Measurement increment	20 – 30 mm
Measurement system	Asymmetrical
Measurement speed	0 – 60 km/h

SPECIFICATIONS

Parameters [calculated]
 Transverse sections are saved during the measurement, and target parameters are calculated from them

Resolution

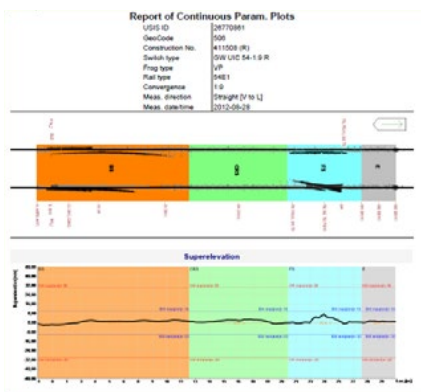
≤ 0.1 mm
 Uncertainty:
 ± 1.0 mm

Repeatability 95 %

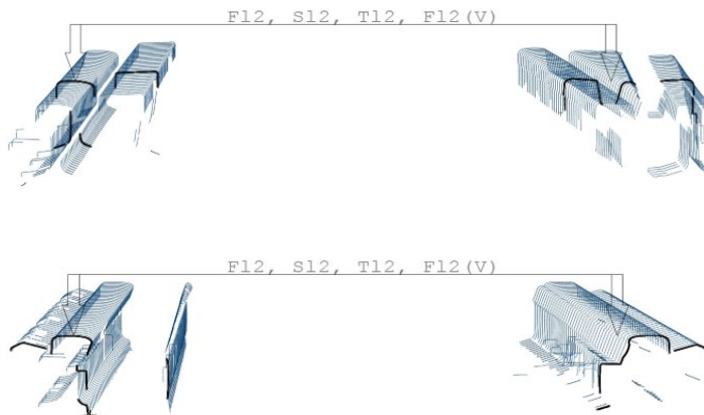
±0.5 mm

Reproducibility 95 %

±1.0 mm



Exemplary turnout measurement report



Gathering the images for assessment of turnout geometry. Custom virtual templates may be used if required.

