

## SWITCH INSPECTION

The Turtle trolley system provides basic switch parameters, namely: frog groove and check rail groove.

### 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.

### Analysis software SWITCH™

This advanced software tool automatically couples the main and turnout branches of the switches, analyses the events and builds a Switch Inspection Report.

The switch parameters can be also displayed directly at Krab 10 SW with enhanced switch report export (MS Excel file).



Measuring trolley

# TURTLE

for track geometry and rail profiles

The TURTLE trolley concept enables the measurement of complete track geometry as well as rail profiles. 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 and EN13848-4 standards.



## 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 lip of the rails is 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**

## TROLLEY DESIGN

The TURTLE is a measuring bogie designed for towing behind the railway vehicle. It weighs 100 kg and data accuracy is guaranteed up to the speed 25 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.**

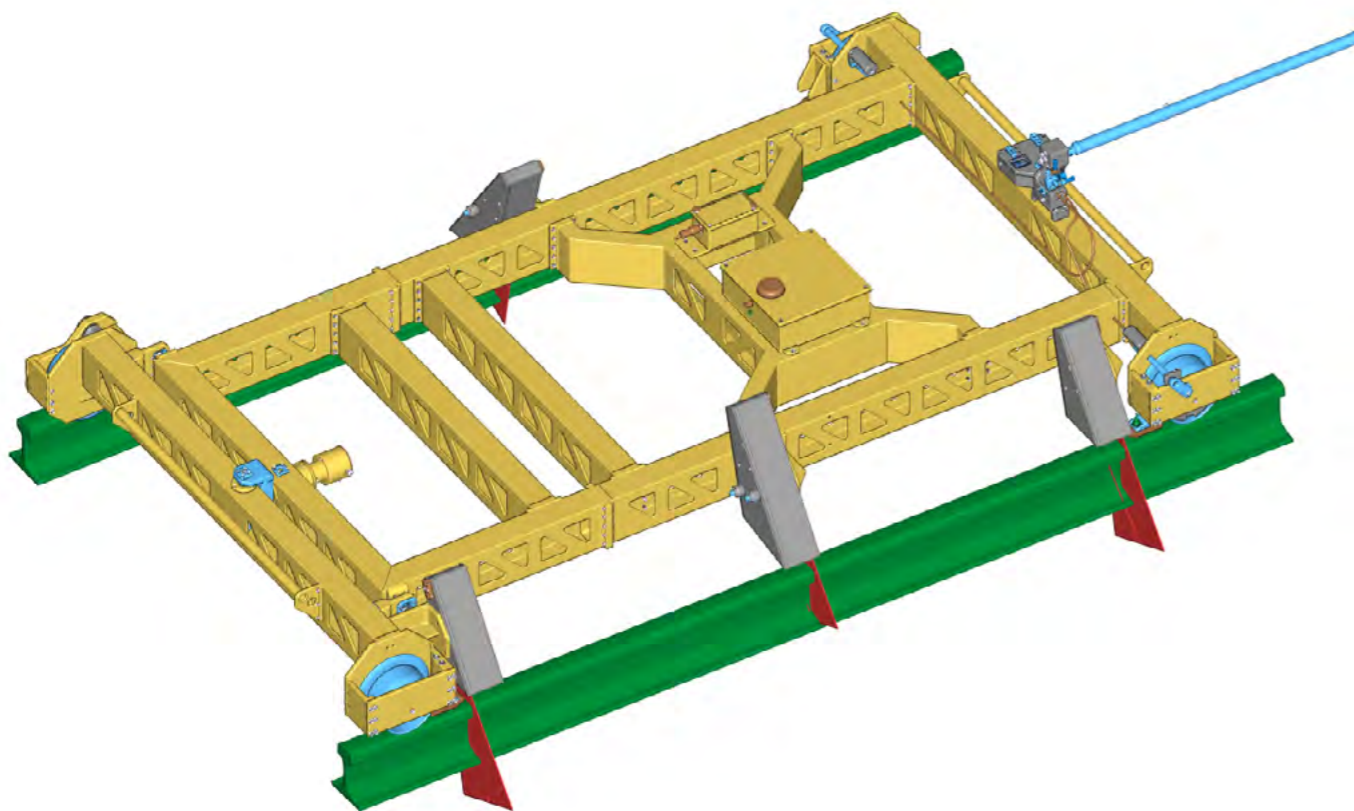
The mechanical construction allows disassembling to two pieces for the purpose of shipment.

## THE BASIC TECHNICAL DATA:

Mass: 100 kg

Autonomy: 8 hours without battery charge

Working temperature: -5 to +55 °C



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

Geometric quantity to be measured	Resolution	Accuracy <sup>2)</sup> [mm]	Range [mm]
Gauge	0,1 mm	± 0,4 <sup>1)</sup>	-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	<15 km/h
Track distance	1,0 mm	1 ‰	No limits

