

1 The CIS-LS allows detecting contact wire wear and position fast and efficiently with one single system.

2 CIS-LS combines a camera system for recording the wire wear (illustrated) and a laser scanner for detecting the contact wire position.



LOW SPEED CONTACT WIRE INSPECTION SYSTEM CIS-LS

Detection of wire position and wear

Position and wear of contact wires are important parameters for an efficient, condition-based catenary maintenance. With its Low Speed Contact Wire Inspection System, Fraunhofer IPM offers a combined optical measurement system for recording the vertical and horizontal position of up to four contact wires simultaneously while also measuring their degree of wear. CIS-LS is the only system worldwide to measure wire position and wear contactlessly in one single measurement process. The CIS-LS comprises

- Contact Wire Recording System CRS*
- Wire Wear Monitoring System WWS*

Reliable operation at up to 60 km/h

The Contact Wire Inspection System CIS-LS is mounted on the roof of an inspection car. The system is suitable for use at speeds

of up to 60 km/h. A processing unit inside the inspection train provides the operators on site with processed position data that has already been compensated for the train's roll, which is recorded separately. Additional features, such as the automatic cleaning of the measurement window, ensure that the system operates reliably and requires little maintenance. The CIS-LS features its own lighting unit and can be operated reliably at any light situation, including at night, in tunnels, or under bridges.

Camera-based wire wear detection

A camera is used to identify the level of wire wear. The residual thickness of contact wires with a round cross section is calculated from the width of their sliding surface. The CIS' camera-based measuring

** More detailed information on the individual systems is available on separate product sheets.*

Fraunhofer Institute for Physical Measurement Techniques IPM

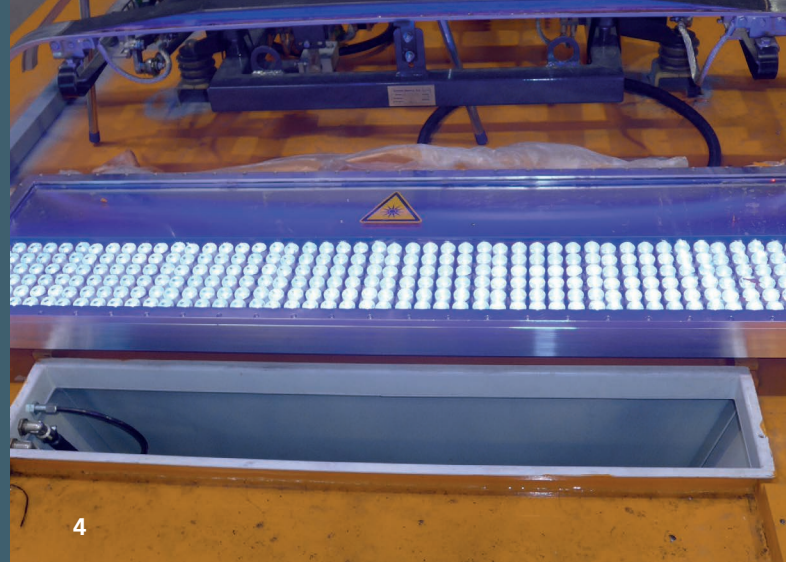
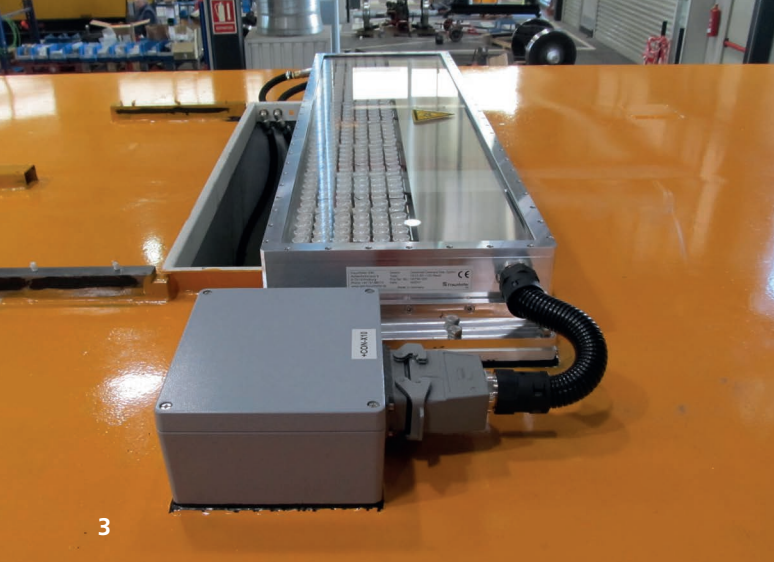
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3 Typical arrangement of the CIS-LS on a train's roof.

