Super low weight measuring trolley

KRAB S-Light

for track geometry

The KRAB S-Light system is the latest step of Krab evolution. It was designed with focus on low weight and easy operation. The measurement speed is limited to approx. 15 km/h. The trolley weights app. 30 kg, only one operator is capable to take it away from the track. On-board computer has enough memory for at least 2000 km; its battery works 8 hours without charging. The trolley has versatile adjustable nominal gauge in wide range as an option (e.g. 760 mm - 1676 mm).

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TROLLEY DESIGN

The trolley's central body is made of a square profile, which increases stiffness and robustness of the system. The electrically insulated wheels are provided by flanges. Permanent contact of the wheel flanges and running rail edge is provided by springs. A special apparatus having two degrees of the freedom in translation is at the central part of the longitudinal chord. It scans vertical and lateral rail versine.

The wheel surface treatment is executed in hard chromium. The trolley surface finish is yellow powder paint.

The arresting mechanism is controlled by rope & bowden and two levers on pushing rod when the trolley passes through the frog.

MEASURING PRINCIPLE

During the measuring run the following so called primary track values are scanned in space interval 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, high reliable and precise inclinometer)
- **quasi-twist** on the twist base 0,9 m (option; it increases the precision of the final cant measuring)
- **track gradient** (option)
- **track distance** (odometer-optical encoder)
- **measuring speed**

ON BOARD COMPUTER

The real time processing of signals from the sensors is performed by the on-board rugged PDA computer (Android operating system) with KrabDroid measuring software, whereby the following items are determined:

- reading and scanning of signals given above
- on-line processing of the signals:
  - anti-aliasing
  - smoothing of long wave part
  - optical signaling when the geometry data exceed the selectable thresholds
- display of numerical values of the geometry data
- entry of the geometry data into non-erasable storage of on-board computer at the distance 0,25 m (the measuring distance is limited by computer memory, typically 1000 km)
- entry of the information describing the track section to be measured
- entry selected events (e.g. mud spots in ballast, damaged sleepers etc.) with the exact position along the route

ASSESSMENT OF THE COLLECTED DATA BY KRAB 10 SOFTWARE

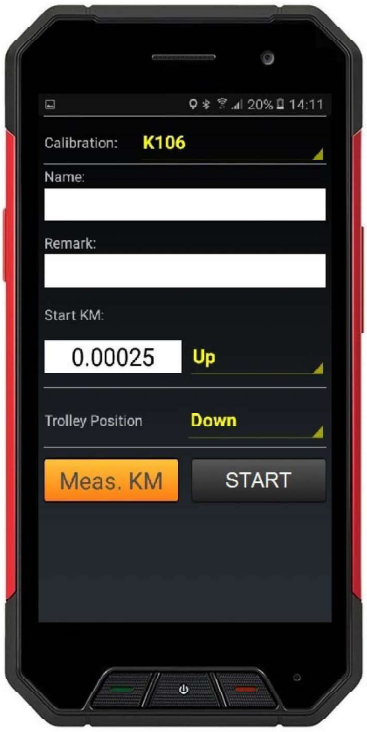
After the measuring, the collected raw geometry data are transferred from the on-board computer into any PC computer. Sophisticated assessment software computes so called actual geometry (with unit transfer function) in the waveband λ=1÷25 m via FFT (Fast Fourier Transformation) technique. Thus the following items are available:

- actual alignment and level in waveband λ=1÷25 m
- separation of all geometric signals into long wave (λ>25 m) and short wave (λ<25 m) parts
- so called section assessment - statistic evaluation of the track geometry based on standard deviation and quality index
- table of local defects, print out of geometrical lay and tables

