

Plasser Inertial Track Geometry Measuring System

Installation on track maintenance machines

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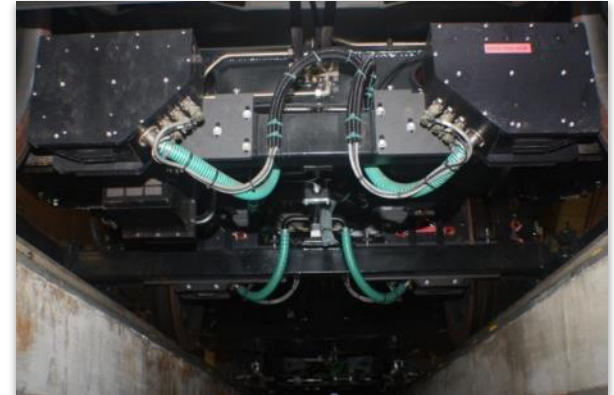
Introduction

- Plasser & Theurer developed the Inertial track geometry system in the late 1990's
- Over 55 Inertial measuring systems installed worldwide
- The new trend is the installation of the system on track maintenance machines
- This open new possibilities and also new challenges

Plasser Track Geometry Measuring System

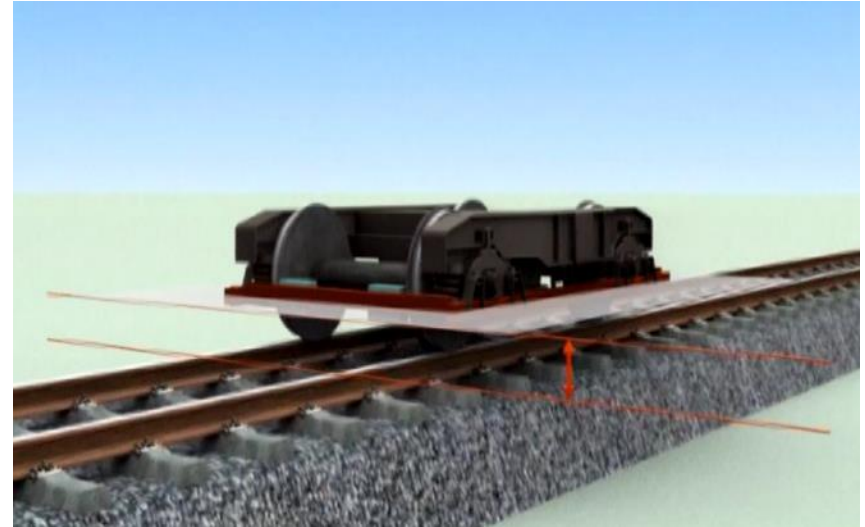
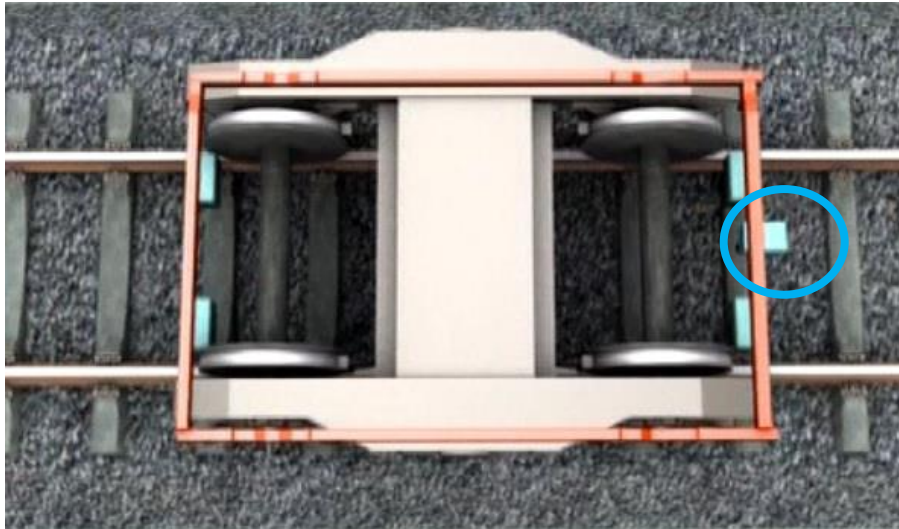
The system is composed of:

- Inertial measuring unit
- Navigational system
- Non contact gauge measuring system



