

# Amberg Rail

## The comprehensive solution for railway surveying



**Why choose Amberg Rail surveying solutions?**



Partnership



Ease of use



Scalability



All-in-one



Swiss quality



# AMBERG RAIL

For all tasks in railway surveying – no matter how demanding and complex they may be



## Amberg Rail – innovative, fast, safe

Railway operators require proper track geometry and knowledge concerning the position of objects around the track in order to safely and economically operate their networks. Railway track construction, maintenance and clearance control therefore represent substantial expense items in infrastructure management. Powerful means of production and flexible procedures help to reduce the expense. Amberg Rail offers innovative railway surveying solutions, which accelerate the surveying process and deliver the high-quality data required for the different fields of application.

## Railway surveying with exceptional efficiency

The Amberg Rail solution is a mobile surveying solution, that is 'portable' in the strictest sense of the word. This allows the measurements to be made in real-time during the construction process, in the run-up to the actual maintenance work or at a regular interval, e.g. for clearance analysis. Thus slab track construction tasks, maintenance of way using the tamping machine or the assessment of new rolling stock regarding clearance can be performed effortlessly without waiting times. Up to 5 km of track per hour can be surveyed thanks to the use of dynamic surveying methods.

## Why Amberg Rail?

- Complete integration into the construction and maintenance process – from planning to data acquisition, direct data presentation and result output
- Combines robust, high-precision measuring sensors with measurement procedures ideal for job sites
- System configuration according to specific project and customer needs
- Optimal interaction between application-based software and corresponding hardware configurations
- System approvals from many different countries including EN 13848-4
- Cost efficiency thanks to modular design
- Best cost-benefit ratio on the market

