We inspect:

Overhead lines at up to 160 km/h
To be able to ensure rail traffic safety, it is absolutely necessary to know the detailed condition of the railway infrastructure. The substructure, track bed, turnouts, rails and catenary form an entire complex, whose individual components interact with each other.

The regular inspection and analysis of these components is a prerequisite for a condition-based, preventive maintenance regime, which in turn is a precondition for the sustained reduction of the life cycle costs of the railway infrastructure components.

Today, EURAILSCOUT Inspection & Analysis is the largest independent inspection organisation for the components of the railway infrastructure. EURAILSCOUT has its headquarters in Amersfoort in the Netherlands and a branch office in Berlin / Germany and in Paris / France and in Bologna / Italy. From these locations, we provide infrastructure monitoring services to clients throughout Europe.

We work in partnership with infrastructure companies and maintenance providers to develop and implement new concepts in monitoring and maintenance practices to ensure safety and to optimise the performance of the railway infrastructure.

In doing so, the latest measurement systems, modern test and measurement cars, fully developed processes, and an exemplary quality management system are the basis for a team of more than one hundred highly motivated, qualified employees who will be pleased to assist you with innovation and enthusiasm in finding solutions to your problems.

Today’s inspection and analysis of overhead line systems at normal and high speeds guarantees the safe and trouble-free operation of trains.
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1. General Description

A full survey of overhead lines can be carried out at speeds of up to 160kph using EURAILSCOUT’s measurement trains. The various trains are equipped with innovative measurement and diagnosis technologies for the many aspects of an overhead line inspection. The integrated assessment and evaluation of the various parameters during an inspection run combined with measurements from other infrastructural areas offers considerable operational advantages and a low cost of inspection when compared to conventional methods.

The measurement vehicle by EURAILSCOUT compiles all infrastructure data required for a comprehensive condition analysis, thus providing the basis for a planned, condition-related maintenance.

2. Measuring and Inspection Systems

2.1 Contact wire position measurement

Non-contact laser systems scan the height and horizontal position of up to four contact wires, with automatic corrections for the rolling motion of the carriage body, which is measured separately. The measurement can be carried out both under load (pantograph in operating position - contact pressure can be adjusted for the different types of overhead line) or with no load. When the pantograph is up the Hitdetection/defects detection can also be measured.
2.2 Hitdetection/incidents and incoming wires

Eurailscout has a new measurement system for hit detection and horn contact detection of the overhead wire at the pantograph. They are combined into a system called “ConForM”. Fiber optical sensors are embedded into the carbon stripes of a special measuring pantograph. Horn contact sensors detect the range of outgoing and incoming wires. Hit detection sensors detect incidents in the catenary system. This system was used in production at first in End of 2013.

2.3 Contact wire gauge measurement

Two sensors make a continuous, non-contact survey of the contact wire to assess wire wear. The pictures are used to evaluate the width of the wearing surface and of the visible gauge and are stored separately to the measurement results. As a result, ambiguous results can be checked at a later date without an on-site inspection of the system.

• The height of the contact wire is measured every 25cm with an accuracy of 0.25mm at 120 kph by means of a non-contact survey of the wearing surface and the gauge of the contact wire.
• Online detection of weak spots (areas showing increased wear)
3. Measuring and Inspection Systems

3.1 Position of mast poles

The position of the mast poles along the tracks is recognised automatically by laser-based systems and stored with the measuring and inspection data. The positions are shown in the resulting evaluation.

The pole recognition system consists of two recording units installed to the left and the right of the roof of the measuring car parallel to the bogie. Each recording unit consists of two laser distance sensors which point straight upwards. If both laser beams are reflected by an object at almost the same time it can be assumed that the unit has recorded a registration arm and thus an overhead line support.

3.2 Video survey

In addition to the inspection systems described below, a dedicated camera on the roof takes high-resolution digital photos of pantograph and the overhead lines.

Digital cameras on the front of the train take high-resolution images of the driver’s view; these are stored directly to hard disk without any analogue signal conversion. The images are very high quality and can be viewed either as individual frames or as a video. This enables the maintenance engineer to carry out a survey of the surroundings if he suspects that measuring and inspection results from the other overhead inspection systems might be faulty. The individual image frames are precisely interfaced with track location and dedicated software allows the corresponding track image to be viewed when an overhead line fault is ascertained.