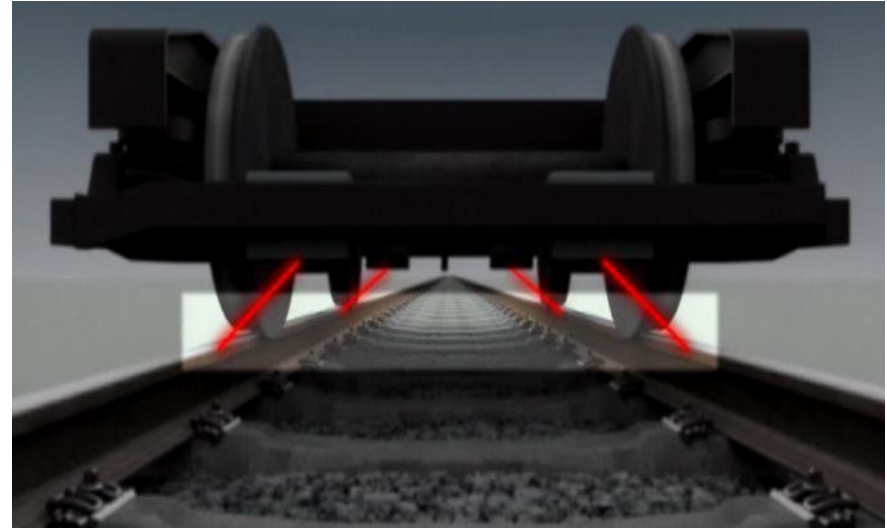
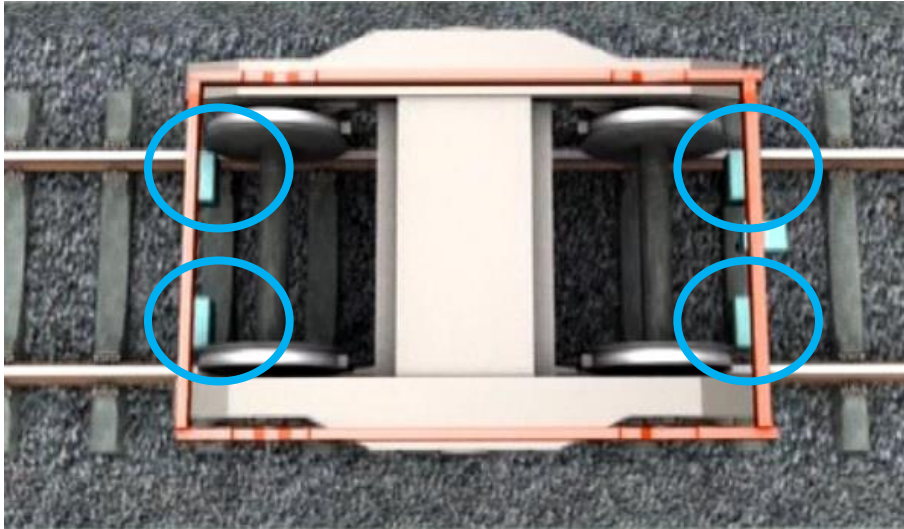
Inertial Unit

The Inertial unit (IMU) is mounted on the measuring frame.
The measuring frame is fixed on the axle bearings.