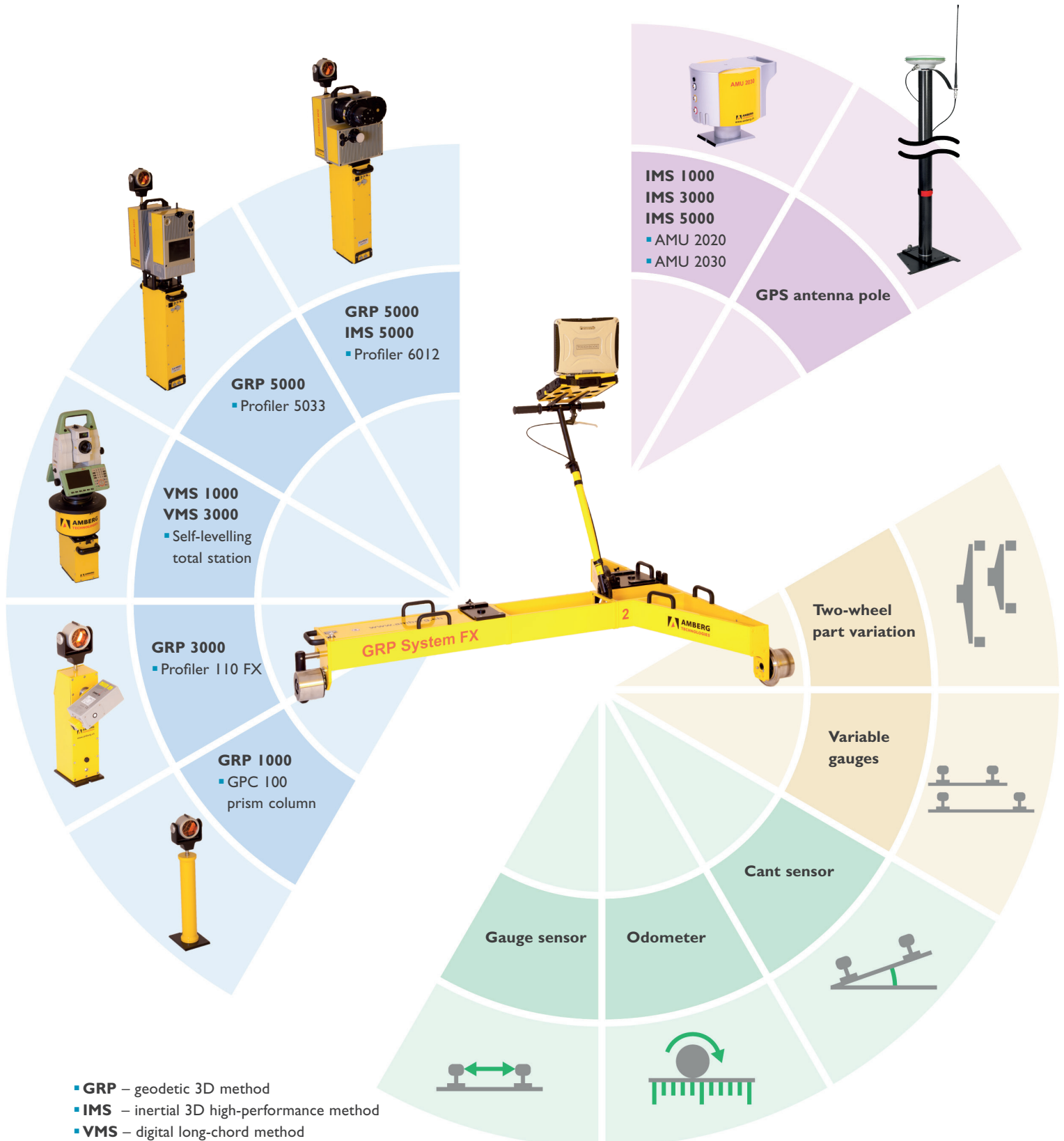
## Optimised to meet your needs

- Central data management for project and measurement data
- Basic track alignment data taken from a track layout plan or digital track database
- Database for static and dynamic clearance envelopes
- Track deviation values either in real-time or as correction-data, e.g. for the tamping machine
- Powerful data editors for detailed analysis and more extensive correction-data preparation
- High-resolution clearance analysis based on point cloud data
- Flexible data reporting and exporting engine according to customers' needs

# GRP SYSTEM FX

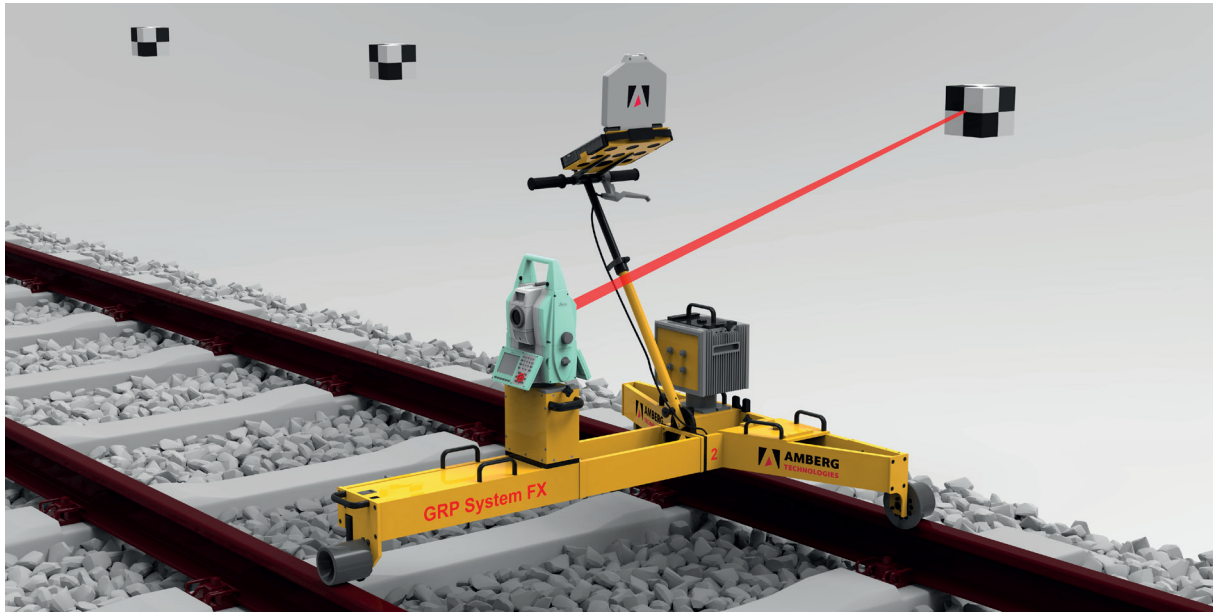
## Universal system solution configurable for user-specific applications

Amberg GRP System FX is the proven, universal system solution for acquiring precise track geometry and track environment data. Thanks to the modular design, the surveying system can be optimally adapted to suit individual requirements. The system is easy to transport, allowing surveying to be easily integrated in railway construction processes. Available system configurations:



# AMBERG SURVEY

Map your line!

