Optical 3D-Deformation Monitoring

HIGHLIGHTS

- Determination of absolute deformation with state-of-the-art equipment and ultimate precision
- Flexible measurement setup and no interference with the construction activities
- Quick availability of the results by way of problem-oriented diagrams and visualisations
- All system components from one source

Field of Application

Tunnel and Underground Construction

GEODATA has continued to develop the optical 3D displacement measurement into a flexible and specialised, geodetic method of measurement for tunnel construction. This provides absolute, spatial displacements of individual specially marked measuring points. The results serve to constantly monitor the deformation behaviour, to optimise the support and adapt the heading method in conventional construction methods.

Systematic 3D displacement measurements are an indispensable component today of any underground geotechnical measurement programme. Valuable synergies can be achieved in combination with the construction and heading surveys.

Surface Applications

The optical 3D displacement measurements are an indispensable observation method for the supervision of engineering constructions such as buildings, protections of banks and slopes, embankments and dams and also natural features such as unstable slopes etc. Applications range from measurements during the construction phase to long-term supervision. The possibility of observing critical objects on-line, using automatic measuring stations, has particular advantages.
GEODATA offers optical 3D displacement measurements as a service and provides the required high-quality components. In addition, our KRONOS software package can be used to collect and combine the displacements with many other monitoring and technical data, thereby creating a powerful information system.

Description of Services

Procedure

The three-dimensional coordinates of arbitrarily arranged displacement points are determined in an absolute reference system by optic-trigonometric surveying of targets in repeated measurement cycles. This is achieved by also including a number of reference points which are considered stable in the survey. The measuring instrument is positioned to provide the best possible lines of sight to the targets and reference points and can otherwise be freely positioned.

Evaluation

The acquired data are transferred directly to an evaluation computer and processed using our EUPALINOS software. The results – relative displacements from a reference measurement – are visualised using diagrams. A number of different display options assist the geo-technician with his interpretation. The procedure enables displacement to be measured in dependence on the measuring configuration, with an accuracy of < 1mm to a few mm.

User Advantages

- Determination of absolute displacements in a project coordinate system with the possibility of measuring a great number of points, thereby achieving high information densities.
- The geotechnical interpretation is made easier through the graphing of relative displacement ratios between individual measuring points, deflection lines related to the heading progress, including lines showing influences and trends, and many further options for visualisation.
- In tunnel construction, the observation of the development of longitudinal displacements facilitates the identification of spatial changes of stress and the early identification of changes in the rigidity of the rock formations.
The short measuring time and arbitrary positioning enable the measurements to be carried out with virtually no interference with the construction work.

Reference measurements can be carried out immediately after the bolts have been fitted, since the measurements put no mechanical stress on the bolts.

Scope of Services and Delivery

We provide all components required for high quality measurements:

- Accurate and high quality targets
- Specialised analysis and visualisation software
- Total stations with correspondingly high accuracy class
- Experienced staff
- Optional links to an information system and automatic online measurements

Our range of services includes the execution of complete measuring programmes using own staff. With major international projects in particular, hardware, software and key staff are often provided and the individual measurement teams are staffed with local personnel. Our experienced staff can be made available to train designated customer personnel for short periods.

The following other data sheets are associated with this data sheet.

**Hardware:** Targets and Marking Material

**Software:** EUPALINOS Surveying Software

**Systems:** KRONOSTunnel Information System

**Systems:** GeoRobot - Automatic 3D-Deformation Monitoring System