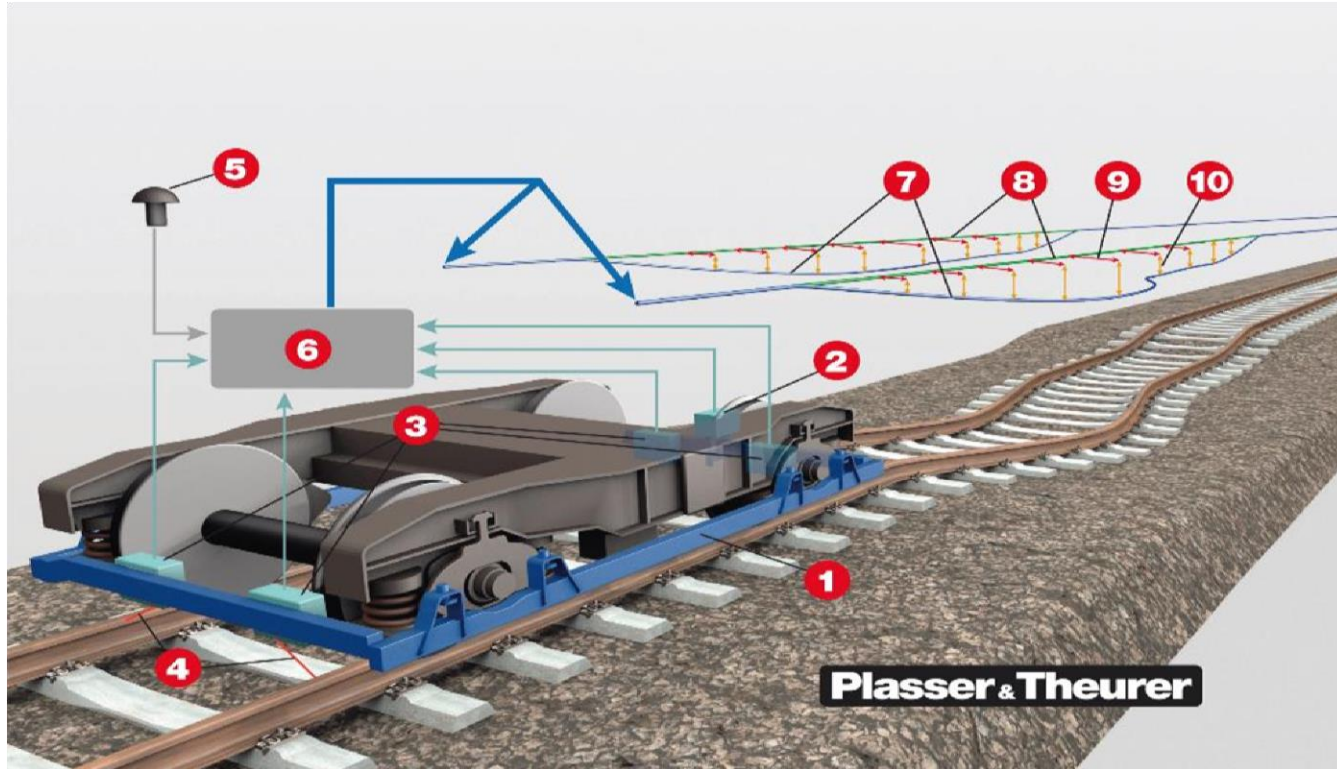


Optical Gauge Measuring System

- Compensation of the horizontal movement of the bogie
- Gauge measuring



Inertial Navigational Track Geometry



Parameters

- Cross level
- Twist
- Gauge
- Longitudinal level (3 different wave and chord lengths)
- Alignment (3 different wave and chord lengths)
- Radius/Curvature
- Gradient

Features

- No minimum speed required
- Measurement under load
- Excellent reproducibility
- No vertical compensation required
- Integrates GNSS
- GNSS even available in areas with no GNSS reception
- Compliant with the European Standard EN13848

Installation on Tamping machine



Use of the system on tamping machines

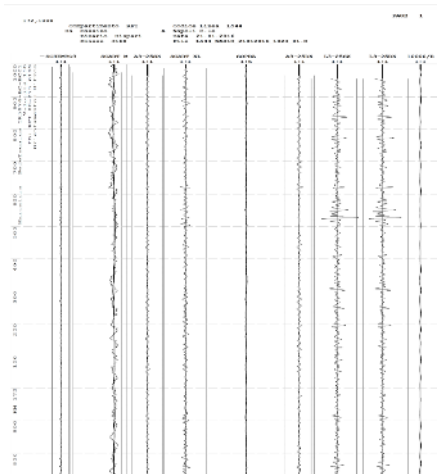
- Use of the tamping machine as a measuring car
- Measurement for acceptance of the work performed
- Speed up spot intervention for single exception
- Pre-Measurement to define the design track geometry
- Absolut track geometry measurement (development in progress)

Tamping machine as measuring car

- The tamping machine is traveling to and from the construction area. The measured data are therefore “for free”
- Onboard Analyses
 - Output of single Exception and evaluation in real time
 - Calculation of quality indexes (e.g. TQI)
 - Identification of defective areas
- Integrated database for track speed, class of the section, events, etc.

Measurement for work acceptance

- No measuring speed limit
- Verification of long wavelength defects (D2/D3)
- Documentation output according to local standards



DIREZIONE PRODUZIONE

2025

COMUNICAZIONE DI DIFETTI RILEVANTI

Si dà avviso che nella corsa di verifica effettuata dalla vettura di rilievo **A0086924**