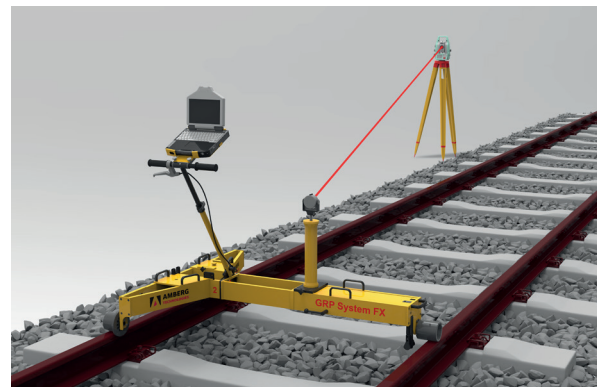


Highly efficient system for as-built survey of existing railway lines for documentation and future planning purposes

- Comprehensive, line-dedicated project data management as a basis for structured inventory surveys, data processing and data transfer
- Convenient project cockpit for preparation of efficient and easy practical fieldwork
- Powerful and integrated acquisition of as-built track coordinates and other track parameters such as gauge, superelevation, twist and versines
- Economic data evaluation thanks to automatic analysis and merging of several measurement sections
- Amberg Survey is an integral part of the application modules Slab Track, Tamping and Clearance

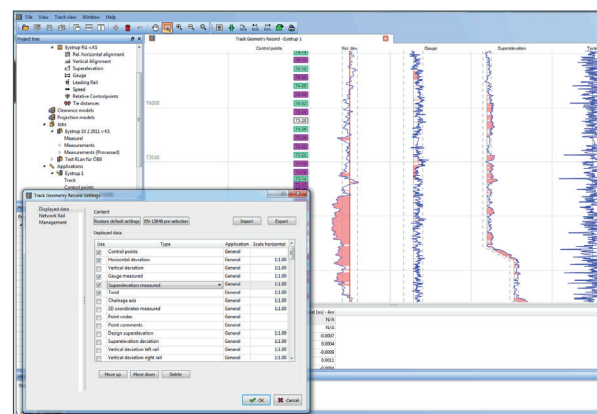
## Measurement system

- Choose between a geodetic 3D (TPS/GPS) and long-chord measurement approach
- Select the right system configuration depending on your accuracy and measurement performance requirements
- Measure single objects beside the track for additional documentation
- Assign codes and comments to track measurement points of special interest
- System configurations: GRP 1000, IMS 1000, IMS 3000



## Software

- Automatic merging of different track measurement sections by user-defined rules
- Comprehensive options for analysis of the as-built track based on numerical and graphical data representation – specialised Track Geometry Record
- Powerful reporting and exporting engine supports many different formats and interfaces





# AMBERG TAMPING

The perfect track!

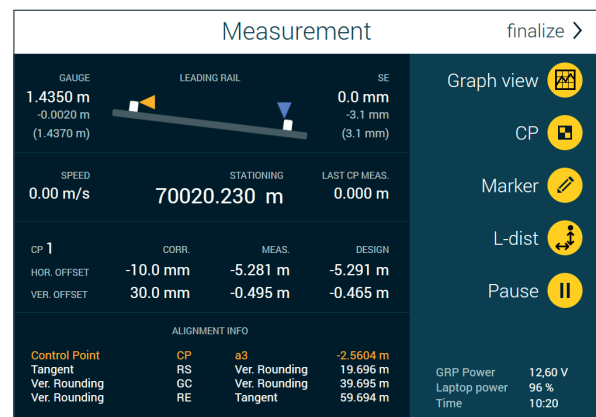


High-performance system solution for track alignment data or control-point-based tamping survey

- Identify track position errors as a basis for construction and maintenance of ballast track
- Comprehensive design data definition possibilities (absolute/relative alignment) including various interfaces for import and export
- Interactive correction-data preparation for all current tamping machines (e.g. Plasser&Theurer, Matisa, Harsco)
- Comprehensive reporting of track alignment and control point data
- Integrated control point surveying as a stand-alone option

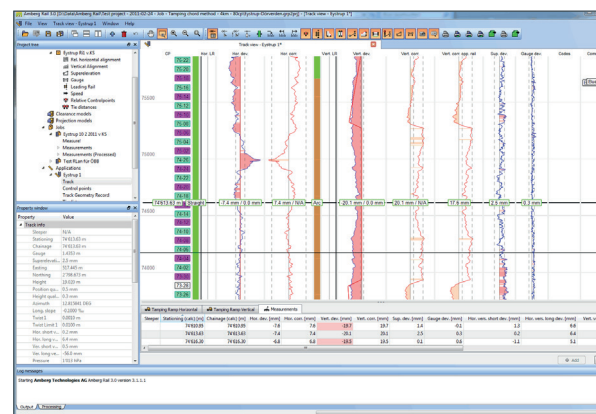
## Measurement system

- Geodetic 3D survey mode for high precision and reliability in track surveying
- Unique long-chord measurement mode with the highest measurement performance optimised for typical railway surveying conditions
- Emphasise track locations of special interest for the tamping run using the marker function
- Check certain track measurement parameters in real-time during the data acquisition
- System configurations: GRP 1000, GRP 3000, VMS 1000, VMS 3000, IMS 1000, IMS 3000



## Software

- Hierarchic and efficient management of design and survey data for handling changing track conditions during the project
- User-defined merging of several measurement sections including a manageable way to handle overlapping areas
- Powerful tamping data editor for intuitive and semi-automated correction-data preparation
- Track Geometry Record as an additional tool for more detailed analysis of the track condition



# AMBERG SLAB TRACK

394.3 km/h? No problem!