TIS GAM

GEOMETRY ASSESSMENT MODULE

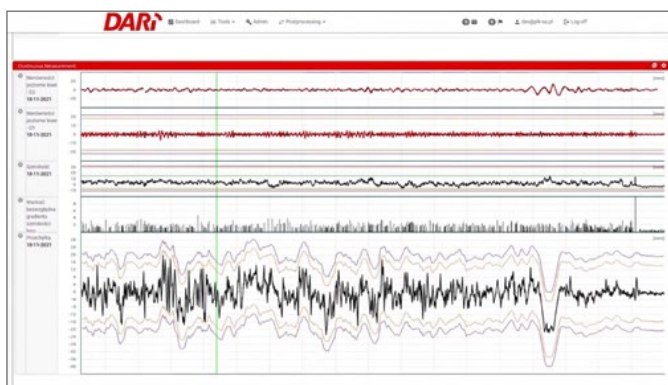


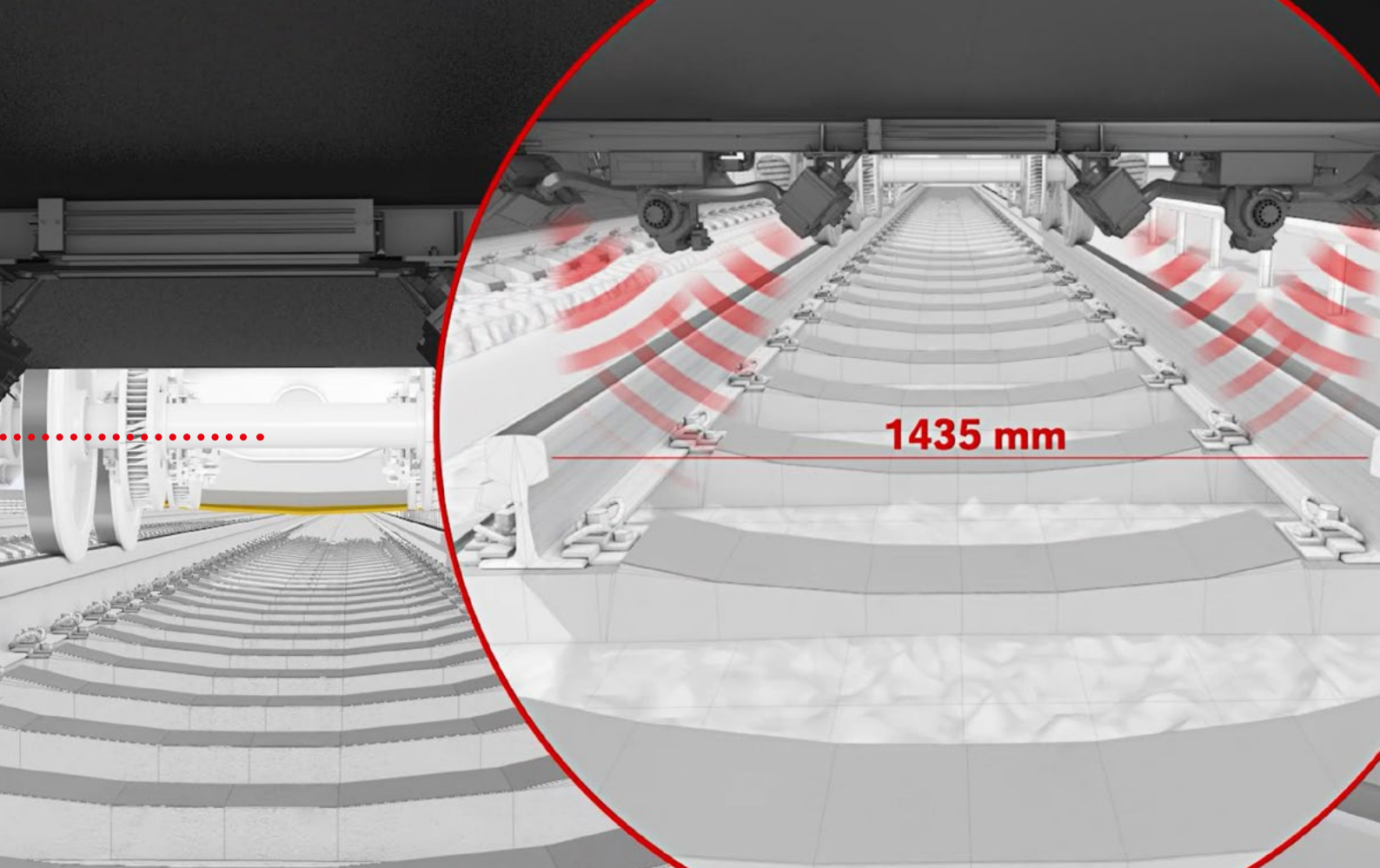
NON-CONTACT TRACK GEOMETRY MEASUREMENT MODULE

Introducing GAM – a top-notch tool for track geometry measurement. This module uses the 3-axial method and IMU for non-contact measurement in an asymmetric setup, even in harsh weather or lighting conditions. The Geometry Assessment Module complies with the EN 13848 standard and can measure parameters with a step of 0.25 m. It offers accuracy with chord-based or inertial options and improves results with INS integration. The module calculates track condition and filters turnout discontinuities for the best results. Choose GAM for accurate track geometry measurement and safe rail network operation.

TECHNICAL DATA

Measurement technology	Optical, contactless
Measurement increment	250 mm
Measurement system	Asymmetrical
Measurement speed	0 – 140 km/h
Standard	EN 13848





SPECIFICATIONS	Resolution	Repeatability 95 %	Reproducibility 95 %	Measurement Range
Track gauge [measured] Measurement of the cross-section profile of the rail with a minimum step of 1 mm	0.1 mm	0.5 mm	1.5 mm	-15 ... +50 mm
Track cant [measured]	0.1 mm	1.5 mm	2.5 mm	-225 ... +225 mm
Track twist [calculated]	For various base lengths			
Track gauge gradient [calculated]				
Alignment & Unevenness [calculated]	The irregularities of the track rails are measured indirectly by measuring the versine in the three-point asymmetrical setup.			
Longitudinal level D1	0.1 mm	±0.5 mm	±0.8 mm	±50 mm
Longitudinal level D2	0.1 mm	±1.0 mm	±2.0 mm	±100 mm
Alignment D1	0.1 mm	±0.7 mm	±1.1 mm	±50 mm
Alignment D2	0.1 mm	±2.0 mm	±3.0 mm	±100 mm