4 The LED panel illuminates the measurement environment.

5 Typical measurement results.

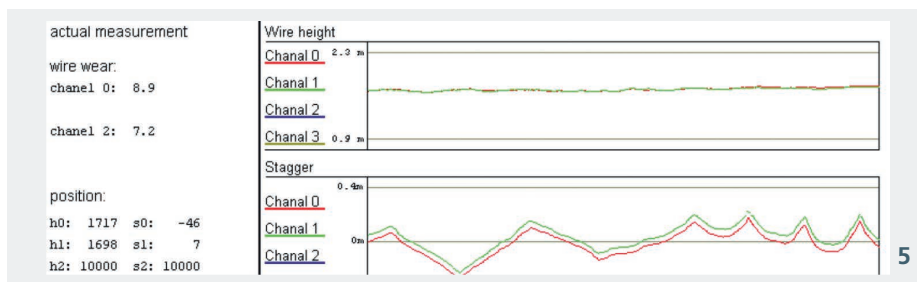
unit records the sliding surface and uses this information to derive data about the degree of wear. At a speed of 40 km/h, a reading is taken every 13 mm.

Laser scanner for detecting wire position

The laser-based measuring unit (CRS), used to record contact wire position, was significantly upgraded for integration into the CIS. Higher scan frequencies have improved the system's precision. The measurement range has been extended to 10 meters, while the sampling rate, i.e. the number of measuring points per scan, has been increased sixfold.

Modular system

The modular setup of the CIS-LS' acquisition unit comprises the WWS and CRS. As a one-box solution, the system can be mounted flexibly on a broad range of measuring vehicles, on the sole condition that the LED-panel be placed nearby. A customer friendly software features the analysis of the catenary system.



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Technical Specifications

**CLASS 1
LASER PRODUCT**

Contact Wire Range System CRS

Allowed range of wire position	Height: 700–2,600 mm above roof
Sensor mounted about 1 m below roof	Stagger: ± 500 mm
Uncertainty for height and stagger	5 mm (1σ, 3 m, R= 10 %), in relation to the acquisition unit
Resolution of thickness	0.1 - 0.2 mm (depending on wire position)
Accuracy of thickness (typical value)	± 0.3 mm up to 2,250 mm above roof ± 0.4 mm up to 2,600 mm above roof
Measuring frequency	10 kHz resulting in one measurement value 13.3 mm at 40 km/h and 12 combined scans
Speed of measuring vehicle	Up to 60 km/h
Max. number of detectable contact wires	4
Ambient temperature range	- 15 to + 60 °C
- Storage	+ 5 to + 35 °C (inside vehicle)
- Measurement	

Railway Measurement Technology at Fraunhofer IPM

Fraunhofer IPM develops optical measuring systems for monitoring the condition of rail 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. Other railroad measurement systems made by Fraunhofer IPM:

- Clearance Profile Scanner CPS
- High Speed Profiler HSP
- Sector Profile Scanner SPS
- Rail Track Scanner RTS



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

All specifications and features are subject to modification without notice.