<sup>1)</sup> excluding temperature effect

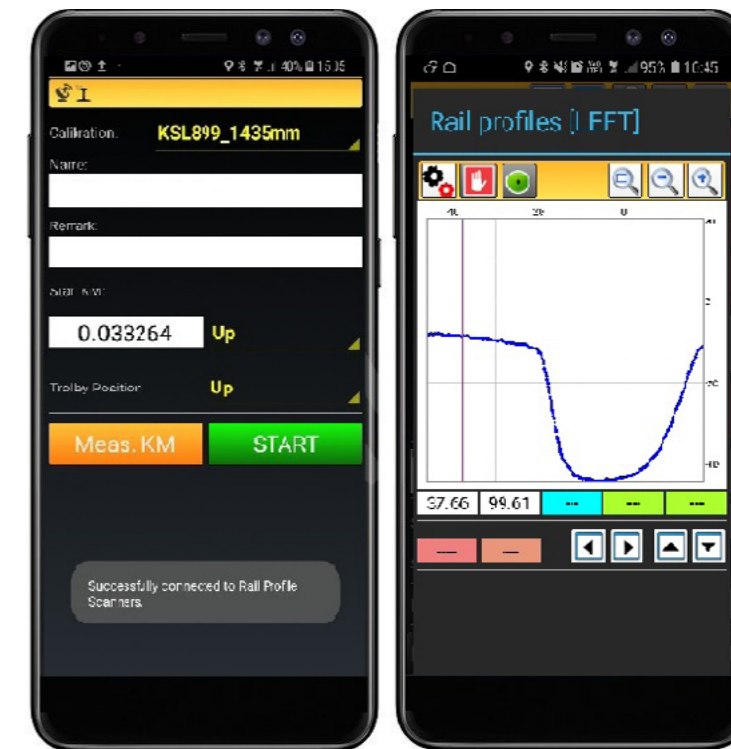
<sup>2)</sup> in terms of reproducibility 95%

## 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 2000 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 exceeded 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

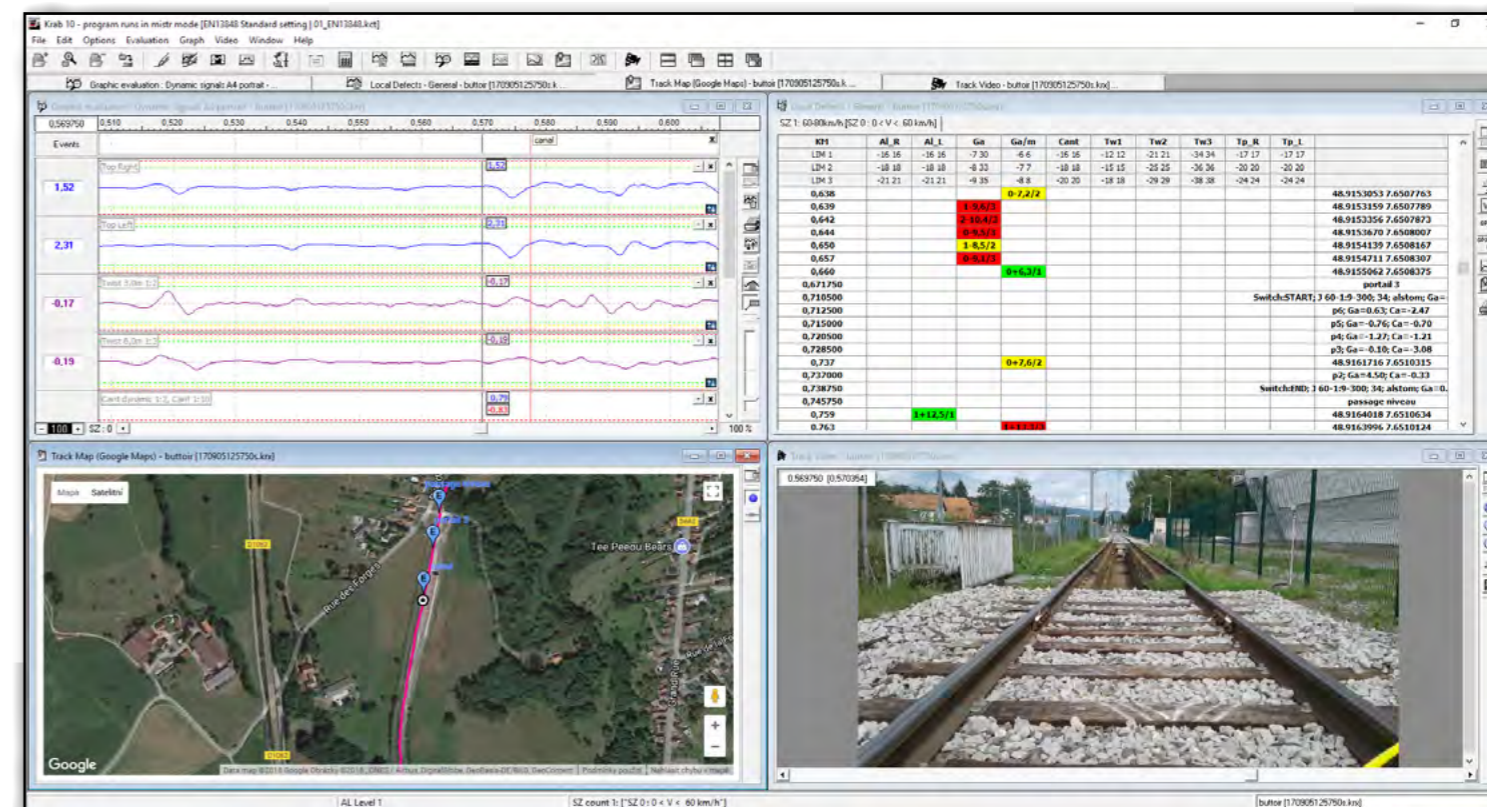


The example of measuring software

## EVALUATION OF THE COLLECTED DATA USING THE KRAB 10 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 (the 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



The example of evaluation in Krab 10