TIS PAM

PROFILE ASSESSMENT MODULE

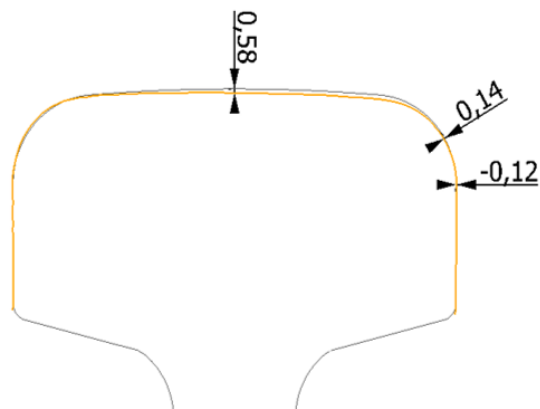
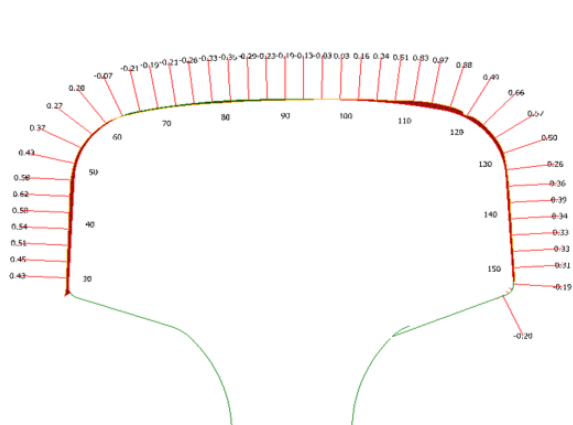


