

SWITCH INSPECTION

TURTLE system provides basic switch parameters, namely: frog groove and check rail groove.

Switches in measuring software

An additional feature of the KrabDroid measuring software supports data collection at discrete switch locations as special events. Each such event contains the name of the station, switch number, measured values and visual inspection values.

Rail profile scanners

The trolley can be equipped with rail profile scanners for continuous profile scanning and wear evaluation.

Track clearance scanner

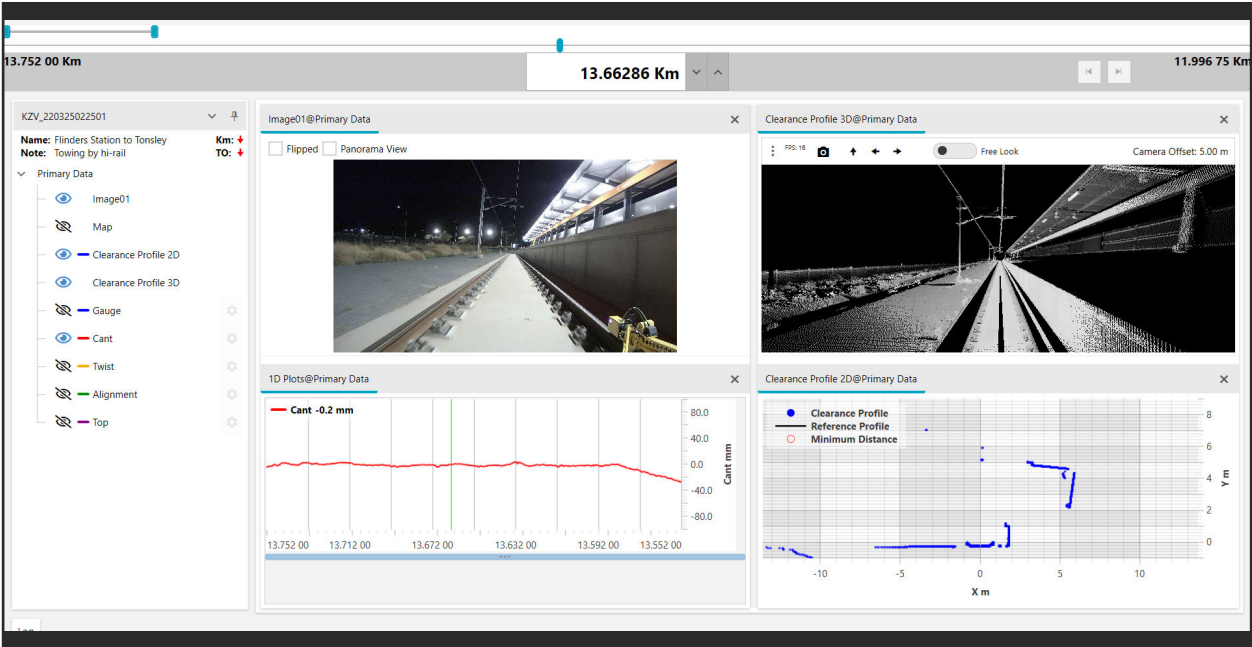
It is possible to install a track clearance scanner to evaluate distances of surroundings, platforms or overhead line equipment. The clearance profile evaluation is realised in powerful LPS Evaluation Suite software, which provides 3D point cloud, 2D cross section, surface maps and many more.



Measuring trolley 

TURTLE

for track geometry, corrugation, rail profiles and track clearance profile



The example of evaluation in LPS Evaluation Suite

The TURTLE concept enables the measurement of complete track geometry, corrugation, rail profiles and track clearance profile. The TURTLE can be made for any nominal track gauge (e.g. 1067, 1435, 1600 mm) and it can be used for all common vignoles and grooved rail profiles including UIC60.

The TURTLE fulfills all the requirements of the EN13848-1, EN 13848-4 and EN13231-3 standards.



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MEASURING PRINCIPLE

Non-contact measuring technology is achieved using 3D cameras. The main advantage of the non-contact concept is the measuring of track geometry and profiles of both rails using one device. Wear and lipping of the rails are determined by reading the track rail profiles (vertical, horizontal, by user-defined angle, etc.).