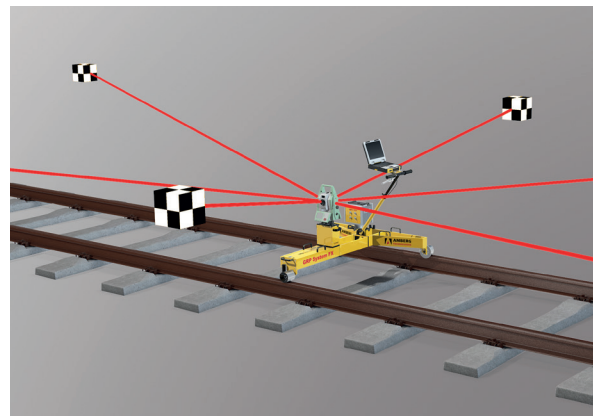


Integrated surveying solution optimised for the typical requirements during construction, monitoring and maintenance of slab track lines

- High-precision systems optimally support the different slab track construction stages
- Real-time display of correction values for direct adjustment of track position and height
- Interactive, sleeper-based correction-data preparation
- Acceptance mode for proper documentation of final track position
- Comprehensive numerical and graphical reporting as a hand-out for contractors

## Measurement system

- High-precision geodetic 3D mode for construction, fine adjustment and acceptance
- High-speed long-chord mode optimised for regular maintenance of existing slab track lines
- Long-chord mode supports Single CP mode for highest performance and Multi CP mode for highest reliability
- System configurations: GRP 1000, IMS 1000, IMS 3000



## Software

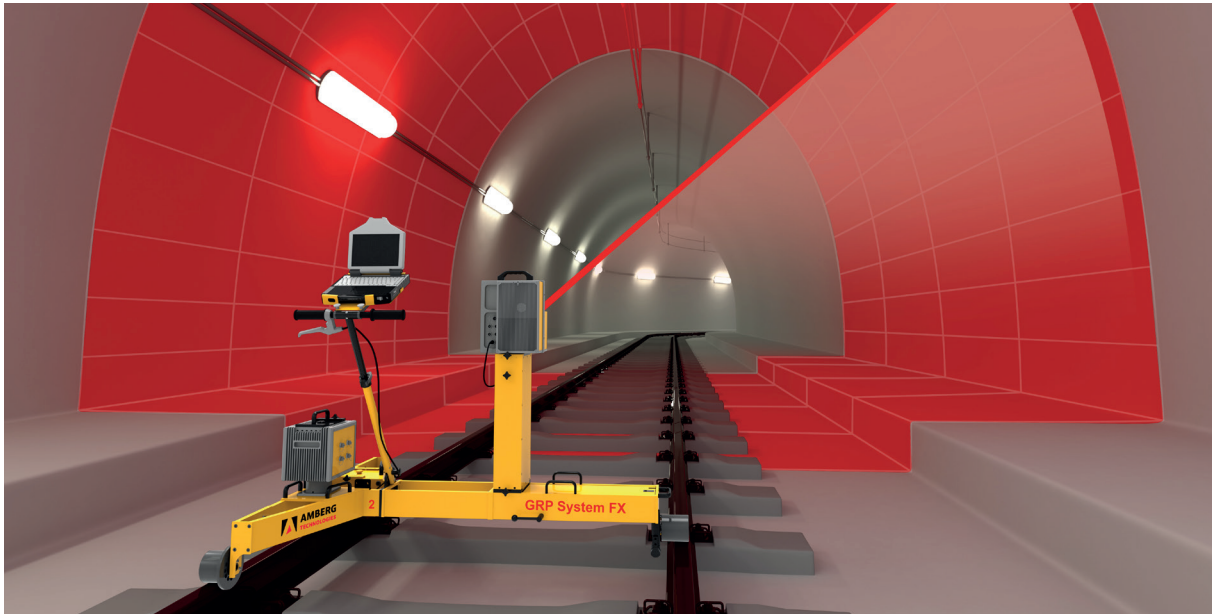
- Simple management of project data including ability to handle evolving design data states
- Sophisticated editor for interactive correction-data preparation for each sleeper
- Export of a track correction list according to construction requirements
- Creation of required hand-outs for proper documentation of the final as-built slab track