In d'atrac: 09.12.2009

1537 Cancer by Sex

Call Center
New Location

una serie di altri seguenti effetti rilevanti

Index	Frequency	Parameter	Value (Hz)	Amplitude	Phase (deg)
0.000000E+00	0.7749 (0.03)	UAS L&R 0.5	-96.1	0.032	Ref. 0°/180°
0.000000E+00	0.804 (0.03)	UAS L&R 0.5	-95.5	0.045	Ref. 0°/180°
0.000000E+00	0.834 (0.03)	UAS L&R 0.5	-95.0	0.058	Ref. 0°/180°
0.000000E+00	1.060 (0.03)	UAS L&R 0.5	-94.3	0.071	Ref. 0°/180°
0.000000E+00	1.280 (0.03)	UAS L&R 0.5	-93.7	0.083	Ref. 0°/180°
0.000000E+00	1.500 (0.03)	UAS L&R 0.5	-93.0	0.093	Ref. 0°/180°
0.000000E+00	1.720 (0.03)	UAS L&R 0.5	-92.3	0.103	Ref. 0°/180°
0.000000E+00	1.940 (0.03)	UAS L&R 0.5	-91.6	0.112	Ref. 0°/180°
0.000000E+00	2.160 (0.03)	UAS L&R 0.5	-90.9	0.120	Ref. 0°/180°
0.000000E+00	2.380 (0.03)	UAS L&R 0.5	-90.2	0.128	Ref. 0°/180°
0.000000E+00	2.600 (0.03)	UAS L&R 0.5	-89.5	0.135	Ref. 0°/180°
0.000000E+00	2.820 (0.03)	UAS L&R 0.5	-88.8	0.142	Ref. 0°/180°
0.000000E+00	3.040 (0.03)	UAS L&R 0.5	-88.1	0.148	Ref. 0°/180°
0.000000E+00	3.260 (0.03)	UAS L&R 0.5	-87.4	0.154	Ref. 0°/180°
0.000000E+00	3.480 (0.03)	UAS L&R 0.5	-86.7	0.160	Ref. 0°/180°
0.000000E+00	3.700 (0.03)	UAS L&R 0.5	-86.0	0.165	Ref. 0°/180°
0.000000E+00	3.920 (0.03)	UAS L&R 0.5	-85.3	0.170	Ref. 0°/180°
0.000000E+00	4.140 (0.03)	UAS L&R 0.5	-84.6	0.175	Ref. 0°/180°
0.000000E+00	4.360 (0.03)	UAS L&R 0.5	-83.9	0.179	Ref. 0°/180°
0.000000E+00	4.580 (0.03)	UAS L&R 0.5	-83.2	0.183	Ref. 0°/180°
0.000000E+00	4.800 (0.03)	UAS L&R 0.5	-82.5	0.187	Ref. 0°/180°
0.000000E+00	5.020 (0.03)	UAS L&R 0.5	-81.8	0.190	Ref. 0°/180°
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0.000000E+00	5.460 (0.03)	UAS L&R 0.5	-80.4	0.196	Ref. 0°/180°
0.000000E+00	5.680 (0.03)	UAS L&R 0.5	-79.7	0.199	Ref. 0°/180°
0.000000E+00	5.900 (0.03)	UAS L&R 0.5	-79.0	0.202	Ref. 0°/180°
0.000000E+00	6.120 (0.03)	UAS L&R 0.5	-78.3	0.205	Ref. 0°/180°
0.000000E+00	6.340 (0.03)	UAS L&R 0.5	-77.6	0.208	Ref. 0°/180°
0.000000E+00	6.560 (0.03)	UAS L&R 0.5	-76.9	0.211	Ref. 0°/180°
0.000000E+00	6.780 (0.03)	UAS L&R 0.5	-76.2	0.214	Ref. 0°/180°
0.000000E+00	7.000 (0.03)	UAS L&R 0.5	-75.5	0.217	Ref. 0°/180°
0.000000E+00	7.220 (0.03)	UAS L&R 0.5	-74.8	0.220	Ref. 0°/180°
0.000000E+00	7.440 (0.03)	UAS L&R 0.5	-74.1	0.223	Ref. 0°/180°
0.000000E+00	7.660 (0.03)	UAS L&R 0.5	-73.4	0.226	Ref. 0°/180°
0.000000E+00	7.880 (0.03)	UAS L&R 0.5	-72.7	0.229	Ref. 0°/180°
0.000000E+00	8.100 (0.03)	UAS L&R 0.5	-72.0	0.232	Ref. 0°/180°
0.000000E+00	8.320 (0.03)	UAS L&R 0.5	-71.3	0.235	Ref. 0°/180°
0.000000E+00	8.540 (0.03)	UAS L&R 0.5	-70.6	0.238	Ref. 0°/180°
0.000000E+00	8.760 (0.03)	UAS L&R 0.5	-69.9	0.241	Ref. 0°/180°
0.000000E+00	8.980 (0.03)	UAS L&R 0.5	-69.2	0.244	Ref. 0°/180°
0.000000E+00	9.200 (0.03)	UAS L&R 0.5	-68.5	0.247	Ref. 0°/180°
0.000000E+00	9.420 (0.03)	UAS L&R 0.5	-67.8	0.250	Ref. 0°/180°
0.000000E+00	9.640 (0.03)	UAS L&R 0.5	-67.1	0.253	Ref. 0°/180°