3.3 Inspection of the longitudinal catenary system

Two high-speed diode line scan cameras mounted on each side of the vehicle take continuous images from below of the opposite side. The photos are taken at speeds of 80kph under infra-red laser illumination at a resolution of 1mm (45 µs exposure and a bit rate of 100 MHz). This process produces an “infinitely long” image of both sides of the longitudinal catenary. The high-resolution images are precisely interfaced with the track location, enabling a visual, onscreen inspection (monitoring, „Overhead contact line inspection“) requiring no further processing. The images can also be formatted for automatic evaluation.
Fig.: System draft of the longitudinal chain work measurement system
3.4 Inspection of the cross-span installations

Two cross-span wire sensors mounted at each end of the vehicle allow high-speed line scan cameras to record the transverse supports in both directions. When the front pole recognition system senses a transverse support it triggers the forward-facing scanning system at the back of the train. Once the support has been passed the backward-facing scanning system at the front of the train is activated. This system provides images of both sides of the cross-span installations.

The individual, high-resolution images are precisely interfaced to the track location, enabling a visual, onscreen inspection (monitoring, „Overhead contact line inspection”) requiring no further processing. The images can also be formatted for automatic evaluation.
3.5 Automated optical inspection

The automated optical inspection is based on surveys of the catenary and cross-span installations. The four sensors used in these two systems typically produce 4 GB of image data for each kilometre travelled. Real-time data compression reduces the data to less than 3% of its original volume. The cross-span installations and the longitudinal catenary are inspected offline using automatic image processing which recognises any changes by comparing a pre-defined status (teach-in run) with all of the subsequent inspection runs. The reference data for each section of the teach-in run is compared with the image data from the inspection run, allowing defects to be recognised and classified accordingly.

The real-time determination of the vertical and horizontal position of the contact wire and of its vertical gauge is supplemented by offline evaluation of the stored images. The automated image evaluation recognises damage and foreign objects. Damage can include loose or missing screws, frayed cable and other damaged components.
4. Display of the Measuring and Inspection Results

4.1 Results log

All of the geometric data from the overhead line system described above is recorded for each centimetre of the track and is displayed and stored digitally at least every 25cm. The measured data can be displayed on a computer screen during the inspection run and printed out. The chart layout (choice of channel, position of curves, scaling, language etc.) can easily be adapted to the clients requirements. Complex analyses and reports have already been provided in a range of languages for our clients (ProRail/NL, DB AG/D, Network Rail and CTRL/UK, SZ/SI etc.). All data is transferred to the IRISsys database, where any additional data can also be stored and analysed. Any type of threshold value can be applied and run-on-run analyses can be made to compare the current results with those of earlier runs. More comprehensive calculations can also be carried out with the collected data. This enables the system to be adapted and customised to the clients requirements in any international railway organisation. The system uses state-of-the-art database technology, making flexible importation of all measuring and inspection data possible, and has an intuitive graphical user interface. IRISsys can process any data created and collected by the measurement trains.

4.2 Parameters

Contact wire:
- Horizontal position (stagger)*
- Vertical position (height)*
- Vertical gauge of the wire
- Interaction between contact wire and contact strip
- speed up on contact strip in horizontal direction
- Mast pole position
- Position of incoming and outgoing as well as intersecting catenary wires
  * vertical to the track from the end touching the rail head

4.3 Inspection and video survey

- Automated optical inspection of the longitudinal catenary and cross-span installations
- Video survey of track surroundings (driver’s view), pantograph and overhead lines by roof camera

4.4 How you will benefit

- Significant limitation of damages through early recogniti on of faults
- Systematic correction of faults
- Significant increase in the quality of inspection results
- Annual savings in the cost of inspection
- Electronic evaluation, verification and management of the inspection process
- Fewer interruptions and line possessions for inspection purposes
- procedures (Catenary wire position and catenary wire strength measurement visual inspection „overhead contact line inspection”) that have been tested concerning quality and competence, through certification as a testing authority according to DIN EN ISO IEC 17025
## 5. Messfahrzeuge

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