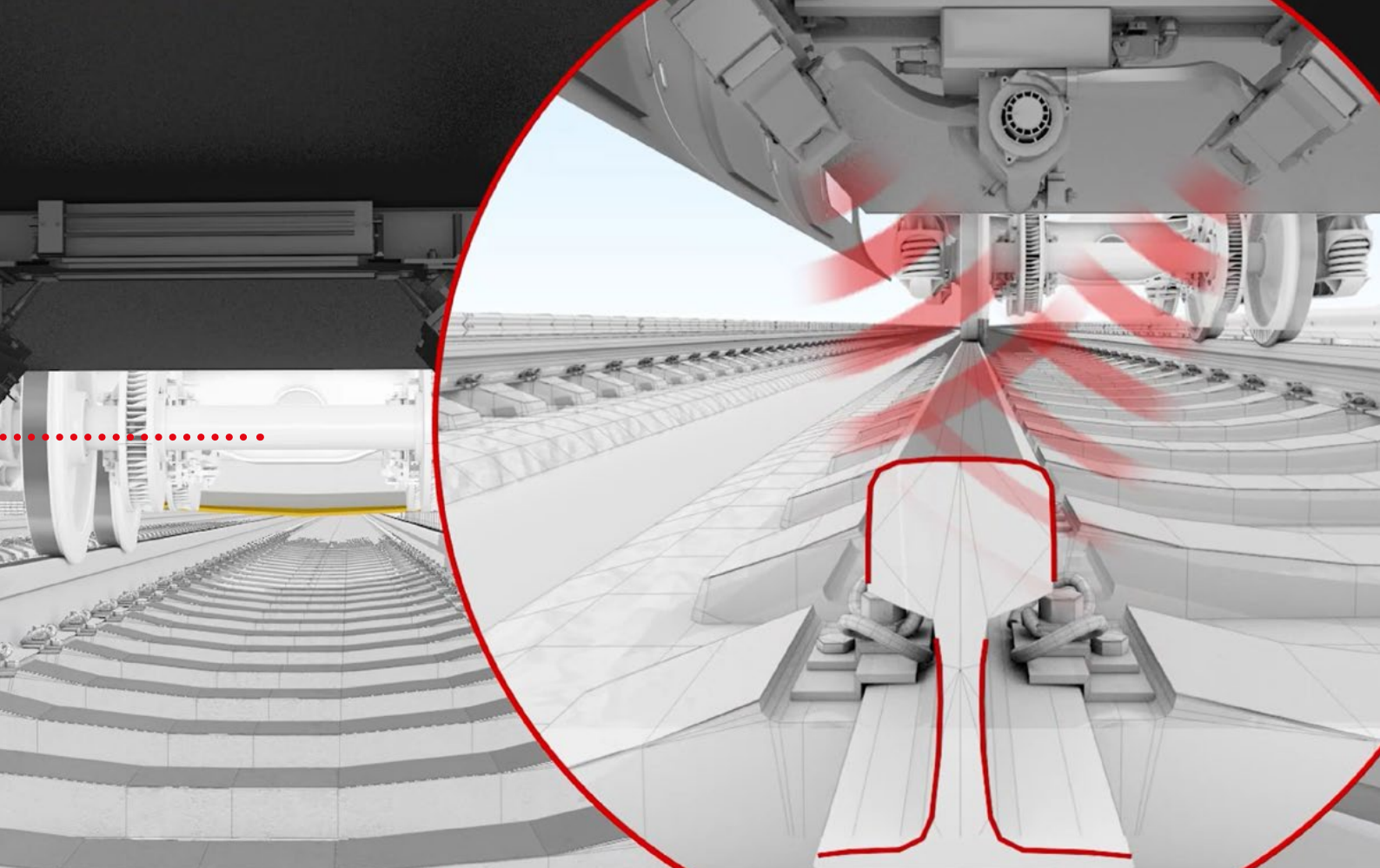
NON-CONTACT RAIL PROFILE ASSESSMENT MODULE

Introducing the Profile Assessment Module – a tool for rail cross-section measurement. It uses non-contact method in a speed range of 0 – 140 km/h and is equipped with curtains to minimize ambient light and weather influences. The system can determine rail type automatically and detect and eliminate profile discontinuities. The module provides accurate cross-section profile measurement with a minimum step of 1 mm, allowing for equivalent conicity determination and rail head assessment. Reliable results, even in challenging conditions, make the Profile Assessment Module a must-have tool for rail professionals.

TECHNICAL DATA

Measurement technology	Optical, contactless
Measurement increment	250 mm
Measurement speed	0 – 140 km/h
Measurement step of the cross-section profile	Minimum step of 1 mm





SPECIFICATIONS	Resolution	Repeatability 95 %	Reproducibility 95 %
Rail profile	±0.1 mm	±0.3 mm	±0.5 mm
Vertical rail head wear [calculated]	±0.1 mm	±0.5 mm	±1.0 mm
Horizontal rail head wear [calculated]	±0.1 mm	±0.5 mm	±1.0 mm

BENEFITS

- Automatic detection of the rail type
- Calculating the rail inclination
- Calculating the angle of the wear-and-tear
- Calculating the equivalent conicity
- Calculation of the groove depth and width for grooved rails
- Compliance with the requirements of many national regulations
- The ability to determine the depth of calculating the wear parameters



TIS VIU

VISUAL INSPECTION UNIT



MODULE FOR VISUAL INSPECTION OF RAILS

Introducing the Visual Inspection Unit – the solution for complete track inspection. With digital imaging technology, this unit captures crystal clear images of the rolling surfaces of both rails, sleepers, and ballast, making visual inspection of civil engineering objects in the track infrastructure a breeze. The unit's cutting-edge features include automatic detection of missing or misplaced fastening elements, wheel burns, and rail head surface and sleeper defects.

To ensure complete coverage, the unit comes equipped with front and rear driver view cameras, providing a comprehensive view of the track bedding and infrastructure elements such as fasteners. The images captured during the inspection process are displayed in real-time on multiple monitors, allowing operators to check the infrastructure condition at all times. In-depth analysis can be carried out during post-processing, ensuring no detail goes unnoticed.

This method of visual inspection is robust and easily expandable, allowing for the detection of any infrastructure element with a known location on the track. Choose between monochrome or color images and enhance your inspection with IR cameras and headlights for clear images even in low light conditions. Upgrade your inspection process today with the Visual Inspection Unit.



DRIVER'S VIEW CAMERA TO ASSESS THE TRACK SURROUNDINGS

Driver's view available in two versions – for the day & night and (optionally) IR view for better visibility in poor lighting conditions – is used for providing general information about the track recording vehicle location.