Slabtrack report																
Customer		Line name		Tunnel XY		Section name		Track name		Track 1		Design data name		Left track		
Customer 1		Line number		200		Section number		3000		Track number		3000				
		Start place		78+100		End place		78+100		Track start place		78+100				
		End place		0.000 m		Start place		0.000 m		Track end place		0.000 m				
		End stationing		0.000 m		End stationing		0.000 m		End stationing		0.000 m				
Sleeper no	Stationing [m]	Change [m]	Deviation		Superelevation		Gauge		Horizontal Versine		Vertical Versine		Horizontal Versine		Vertical Versine	
			Pos [mm]	Height [mm]	Left [mm]	Right [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]	Dev [mm]
100	2102.146	78105.000	0.9	-0.1	-0.472	0.5	1400.0	1400.3	0.3	0.0	-2.9	-2.9	-3.3	-3.3	-3.3	-3.3
101	2102.384	78105.250	0.9	0.0	-0.507	0.5	1400.0	1400.3	0.3	0.0	-3.2	-3.2	-3.3	-3.3	-3.3	-3.3
102	2102.622	78105.500	0.9	0.0	-0.542	0.5	1400.0	1400.3	0.3	0.0	-3.5	-3.5	-3.3	-3.3	-3.3	-3.3
103	2102.860	78105.750	0.9	0.0	-0.577	0.5	1400.0	1400.3	0.3	0.0	-3.8	-3.8	-3.3	-3.3	-3.3	-3.3
104	2103.098	78106.000	0.9	0.0	-0.612	0.5	1400.0	1400.3	0.3	0.0	-4.1	-4.1	-3.3	-3.3	-3.3	-3.3
105	2103.336	78106.250	0.9	0.0	-0.647	0.5	1400.0	1400.3	0.3	0.0	-4.4	-4.4	-3.3	-3.3	-3.3	-3.3
106	2103.574	78106.500	0.9	0.0	-0.682	0.5	1400.0	1400.3	0.3	0.0	-4.7	-4.7	-3.3	-3.3	-3.3	-3.3
107	2103.812	78106.750	0.9	0.0	-0.717	0.5	1400.0	1400.3	0.3	0.0	-5.0	-5.0	-3.3	-3.3	-3.3	-3.3
108	2104.050	78107.000	0.9	0.0	-0.752	0.5	1400.0	1400.3	0.3	0.0	-5.3	-5.3	-3.3	-3.3	-3.3	-3.3
109	2104.288	78107.250	0.9	0.0	-0.787	0.5	1400.0	1400.3	0.3	0.0	-5.6	-5.6	-3.3	-3.3	-3.3	-3.3
110	2104.526	78107.500	0.9	0.0	-0.822	0.5	1400.0	1400.3	0.3	0.0	-5.9	-5.9	-3.3	-3.3	-3.3	-3.3
111	2104.764	78107.750	0.9	0.0	-0.857	0.5	1400.0	1400.3	0.3	0.0	-6.2	-6.2	-3.3	-3.3	-3.3	-3.3
112	2105.002	78108.000	0.9	0.0	-0.892	0.5	1400.0	1400.3	0.3	0.0	-6.5	-6.5	-3.3	-3.3	-3.3	-3.3
113	2105.240	78108.250	0.9	0.0	-0.927	0.5	1400.0	1400.3	0.3	0.0	-6.8	-6.8	-3.3	-3.3	-3.3	-3.3
114	2105.478	78108.500	0.9	0.0	-0.962	0.5	1400.0	1400.3	0.3	0.0	-7.1	-7.1	-3.3	-3.3	-3.3	-3.3
115	2105.716	78108.750	0.9	0.0	-0.997	0.5	1400.0	1400.3	0.3	0.0	-7.4	-7.4	-3.3	-3.3	-3.3	-3.3
116	2105.954	78109.000	0.9	0.0	-1.032	0.5	1400.0	1400.3	0.3	0.0	-7.7	-7.7	-3.3	-3.3	-3.3	-3.3
117	2106.192	78109.250	0.9	0.0	-1.067	0.5	1400.0	1400.3	0.3	0.0	-8.0	-8.0	-3.3	-3.3	-3.3	-3.3
118	2106.430	78109.500	0.9	0.0	-1.102	0.5	1400.0	1400.3	0.3	0.0	-8.3	-8.3	-3.3	-3.3	-3.3	-3.3
119	2106.668	78109.750	0.9	0.0	-1.137	0.5	1400.0	1400.3	0.3	0.0	-8.6	-8.6	-3.3	-3.3	-3.3	-3.3