During the measuring run the following so-called primary track values are scanned in intervals of 0,25 m:

- **gauge** (potentiometer transducer on the left wheel)
- **alignment** (lateral versine) of the right rail
- **top** (vertical versine) of the right rail
- **cant** (new, highly reliable and precise inclinometer)
- **quasi-twist** on the twist base 0,9 m (option; it increases the precision of the final cant measurement)
- **track gradient** (option)
- **track distance** (odometer-optical encoder)
- **measuring speed**
- **rail profiles**
- **track clearance profile**
- **rail corrugation**

TROLLEY DESIGN

The TURTLE is a measuring bogie designed for towing behind the railway vehicle. It weighs 110 kg and data accuracy is guaranteed up to the speed 30 km/h.

The use of non-contact measuring technology makes the passage through the switches easier where the arresting system is not required at all. It also allows to measure and inspect switches without any additional mechanism.

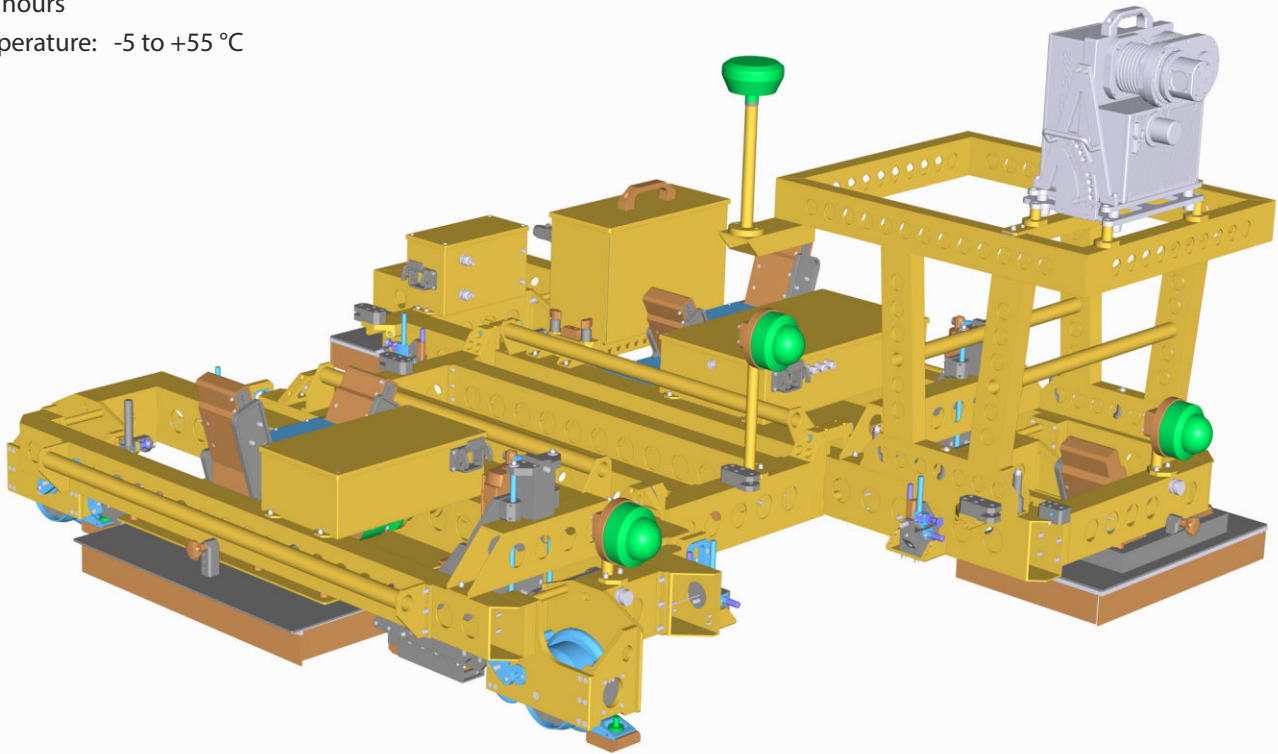
The mechanical construction allows disassembling into two pieces for the purpose of shipment.