The view can be scrolled synchronously with the other track inspection information, like its geometry, or visual inspection of track or rail defects.





TECHNICAL DATA

Lighting system	LED lighting – for clear images of high contrast in any environment and lighting conditions
Cameras	Sets of cameras located above rails (no shadowed places), cover the length of the whole sleeper with an additional margin of ballast, other cameras check the integrity of rail fasteners, and detect rail head and sleeper defects
Driver view	Cameras mounted at the front and back ends of the vehicle – one high-resolution color camera and one camera adjusted to infra-red light. The preview from cameras is automatically switched from the colour camera to the infra-red one in case of low ambient light. The infra-red illuminators can be also installed
Operating speed	0 – 140 km/h
System mounting location	Under the vehicle, and at both ends of the vehicle
Standard	EN 13848



TRACK VIEW FOR THE ASSESSMENT OF TRACK INFRASTRUCTURE ELEMENTS

Inspection of the infrastructure elements in the track covers recognition of its elements like sleepers, fixing elements, along with the assessment of their condition. Such defects may include sleeper cracks, skewed sleepers, and missing or defective fixing elements. Ballast filling between the sleepers is also analysed and reported if faulty – depending on the customer's specification. The additional rail side views from the outside and inside of the track are available for inspection of the fishplate space.



General track view with optional rail side view



Recognition of sleeper and rail fixing elements defects: Sleeper cracks (left), Skewed sleeper (right)