120	2106.906	78110.000	0.9	0.0	-1.172	0.5	1400.0	1400.3	0.3	0.0	-8.9	-8.9	-3.3	-3.3	-3.3	-3.3
121	2107.144	78110.250	0.9	0.0	-1.207	0.5	1400.0	1400.3	0.3	0.0	-9.2	-9.2	-3.3	-3.3	-3.3	-3.3
122	2107.382	78110.500	0.9	0.0	-1.242	0.5	1400.0	1400.3	0.3	0.0	-9.5	-9.5	-3.3	-3.3	-3.3	-3.3
123	2107.620	78110.750	0.9	0.0	-1.277	0.5	1400.0	1400.3	0.3	0.0	-9.8	-9.8	-3.3	-3.3	-3.3	-3.3
124	2107.858	78111.000	0.9	0.0	-1.312	0.5	1400.0	1400.3	0.3	0.0	-10.1	-10.1	-3.3	-3.3	-3.3	-3.3
125	2108.096	78111.250	0.9	0.0	-1.347	0.5	1400.0	1400.3	0.3	0.0	-10.4	-10.4	-3.3	-3.3	-3.3	-3.3
126	2108.334	78111.500	0.9	0.0	-1.382	0.5	1400.0	1400.3	0.3	0.0	-10.7	-10.7	-3.3	-3.3	-3.3	-3.3
127	2108.572	78111.750	0.9	0.0	-1.417	0.5	1400.0	1400.3	0.3	0.0	-11.0	-11.0	-3.3	-3.3	-3.3	-3.3
128	2108.810	78112.000	0.9	0.0	-1.452	0.5	1400.0	1400.3	0.3	0.0	-11.3	-11.3	-3.3	-3.3	-3.3	-3.3
129	2109.048	78112.250	0.9	0.0	-1.487	0.5	1400.0	1400.3	0.3	0.0	-11.6	-11.6	-3.3	-3.3	-3.3	-3.3
130	2109.286	78112.500	0.9	0.0	-1.522	0.5	1400.0	1400.3	0.3	0.0	-11.9	-11.9	-3.3	-3.3	-3.3	-3.3
131	2109.524	78112.750	0.9	0.0	-1.557	0.5	1400.0	1400.3	0.3	0.0	-12.2	-12.2	-3.3	-3.3	-3.3	-3.3
132	2109.762	78113.000	0.9	0.0	-1.592	0.5	1400.0	1400.3	0.3	0.0	-12.5	-12.5	-3.3	-3.3	-3.3	-3.3
133	2110.000	78113.250	0.9	0.0	-1.627	0.5	1400.0	1400.3	0.3	0.0	-12.8	-12.8	-3.3	-3.3	-3.3	-3.3
134	2110.238	78113.500	0.9	0.0	-1.662	0.5	1400.0	1400.3	0.3	0.0	-13.1	-13.1	-3.3	-3.3	-3.3	-3.3
135	2110.476	78113.750	0.9	0.0	-1.697	0.5	1400.0	1400.3	0.3	0.0	-13.4	-13.4	-3.3	-3.3	-3.3	-3.3
136	2110.714	78114.000	0.9	0.0	-1.732	0.5	1400.0	1400.3	0.3	0.0	-13.7	-13.7	-3.3	-3.3	-3.3	-3.3
137	2110.952	78114.250	0.9	0.0	-1.767	0.5	1400.0	1400.3	0.3	0.0	-14.0	-14.0	-3.3	-3.3	-3.3	-3.3
138	2111.190	78114.500	0.9	0.0	-1.802	0.5	1400.0	1400.3	0.3	0.0	-14.3	-14.3	-3.3	-3.3	-3.3	-3.3
139	2111.428	78114.750	0.9	0.0	-1.837	0.5	1400.0	1400.3	0.3	0.0	-14.6	-14.6	-3.3	-3.3	-3.3	-3.3
140	2111.666	78115.000	0.9	0.0	-1.872	0.5	1400.0	1400.3	0.3	0.0	-14.9	-14.9	-3.3	-3.3	-3.3	-3.3
141	2111.904	78115.250	0.9	0.0	-1.907	0.5	1400.0	1400.3	0.3	0.0	-15.2	-15.2	-3.3	-3.3	-3.3	-3.3
142	2112.142	78115.500	0.9	0.0	-1.942	0.5	1400.0	1400.3	0.3	0.0	-15.5	-15.5	-3.3	-3.3	-3.3	-3.3
143	2112.380	78115.750	0.9	0.0	-1.977	0.5	1400.0	1400.3	0.3	0.0	-15.8	-15.8	-3.3	-3.3	-3.3	-3.3
144	2112.618	78116.000	0.9	0.0	-2.012	0.5	1400.0	1400.3	0.3	0.0	-16.1	-16.1	-3.3	-3.3	-3.3	-3.3
145	2112.856	78116.250	0.9	0.0	-2.047	0.5	1400.0	1400.3	0.3	0.0	-16.4	-16.4	-3.3	-3.3	-3.3	-3.3
