Specifications

Establishing the reference

The higher-level coordinate frame is a network of track marking points accompanying the track, which must be known with sufficient accuracy. The 3D coordinates of a prism on the GML are determined by the free stationing of a total station to at least eight connection points, if known, taking into account the solder deviations and geoid undulations.

The required target values are derived by transforming the 3D coordinates of the GML into the local coordinate system of the multi-sensor platform with the aid of inclination and laser triangulation sensors. The permanent communication between the total station and the GML is realized via a radio link.

Performance data

The operator can fine-tune the track step by step on the basis of the displayed placement values. The storage values are updated with up to 3 Hz. The continuous operation of the system is easily possible by exchanging the power sources while the system is running.

Measurement uncertainties

Typical accuracies (1 sigma) derived from comparative measurements with laser tracker system:

- 3D-position < 0.2 mm
- gauge < 0.3 mm
- cross slope < 0.2 mm/1.5m

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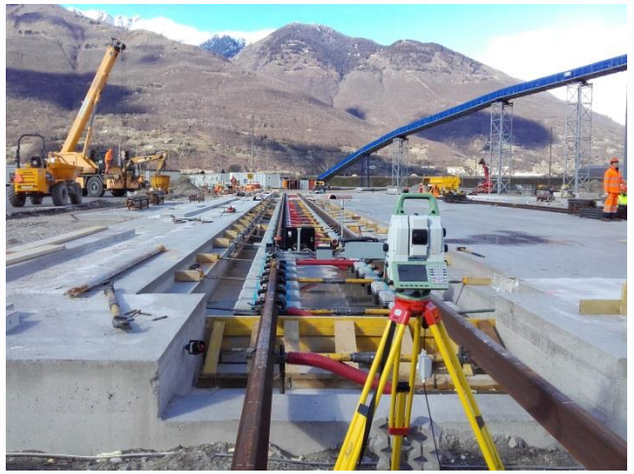
GleisMessLehre



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Task

High-precision track marking when assembling the slab track

- for new tracks and for checking existing tracks
- Coarse and fine track straightening

Target quantities of survey

- absolute 3D position of track axis
- gauge
- cross slope

Track straightening process

Normally, the operator finds the track to be straightened roughly aligned on supporting structures. After free positioning of the total station at the track bed, the GML can be moved freely along the track, whereby the total station follows a prism of the GML with automatic target detection.

The straightening process is carried out station by station at intervals between the individual supporting structures. Based on the displayed placement values, the track is adjusted at the respective stations and the remaining deviations are documented. The storage values are continuously determined by comparing the actual values of the GML with the target values of alignment software.

The track adjustment process is iterative, as the adjustment of a station affects previous, already aligned stations. The overall performance of the GML thus depends in particular on the preparatory work for track construction, the experience of the operator in adjusting the track and the distance between the supporting structures.

Conception and development

The measurement concept was developed at the Institute of Geodesy, the sensors selected and the software developed. The range of functions has been optimized in extensive tests. A required system calibration is carried out in the geodetic laboratory.

The operator controls the interactive measuring process via a touch screen display. The GML software communicates via an open interface with the parallel running alignment software, which provides the target geometry of the route to be set out. Ordinarily one person is required to operate the measuring system and two persons are required for transport.

Validation and calibration

The measuring system is currently being used successfully in projects of the cooperation partner RISTAG. A field calibration program, which allows independent tachymetric control of additional prisms, allows in-situ testing of operation.

During the project, a system calibration can be carried out on site with the aid of a special frame construction, which was previously referenced with the Leica AT901-LR laser tracker. Special adaptations allow the use of barcode levelling staffs to check the inclination sensor if the frame is tilted.