0.000000E+00	9.860 (0.03)	UAS L&R 0.5	-66.4	0.256	Ref. 0°/180°
0.000000E+00	10.080 (0.03)	UAS L&R 0.5	-65.7	0.259	Ref. 0°/180°
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0.000000E+00	10.520 (0.03)	UAS L&R 0.5	-64.3	0.265	Ref. 0°/180°
0.000000E+00	10.740 (0.03)	UAS L&R 0.5	-63.6	0.268	Ref. 0°/180°
0.000000E+00	10.960 (0.03)	UAS L&R 0.5	-62.9	0.271	Ref. 0°/180°
0.000000E+00	11.180 (0.03)	UAS L&R 0.5	-62.2	0.274	Ref. 0°/180°
0.000000E+00	11.400 (0.03)	UAS L&R 0.5	-61.5	0.277	Ref. 0°/180°
0.000000E+00	11.620 (0.03)	UAS L&R 0.5	-60.8	0.280	Ref. 0°/180°
0.000000E+00	11.840 (0.03)	UAS L&R 0.5	-60.1	0.283	Ref. 0°/180°
0.000000E+00	12.060 (0.03)	UAS L&R 0.5	-59.4	0.286	Ref. 0°/180°
0.000000E+00	12.280 (0.03)	UAS L&R 0.5	-58.7	0.289	Ref. 0°/180°
0.000000E+00	12.500 (0.03)	UAS L&R 0.5	-58.0	0.292	Ref. 0°/180°
0.000000E+00	12.720 (0.03)	UAS L&R 0.5	-57.3	0.295	Ref. 0°/180°
0.000000E+00	12.940 (0.03)	UAS L&R 0.5	-56.6	0.298	Ref. 0°/180°
0.000000E+00	13.160 (0.03)	UAS L&R 0.5	-55.9	0.301	Ref. 0°/180°
0.000000E+00	13.380 (0.03)	UAS L&R 0.5	-55.2	0.304	Ref. 0°/180°
0.000000E+00	13.600 (0.03)	UAS L&R 0.5	-54.5	0.307	Ref. 0°/180°
0.000000E+00	13.820 (0.03)	UAS L&R 0.5	-53.8	0.310	Ref. 0°/180°
0.000000E+00	14.040 (0.03)	UAS L&R 0.5	-53.1	0.313	Ref. 0°/180°
0.000000E+00	14.260 (0.03)	UAS L&R 0.5	-52.4	0.316	Ref. 0°/180°
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0.000000E+00	14.700 (0.03)	UAS L&R 0.5	-51.0	0.322	Ref. 0°/180°
0.000000E+00	14.920 (0.03)	UAS L&R 0.5	-50.3	0.325	Ref. 0°/180°
0.000000E+00	15.140 (0.03)	UAS L&R 0.5	-49.6	0.328	Ref. 0°/180°
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0.000000E+00	16.240 (0.03)	UAS L&R 0.5	-46.1	0.343	Ref. 0°/180°
0.000000E+00	16.460 (0.03)	UAS L&R 0.5	-45.4	0.346	Ref. 0°/180°
0.000000E+00	16.680 (0.03)	UAS L&R 0.5	-44.7	0.349	Ref. 0°/180°
0.000000E+00	16.900 (0.03)	UAS L&R 0.5	-44.0	0.352	Ref. 0°/180°
0.000000E+00	17.120 (0.03)	UAS L&R 0.5	-43.3	0.355	Ref. 0°/180°
0.000000E+00	17.340 (0.03)	UAS L&R 0.5	-42.6	0.358	Ref. 0°/180°
0.000000E+00	17.560 (0.03)	UAS L&R 0.5	-41.9	0.361	Ref. 0°/180°
0.000000E+00	17.780 (0.03)	UAS L&R 0.5	-41.2	0.364	Ref. 0°/180°
0.000000E+00	18.000 (0.03)	UAS L&R 0.5	-40.5	0.367	Ref. 0°/180°
0.000000E+00	18.220 (0.03)	UAS L&R 0.5	-39.8	0.370	Ref. 0°/180°
0.000000E+00	18.440 (0.03)	UAS L&R 0.5	-39.1	0.373	Ref. 0°/180°
0.000000E+00	18.660 (0.03)	UAS L&R 0.5	-38.4	0.376	Ref. 0°/180°
0.000000E+00	18.880 (0.03)	UAS L&R 0.5	-37.7	0.379	Ref. 0°/180°
0.000000E+00	19.100 (0.03)	UAS L&R 0.5	-37.0	0.382	Ref. 0°/180°
0.000000E+00	19.320 (0.03)	UAS L&R 0.5	-36.3	0.385	Ref. 0°/180°
0.000000E+00	19.540 (0.03)	UAS L&R 0.5	-35.6	0.388	Ref. 0°/180°
0.000000E+00	19.760 (0.03)	UAS L&R 0.5	-34.9	0.391	Ref. 0°/180°
0.000000E+00	19.980 (0.03)	UAS L&R 0.5	-34.2	0.394	Ref. 0°/180°
0.000000E+00	20.200 (0.03)	UAS L&R 0.5	-33.5	0.397	Ref. 0°/180°
0.000000E+00	20.420 (0.03)	UAS L&R 0.5	-32.8	0.400	Ref. 0°/180°