146	2113.094	78116.500	0.9	0.0	-2.082	0.5	1400.0	1400.3	0.3	0.0	-16.7	-16.7	-3.3	-3.3	-3.3	-3.3
147	2113.332	78116.750	0.9	0.0	-2.117	0.5	1400.0	1400.3	0.3	0.0	-17.0	-17.0	-3.3	-3.3	-3.3	-3.3
148	2113.570	78117.000	0.9	0.0	-2.152	0.5	1400.0	1400.3	0.3	0.0	-17.3	-17.3	-3.3	-3.3	-3.3	-3.3
149	2113.808	78117.250	0.9	0.0	-2.187	0.5	1400.0	1400.3	0.3	0.0	-17.6	-17.6	-3.3	-3.3	-3.3	-3.3
150	2114.046	78117.500	0.9	0.0	-2.222	0.5	1400.0	1400.3	0.3	0.0	-17.9	-17.9	-3.3	-3.3	-3.3	-3.3
151	2114.284	78117.750	0.9	0.0	-2.257	0.5	1400.0	1400.3	0.3	0.0	-18.2	-18.2	-3.3	-3.3	-3.3	-3.3
152	2114.522	78118.000	0.9	0.0	-2.292	0.5	1400.0	1400.3	0.3	0.0	-18.5	-18.5	-3.3	-3.3	-3.3	-3.3
153	2114.760	78118.250	0.9	0.0	-2.327	0.5	1400.0	1400.3	0.3	0.0	-18.8	-18.8	-3.3	-3.3	-3.3	-3.3
154	2115.000	78118.500	0.9	0.0	-2.362	0.5	1400.0	1400.3	0.3	0.0	-19.1	-19.1	-3.3	-3.3	-3.3	-3.3
155	2115.238	78118.750	0.9	0.0	-2.397	0.5	1400.0	1400.3	0.3	0.0	-19.4	-19.4	-3.3	-3.3	-3.3	-3.3
156	2115.476	78119.000	0.9	0.0	-2.432	0.5	1400.0	1400.3	0.3	0.0	-19.7	-19.7	-3.3	-3.3	-3.3	-3.3
157	2115.714	78119.250	0.9	0.0	-2.467	0.5	1400.0	1400.3	0.3	0.0	-20.0	-20.0	-3.3	-3.3	-3.3	-3.3
158	2115.952	78119.500	0.9	0.0	-2.502	0.5	1400.0	1400.3	0.3	0.0	-20.3	-20.3	-3.3	-3.3	-3.3	-3.3
159	2116.190	78119.750	0.9	0.0	-2.537	0.5	1400.0	1400.3	0.3	0.0	-20.6	-20.6	-3.3	-3.3	-3.3	-3.3
160	2116.428	78120.000	0.9	0.0	-2.572	0.5	1400.0	1400.3	0.3	0.0	-20.9	-20.9	-3.3	-3.3	-3.3	-3.3
161	2116.666	78120.250	0.9	0.0	-2.607	0.5	1400.0	1400.3	0.3	0.0	-21.2	-21.2	-3.3	-3.3	-3.3	-3.3
162	2116.904	78120.500	0.9	0.0	-2.642	0.5	1400.0	1400.3	0.3	0.0	-21.5	-21.5	-3.3	-3.3	-3.3	-3.3
163	2117.142	78120.750	0.9	0.0	-2.677	0.5	1400.0	1400.3	0.3	0.0	-21.8	-21.8	-3.3	-3.3	-3.3	-3.3
164	2117.380	78121.000	0.9	0.0	-2.712	0.5	1400.0	1400.3	0.3	0.0	-22.1	-22.1	-3.3	-3.3	-3.3	-3.3
165	2117.618	78121.250	0.9	0.0	-2.747	0.5	1400.0	1400.3	0.3	0.0	-22.4	-22.4	-3.3	-3.3	-3.3	-3.3
166	2117.856	78121.500	0.9	0.0	-2.782	0.5	1400.0	1400.3	0.3	0.0	-22.7	-22.7	-3.3	-3.3	-3.3	-3.3
167	2118.094	78121.750	0.9	0.0	-2.817	0.5	1400.0	1400.3	0.3	0.0	-23.0	-23.0	-3.3	-3.3	-3.3	-3.3
168	2118.332	78122.000	0.9	0.0	-2.852	0.5	1400.0	1400.3	0.3	0.0	-23.3	-23.3	-3.3	-3.3	-3.3	-3.3
169	2118.570	78122.250	0.9	0.0	-2.887	0.5	1400.0	1400.3	0.3	0.0	-23.6	-23.6	-3.3	-3.3	-3.3	-3.3
170	2118.808	78122.500	0.9	0.0	-2.922	0.5	1400.0	1400.3	0.3	0.0	-23.9	-23.9	-3.3	-3.3	-3.3	-3.3
171	2119.046	78122.750	0.9	0.0	-2.957	0.5	1400.0	1400.3	0.3	0.0	-24.2	-24.2	-3.3	-3.3	-3.3	-3.3
172	2119.284	78123.000	0.9	0.0	-2.992	0.5	1400.0	1400.3	0.3	0.0	-24.5	-24.5	-3.3	-3.3</		