THE BASIC TECHNICAL DATA:

Mass: 110 kg

Battery life: 8 hours

Working temperature: -5 to +55 °C



THE ACCURACY OF THE REPORTED GEOMETRY VALUES, SEE TAB.:

Geometric quantity to be measured	Resolution	Accuracy ²⁾ [mm]	Range [mm]
Gauge	0,1 mm	± 0,4 ¹⁾	-15+50
Gauge variation per 1 m	0,1 mm	± 0,5	-
Vertical alignment - Top (waveband 1÷25 m)	0,1 mm	± 0,7	± 100
Horizontal alignment (waveband 1÷25 m)	0,1 mm	± 1,0	± 100
Cant (the absolute value)	0,1 mm	± 1,0	± 250
Cant (the relative value for twist calculation)	0,1 mm	± 0,7	-
Twist (any twist base)	0,1 mm	± 0,7/ℓ	± 15 ‰
Rail profiles	0,1 mm	± 0,2	120x200
Speed	0,1 km/h	0,3 km/h	<30 km/h
Track distance	1,0 mm	1 ‰	No limit

¹⁾ excluding temperature effect

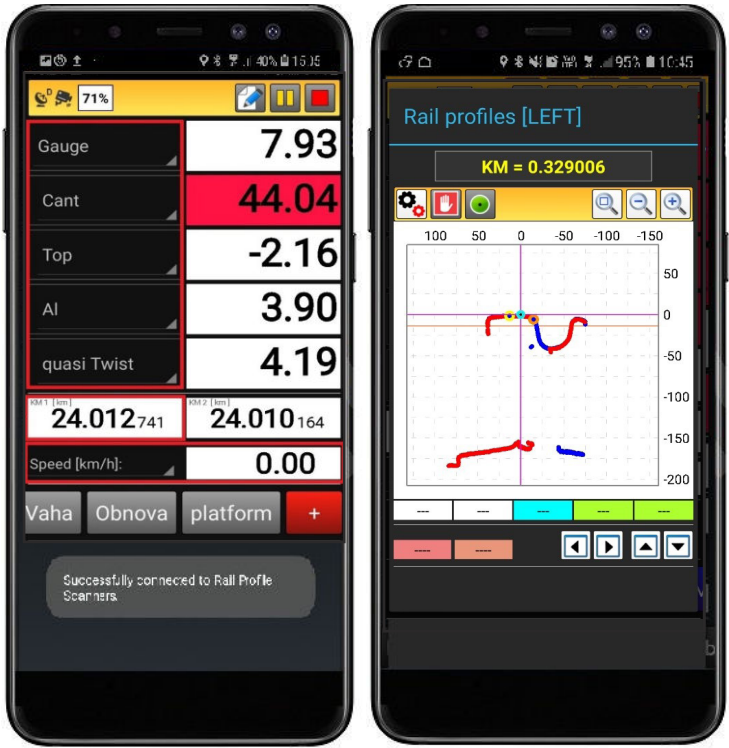
²⁾ in terms of reproducibility 95%

ON-BOARD COMPUTER

The real time processing of signals from the 3D cameras is performed by a rugged measuring computer with the measuring software. The on-board computer has enough memory for at least 1000 km with a battery life of 8 hours without charging.

The following items are reported using the measuring software:

- reading and scanning of the above signals
- on-line processing of the signals:
 - graphical presentation of the signals
 - optical signaling when the geometry data exceed the selectable thresholds
- display of numerical values of the geometry data
- display of the rail profile graphs with indication of:
 - lateral wear value
 - plastic flow value
- recording of the data into non-erasable storage of the on-board computer at selectable sampling steps (2,5 cm - 25 cm)
- recording of the information describing the track section to be measured
- recording of events (point events, e.g. mud spots in ballast or section events, e.g. bridge, level crossing) with the exact positions along the route