0.000000E+00	20.640 (0.03)	UAS L&R 0.5	-32.1	0.403	Ref. 0°/180°
0.000000E+00	20.860 (0.03)	UAS L&R 0.5	-31.4	0.406	Ref. 0°/180°
0.000000E+00	21.080 (0.03)	UAS L&R 0.5	-30.7	0.409	Ref. 0°/180°
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0.000000E+00	21.740 (0.03)	UAS L&R 0.5	-28.6	0.418	Ref. 0°/180°
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0.000000E+00	23.280 (0.03)	UAS L&R 0.5	-23.7	0.439	Ref. 0°/180°
0.000000E+00	23.500 (0.03)	UAS L&R 0.5	-23.0	0.442	Ref. 0°/180°
0.000000E+00	23.720 (0.03)	UAS L&R 0.5	-22.3	0.445	Ref. 0°/180°
0.000000E+00	23.940 (0.03)	UAS L&R 0.5	-21.6	0.448	Ref. 0°/180°
0.000000E+00	24.160 (0.03)	UAS L&R 0.5	-20.9	0.451	Ref. 0°/180°
0.000000E+00	24.380 (0.03)	UAS L&R 0.5	-20.2	0.454	Ref. 0°/180°
0.000000E+00	24.600 (0.03)	UAS L&R 0.5	-19.5	0.457	Ref. 0°/180°
0.000000E+00	24.820 (0.03)	UAS L&R 0.5	-18.8	0.460	Ref. 0°/180°
0.000000E+00	25.040 (0.03)	UAS L&R 0.5	-18.1	0.463	Ref. 0°/180°
0.000000E+00	25.260 (0.03)	UAS L&R 0.5	-17.4	0.466	Ref. 0°/180°
0.000000E+00	25.480 (0.03)	UAS L&R 0.5	-16.7	0.469	Ref. 0°/180°
0.000000E+00	25.700 (0.03)	UAS L&R 0.5	-16.0	0.472	Ref. 0°/180°
0.000000E+00	25.920 (0.03)	UAS L&R 0.5	-15.3	0.475	Ref. 0°/180°
0.000000E+00	26.140 (0.03)	UAS L&R 0.5	-14.6	0.478	Ref. 0°/180°
0.000000E+00	26.360 (0.03)	UAS L&R 0.5	-13.9	0.481	Ref. 0°/180°
0.000000E+00	26.580 (0.03)	UAS L&R 0.5	-13.2	0.484	Ref. 0°/180°
0.000000E+00	26.800 (0.03)	UAS L&R 0.5	-12.5	0.487	Ref. 0°/180°
0.000000E+00	27.020 (0.03)	UAS L&R 0.5	-11.8	0.490	Ref. 0°/180°
0.000000E+00	27.240 (0.03)	UAS L&R 0.5	-11.1	0.493	Ref. 0°/180°
0.000000E+00	27.460 (0.03)	UAS L&R 0.5	-10.4	0.496	Ref. 0°/180°
0.000000E+00	27.680 (0.03)	UAS L&R 0.5	-9.7	0.499	Ref. 0°/180°
0.000000E+00	27.900 (0.03)	UAS L&R 0.5	-9.0	0.502	Ref. 0°/180°
0.000000E+00	28.120 (0.03)	UAS L&R 0.5	-8.3	0.505	Ref. 0°/180°
0.000000E+00	28.340 (0.03)	UAS L&R 0.5	-7.6	0.508	Ref. 0°/180°
0.000000E+00	28.560 (0.03)	UAS L&R 0.5	-6.9	0.511	Ref. 0°/180°
0.000000E+00	28.780 (0.03)	UAS L&R 0.5	-6.2	0.514	Ref. 0°/180°
0.000000E+00	29.000 (0.03)	UAS L&R 0.5	-5.5	0.517	Ref. 0°/180°
0.000000E+00	29.220 (0.03)	UAS L&R 0.5	-4.8	0.520	Ref. 0°/180°
0.000000E+00	29.440 (0.03)	UAS L&R 0.5	-4.1	0.523	Ref. 0°/180°
0.000000E+00	29.660 (0.03)	UAS L&R 0.5	-3.4	0.526	Ref. 0°/180°
0.000000E+00	29.880 (0.03)	UAS L&R 0.5	-2.7	0.529	Ref. 0°/180°
0.000000E+00	30.100 (0.03)	UAS L&R 0.5	-2.0	0.532	Ref. 0°/180°
0.000000E+00	30.320 (0.03)	UAS L&R 0.5	-1.3	0.535	Ref. 0°/180°
0.000000E+00	30.540 (0.03)	UAS L&R 0.5	-0.6	0.538	Ref. 0°/180°
0.000000E+00	30.760 (0.03)	UAS L&R 0.5	0.1	0.541	Ref. 0°/180°
0.000000E+00	30.980 (0.03)	UAS L&R 0.5	0.8	0.544	Ref. 0°/180°
0.000000E+00	31.200 (0.03)	UAS L&R 0.5	1.5	0.547	Ref. 0°/180°
0.000000E+00	31.420 (0.03)	UAS L&R 0.5	2.2	0.550	Ref. 0°/180°
0.000000E+00	31.640 (0.03)	UAS L&R 0.5	2.9	0.553	Ref. 0°/180°
0.000000E+00	31.860 (0.03)	UAS L&R 0.5	3.6	0.556	Ref. 0°/180°
0.000000E+00					