# AMBERG CLEARANCE

Speedy and conclusive clearance assessments with real-time results

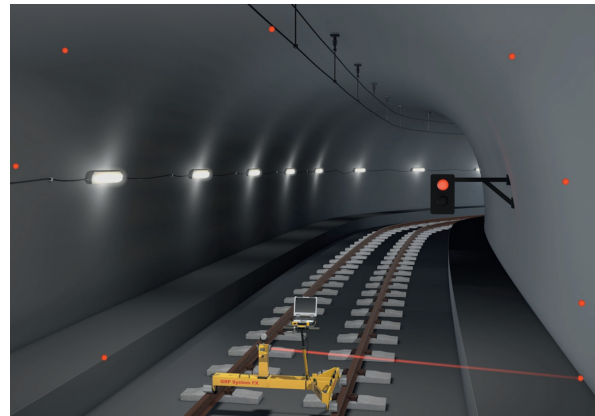


Modular system solution for manual and automatic clearance survey including sophisticated engine for static and dynamic clearance analysis

- One software package with scalable functionality (Basic and Plus)
- Powerful management of project data including static and dynamic clearance models
- Comprehensive and high-resolution data acquisition to detect every potentially critical object
- Clearance analysis results in real-time
- Powerful evaluation, analysis, reporting and exporting tools optimised for the typical requirements

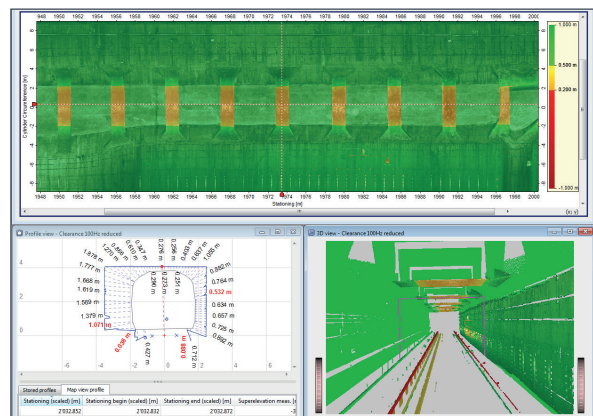
## Measurement system

- Scalable measurement system from quick and easy single object point measurement to high-resolution scanning
- Data acquisition in relative or absolute mode
- Display of relevant clearance information in real-time on measurement screen
- System configurations: GRP 3000, GRP 5000, IMS 5000



## Software

- Management of user-definable static clearance models or integrated dynamic clearance models
- Post-processing of high-resolution clearance results for complete point clouds
- Clearance map for detailed documentation of clearance encroachments over a complete section of track
- Various report and export formats containing profile or point cloud data



# SWISS EXPERTISE – APPLIED WORLDWIDE

Whether it's a high-speed slab track railway line in China, a ballast track line in Central Europe or a metro tunnel in London: Construction and maintenance projects of this kind are the ideal platforms for the high quality, precision and efficient railway surveying systems from Amberg Technologies.



## AMBERG RAIL – RAILWAY SURVEYING FOR PROFESSIONALS

### Partnership

- First-class pre- and after-sales support all over the world
- Hardware service offered based on the clients' needs
- Customer-specific solutions for special requirements

### Ease of use

- Excellent hardware design and intuitive software for optimised workflows in the different surveying applications and tasks
- Lean integration of the surveying process in between the given construction processes
- Fast workflows ensure minimal track blockage times and safe operation

### Scalability

- Simple and modular software and hardware concept
- Support of different surveying methods according to project requirements
- The right system for every class of accuracy required

### All-in-one

- One system solution for all relevant railway surveying tasks
- Different software modules depending on the type of work to be done
- Several hardware configurations for optimal data acquisition depending on project requirements
- Start-to-end data flow from project data import to data acquisition, analysis, presentation, reporting and export
- Presentation of final results optimised for each application

### Swiss quality

- Traditional Swiss quality and reliability
- Company certification according to ISO 9001
- Conformity with all CE norms relevant for railway surveying
- Highest measurement precision and reliability thanks to quality assurance programmes
- Robust system design ensures a long service life

Amberg Technologies has developed specialised system solutions for the infrastructure industry for more than 35 years. The resulting unique combination of systems development experience and industry know-how delivers measurement systems characterised by precision instruments, practical system design and powerful software. Amberg Technologies' solutions have gained the trust and recognition of tunnelling and railway industry experts thanks to a worldwide service and support network.

## Why choose Amberg Rail surveying solutions?



Partnership



Ease of use



Scalability



All-in-one



Swiss quality

**More than 1,000 trolleys sold worldwide – best cost-benefit ratio on the planet**

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