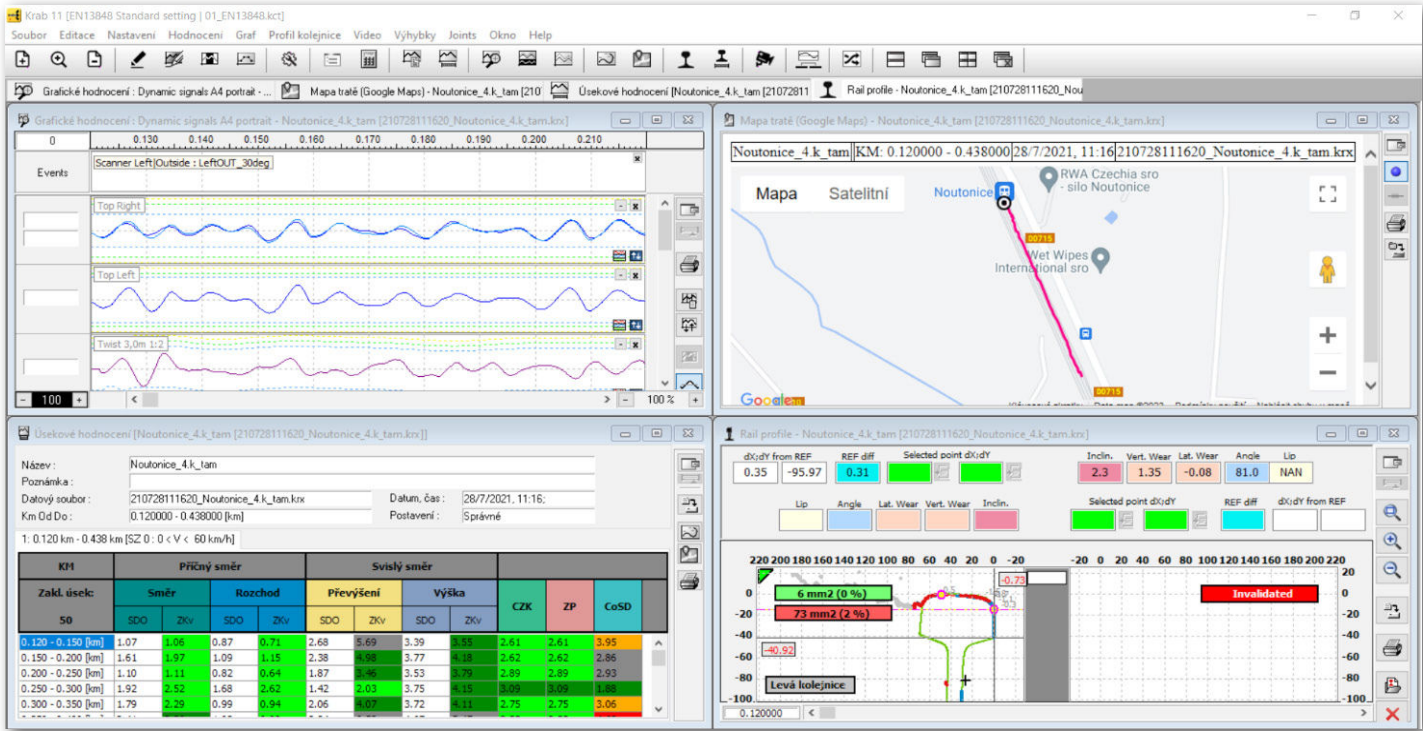


An example of measuring software

EVALUATION OF THE COLLECTED DATA USING THE KRAB 11 SOFTWARE

After measuring, the collected raw geometry data are transferred from the measuring computer into any PC computer. Sophisticated assessment software computes the so-called actual geometry (with the unit transfer function) via the FFT (Fast Fourier transformation) technique. Therefore, the following items are available:

- actual alignment and level in a selectable waveband
- separation of all geometric signals into long wave and short-wave segments
- TQI (Track Quality Index) evaluation - statistic evaluation of the track geometry based on standard deviation and quality index (a number of various TQI standards are available, e.g. DB, SNCF, IP, CRC)
- table of local defects, print out of geometrical lay and tables
- export of all data to Excel and/or .csv files
- export of rail profile cross sections, wear signals
- export of variable Clearance reports (surroundings, surface maps, 3D point cloud, 2D cross sections)



An example of evaluation in Krab 11