Debut

Visito dal Pappe. Del S.O.M.E.

Nota: da inviare via fax a cura del Reparto C.D. al Mantienimento in C.F. scienza e U.T. competente



Spot intervention (Single Exception)

- Additional device for fast detection of the defect, using inertial navigational data
- Measurement before and after



Line	Code	Track	Dispari	Max Exception Location	Measure Parameter Name	Max Amplitude
199	322.25				Liv. L. SX 3-25	-9.73
199	322.00				Liv. L. DX 3-25	-8.91
197	33.00				Liv. L. SX 3-25	8.71

LEGEND
Completed *
Recurring !

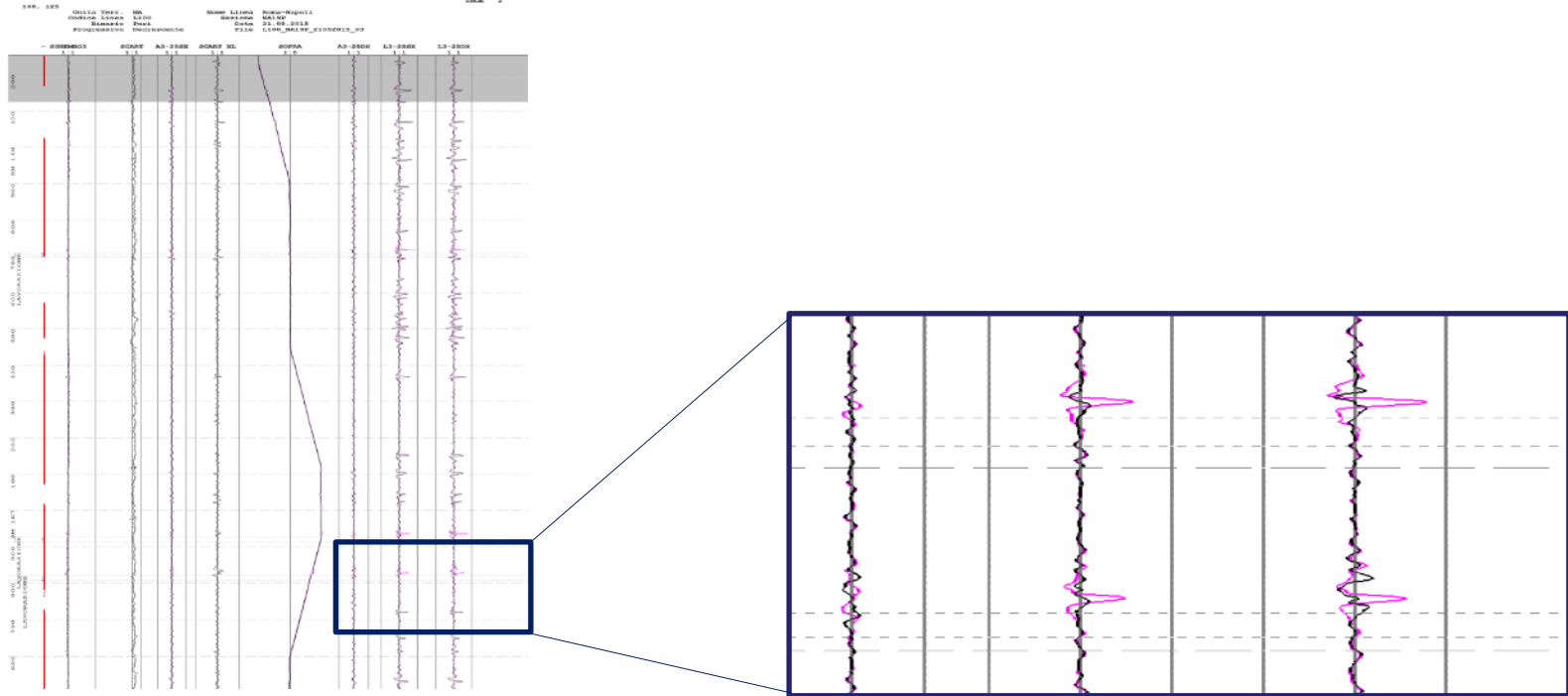
searching for satellites...
Default Location
Lat: 41.922360
Lon: 12.529031