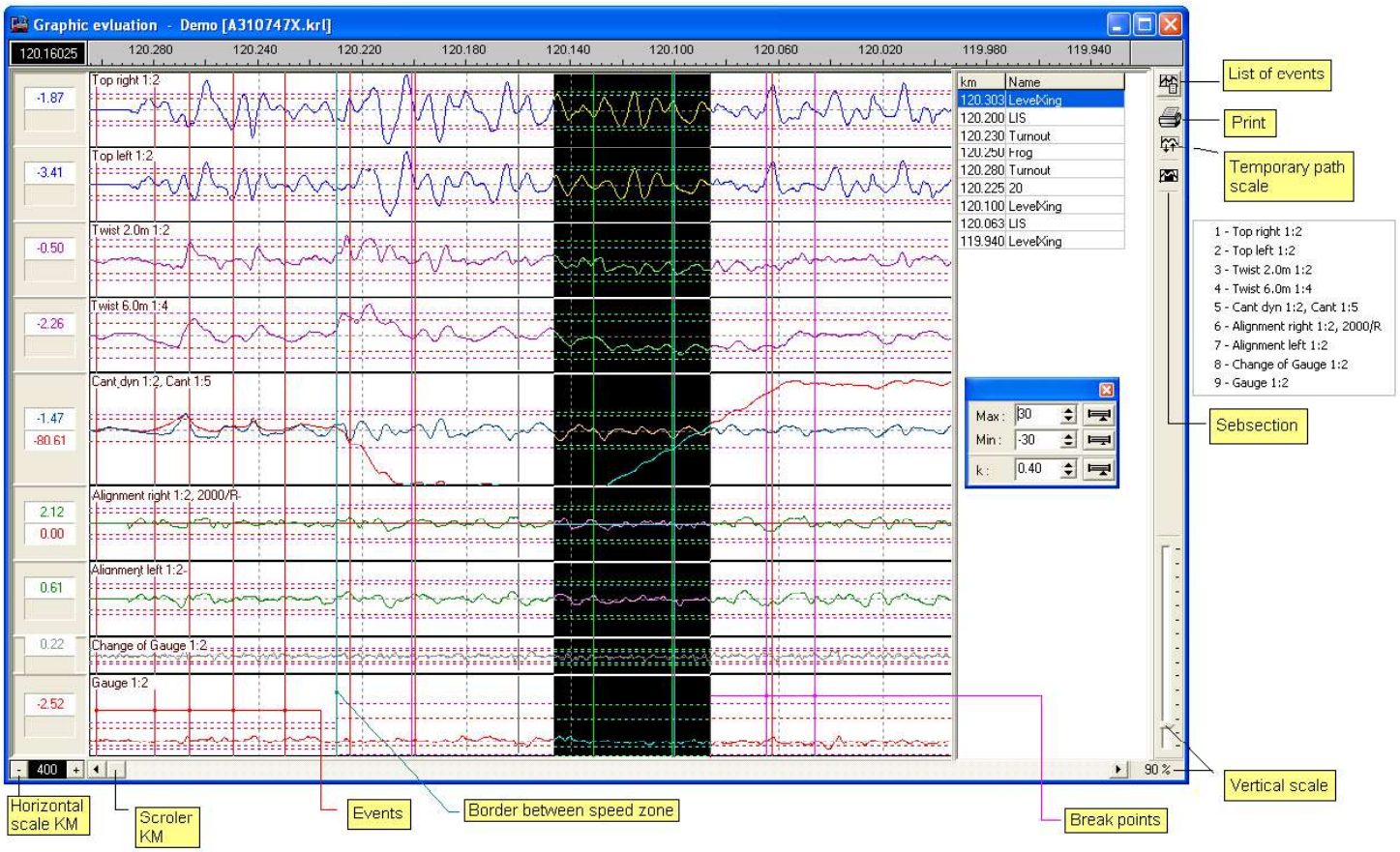
THE ACCURACY OF THE REPORTED GEOMETRY VALUES, SEE TAB.:

Geometric quantity to be measured	Resolution	Reproducibility 95% [mm]	Range [2] [mm]
Vertical alignment - Top (waveband 1÷25 m)	0,1 mm	± 0,7	-15+12
Horizontal alignment (waveband 1÷25 m)	0,1 mm	± 1,0	± 25
Gauge	0,1 mm	± 0,45 [1]	-15+50
Gauge change per 1 m	0,1 mm	± 0,5	-
Cant (the relative value for twist calculation)	0,1 mm	± 0,7 [3]	-
Cant (the absolute value)	0,2 mm	± 1,0 [3]	± 200
Twist (any twist base)	0,1 mm	± 0,7/ℓ [3]	± 13
Speed	0,3 km/h	0,3 km/h	<15 km/h
Track distance	1,0 mm	1 ‰	No limits

[1] excluding temperature effect, [2] range of the primary values, [3] arm of quasi-twist used



For easier transportation the trolley can be easily fold



The example of track geometry graph printed by assessment software

THE BASIC TECHNICAL DATA:

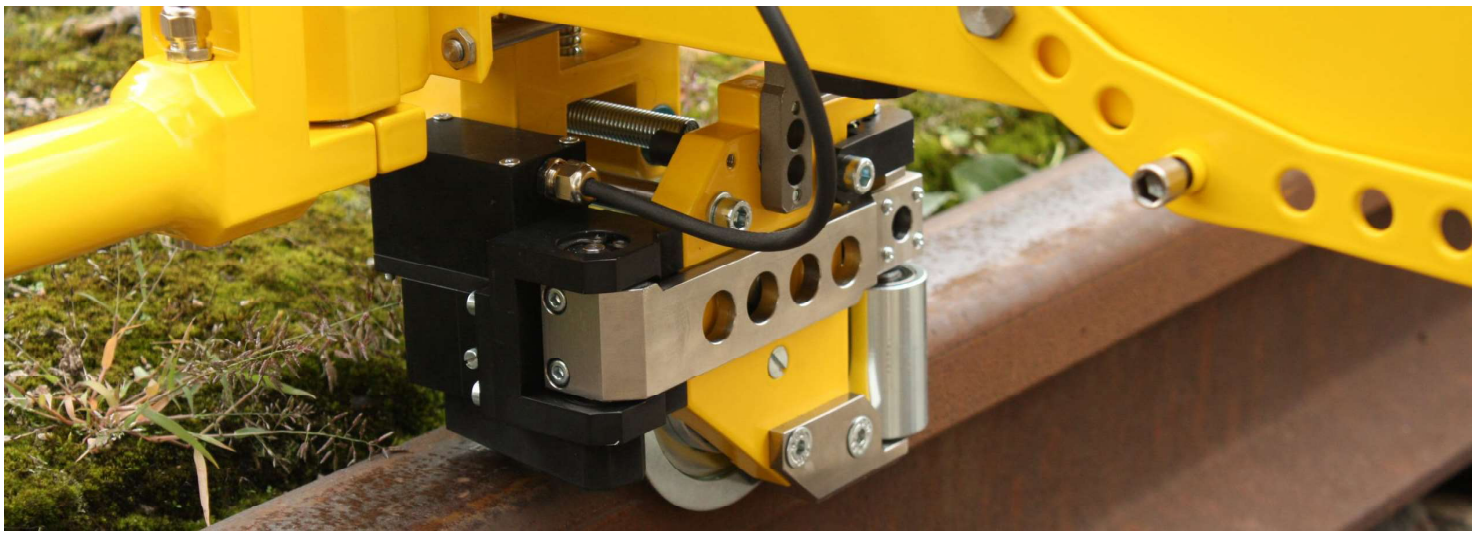
Mass: 30 kg basic form

2 kg auxiliary twist arm

20 hours without battery charge

Working temperature: -5÷55 °C

KRAB S-Light can be used for switch point inspection as an option. The extra auxiliary rollers for flange groove width measuring have to be mounted on the basic trolley. Measuring program is provided by special part of switch point measuring. Extra analysis software SWITCH™ is available for off-line data manipulation, analysis and the Inspection Report print out. The switch point is understood as an integral part of the track. So the regular scanning of the track geometry values runs at background and important discrete location of the switch points are measured in detail when trolley stops.