Rail insulated joint detected



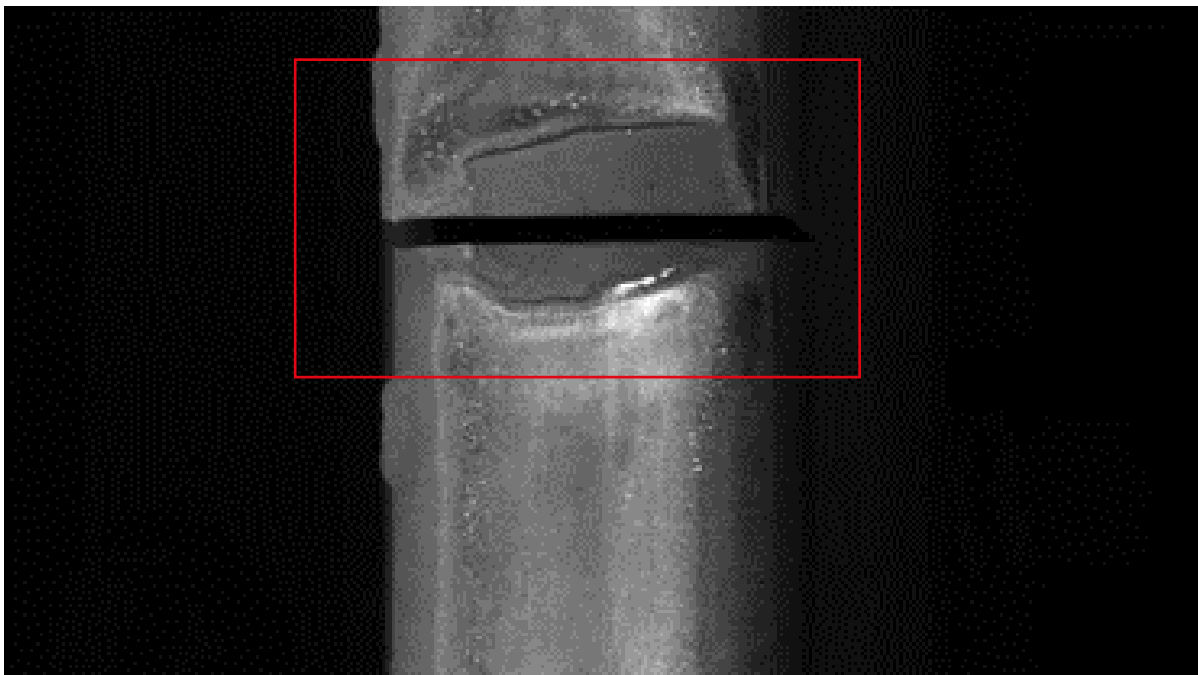
Displaced fastener



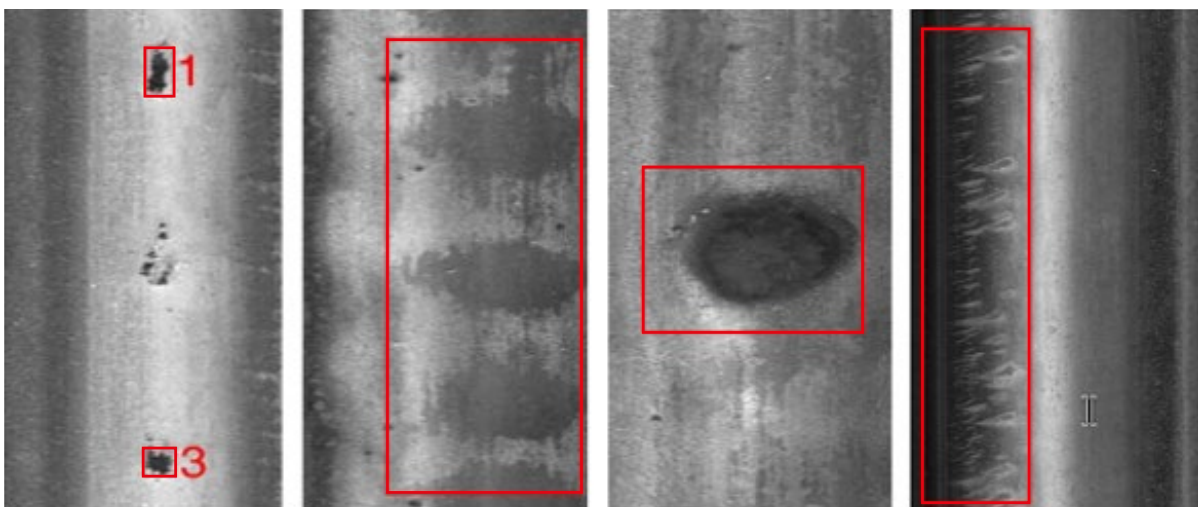


IMAGE OF THE RAIL HEAD SURFACE FOR THE ASSESSMENT OF SURFACE DEFECTS

The rail head inspection module makes it possible to detect a broad range of the rail head defects – as needed by the customer. Moreover, in addition to their automatic detection and classification it provides a complete inspection report on defects found on the inspected track section. The defect detection may be customised by using the images of typical defects provided by the customer.



Rail joint defect



Rail head defects recognition

WE ARE

GOLDSCHMIDT

The Goldschmidt success story begins with the invention of the Thermit® welding process which today still defines the worldwide standard for the welding of rails. A global company group was established based on this expertise and passion for innovation which together with you will shape the rail-bound mobility of tomorrow.



FINDING SOLUTIONS TO BRING YOU FORWARD

Goldschmidt is a unique global network of experts for your railway track requirements and develops smart applications for the railway industry which are exactly matched to your requirements, ranging from the Original Thermit® portion to our digital Dari® products and systems.

Customers on all continents trust in the excellent quality, first-class engineering expertise and proven reliability of Goldschmidt, with the trams of the European transport companies running on the same know-how as the high-speed trains in China. Goldschmidt is your strong partner when it comes to the future-oriented planning and practical development of solutions for railway infrastructure projects according to your respective national requirements with local implementation.



SMART RAIL SOLUTIONS

.....

Goldschmidt offers a comprehensive range of products and services worldwide for the joining of rails, modern construction of railway track, and inspection and maintenance of your track infrastructure:

**Original Thermit® • Insulated Rail Joints • Welding
Grinding • Inspection • Tools & Equipment
Road-Rail Vehicles • Digital Solutions**



SMART RAIL SOLUTIONS

Together with you, Goldschmidt masters the challenges of modern, railbound mobility – for safe, sustainable and long-lasting railways of premium quality. As with Thermit®, Goldschmidt is also a pioneer in maintenance, inspection and digitalization and continues to improve processes and extend the lifecycle of railway infrastructure. Goldschmidt benefits from its global expertise and cross-disciplinary thinking to create tailor-made local solutions for you. The global presence of Goldschmidt gives you access to its whole portfolio – with one goal: to lead your railway infrastructure into the future.