Open File...
Open Database...
Closest Exception
Comment...
Filter...
☐ Precise Positioning
Add...
Delete...

Distance To Exception:
Start (km) Max (km) End (km) Exception Length (m)
176.0 176.0 176.0 1.00

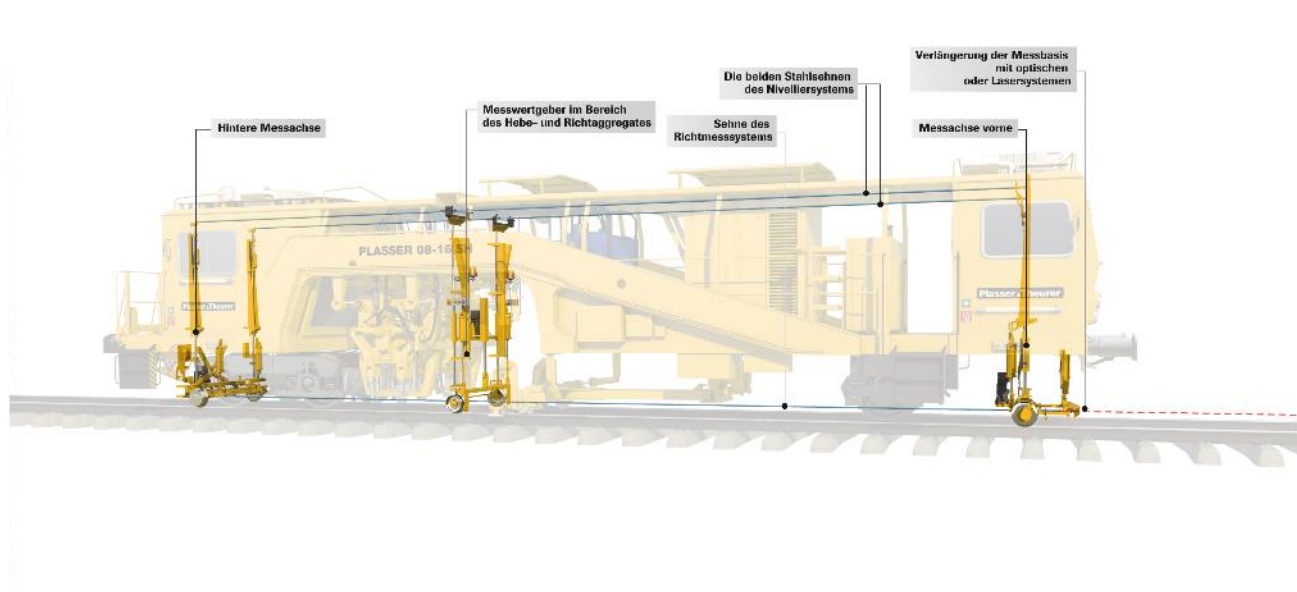
Exception Source : D:\Data_Plasser\Angebot\Projekt_2014_CombiManutenzioneImmediat... Exception Count : 3

Spot intervention, Documentation before / after



Working principle tamping machines

Three measuring axles create the reference of the lifting and lining system
ALC – Automatic guiding computer



Design of track geometry

- Pre-Measurement with the Inertial Measuring system
- Definition of the design superelevation and curvature
- Calculation of lifting and shifting values
- Transfer to the ALC



Absolute track geometry measurement

- Measurement of the Fixpoints using an optical system
- Space curve measurement between Fixpoints using the Inertial track geometry system
- Combination of both data
- Calculation of shifting and lifting values

System under development

Conclusion

The Inertial track measuring system installed on tamping machines improves the speed and quality of the work.

Trend: More measuring technology on maintenance machines.