

# Contact Wire Inspection System (Low-speed)

## Wire position and wear

Measuring up to eight contact wires simultaneously

*The CIS-LS combines a camera system for recording the wire wear and a laser scanner for detecting the contact wire position.*

Position and wear of contact wires are important parameters for an efficient, condition-based catenary maintenance. With its low-speed Contact Wire Inspection System CIS-LS, Fraunhofer IPM offers a combined optical measurement system for recording the vertical and horizontal position of up to eight contact wires simultaneously while also measuring their degree of wear.

### Non-contact optical measurement

The CIS-LS by Fraunhofer IPM measures wire position and wear contactlessly in one single measurement process. In contrast to the CIS, the sensors of this low-speed variant are vertically mounted inside the wagon, except for the illumination panel, which is fitted on the roof (see image page 2). The CIS-LS comprises

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

### Reliable operation at up to 60 km/h

The system is suitable for use at speeds of up to 60 km/h. A processing unit inside the

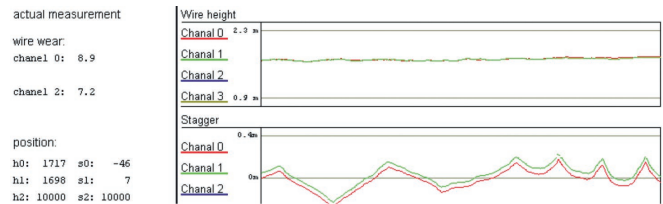
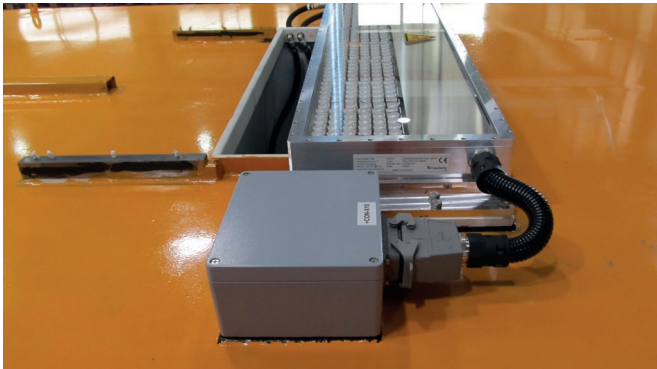
inspection train provides the operators on site with processed position data that has already been compensated for the train's roll, which is recorded separately. As the sensor is located inside the cabin, it can be easily cleaned without the need for an expensive automatic facility. The CIS-LS features its own lighting unit, meaning it 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 system's

### Railroad measurement systems by 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 turn-key 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.



*Left: Typical arrangement of the CIS-LS on a train's roof.  
An LED panel illuminates the measurement environment.  
Above: Typical measurement results.*

camera-based measuring unit records the sliding surface and uses this information to derive data about the degree of wear. One line-image is acquired every millimeter. Typically, a measurement value is generated every 12 mm.

### Laser scanner for detecting wire position

The laser-based measuring unit (CRS) records the contact wire position. The system scans at high frequencies, reaching high precision. The measurement range extends from 0.5 m to 4 m depending on the environmental conditions.

### 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. Optimized illumination with two LED panels instead of one allows measurements at up to 120 km/h, while maintaining all specifications. A customer friendly software features the analysis of the catenary system.

### Technical specifications

#### Low Speed Contact Wire Inspection System CIS-LS

Allowed range of wire position Sensor mounted about 1 m below roof	Height: 700–2,600 mm above roof Stagger: $\pm 500$ mm
Uncertainty for height and stagger	5 mm ( $1\sigma$ , 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)	from $\pm 0.3$ mm to $\pm 0.5$ mm (determined by height of wire and degree of wear)
Measuring rate	One line image per millimeter; typically one measurement value every 12 mm
Speed of measuring vehicle	Up to 60 km/h (one illumination panel)
Max. number of detectable contact wires	8 (maximum height distance of 40 mm)
Ambient temperature range	– 15 to + 60 °C
- Storage	+ 5 to + 35 °C (inside vehicle)
- Measurement	

*All specifications and features are subject to modification without notice.*

**CLASS 1  
LASER PRODUCT**

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