Auxiliary rollers

For the turnout option, the trolley has to be provided by two special rollers. The rollers can be lift up to transport position and activate to measuring position very easily

The rollers measure:

- width of open tongues
- groove of the guard rail
- groove of the wing rail and frog
- backgauge

The basic technical data:

Mass of shoulders: +4 kg
Accuracy: better than 1 mm for all switch values

Measuring software

Extra part of measuring software KrabDroid supports the data collecting at discrete switch location in the form of special events. Each such event contains the name of the station, switch nr. measured values and values coming from visual inspection.

Analysis software SWITCH™

This advanced software tool automatically couples the main and turnout branches of the switches, parses the events and builds Switch Inspection Report:

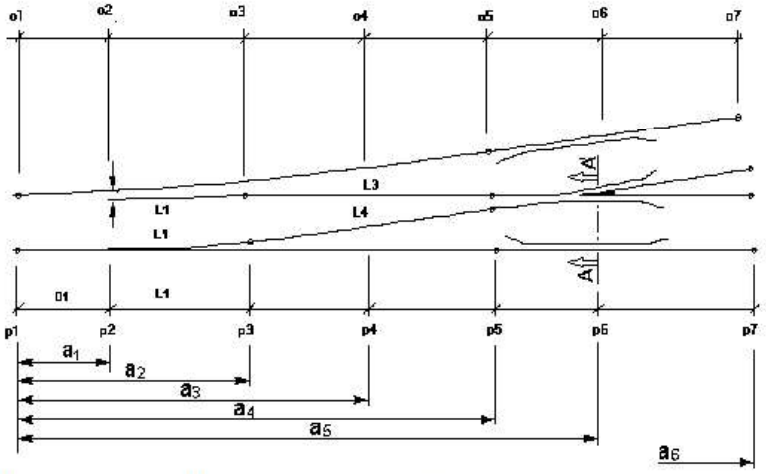
TURNOUT INSPECTION

Station : Noutonice
Turn. No. : 5
Turnout type : SingleSwitch
DescriptiNoutonice

Date :
User To Enter :
Limit values sheet : AL

Diverted line The narrowest groove : 44,57 mm

	1	2	3	4	5	6	7
Gauge	1424.99	1433.48	1436.87	1435.05	1433.57	1426.25	1426.56
Cross Level	-15.93	-16.67	-3.18	4.07	4.91	5.62	5.70
Top R	-6.55	-6.11	-15.25	9.77	2.85	3.35	1.09
Top L	-8.74	-9.60	-16.53	9.08	1.69	4.50	3.54
Alignmenr R	25.37	30.44	39.15	34.93	42.03	53.42	60.20
Alignment L	16.87	32.20	40.34	35.95	41.82	43.92	52.90
Frog groove						38.67	
Check rail groove						54.29	
Twist [3m]	4.07	3.54	9.77	-3.18	-8.74	2.85	3.35



Main line The narrowest groove : 72,08 mm

	1	2	3	4	5	6	7
Gauge	1428.54	1435.14	1428.35	1432.80	1432.15	1424.18	1424.50
Cross Level	-17.21	-19.12	3.64	10.35	11.77	21.21	19.71
Top R	-11.18	-2.75	-15.58	5.16	-1.45	6.00	4.75
Top L	-13.08	-6.96	-11.38	5.17	-6.74	8.66	5.79
Alignmenr R	-12.06	-18.98	-14.99	-16.92	-3.37	12.98	21.89
Alignment L	-10.39	-11.21	-17.10	-14.42	-1.02	7.12	15.91
Frog groove						44.42	
Check rail groove						42.43	
Twist [3m]	-1.45	-11.18	9.77	-3.18	-8.74	2.85	3.35

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