

## AUTOMATIC MONITORING

Optical 3D displacement monitoring is a geodetic measuring method, which determines the absolute, spatial position of strategically placed targets, which are firmly connected to the structure to be monitored. By fast repeated measurements of the 3D observation points, time dependent diagrams can be created, which describe deformation or movement behavior of the structure or area to be monitored.

In case certain thresholds are exceeded, warning or alarming messages can be sent via cellphone or e-mail.

The Dibit Automatic Monitoring System, AMS, consists of hard- and software components which allow fully-automatic, precise measurement, quick and easy data interpretation and evaluation of displacement data of 3D observation points.



## APPLICATIONS

### Landsliding

- sliding rock mass
- slope instability
- landslide hazard and risk assessment
- direct evaluation of the relationship between landslides and their causes (filling a dam with water, building activities, etc.)



### Tunnelling

- rock deformation
- settlement
- deformation rates
- face movements



### Civil and Industrial Construction

- monitoring of buildings and structures in the area of potential settlements due to excavation or other building activities
- monitoring of bridge fender units, bridge piers and base plates
- monitoring of walls, ceilings, beams and tower constructions
- machinery monitoring
- monitoring of retaining structures



## ADVANTAGES

- fully-automatic measurement and data processing
- automatic data-transfer via wireless technologies, i.e. WiFi or UMTS
- precise results: achievable accuracy  $\pm 5 \text{ mm}$  @ 1.5 km, measurement range up to 2.5 km under optimal conditions
- simple data evaluation
- fast measuring sequence: minimal disturbance of the workflow on site
- low cost of operation due to fully-automatic operation

## DIBIT SOFTWARE

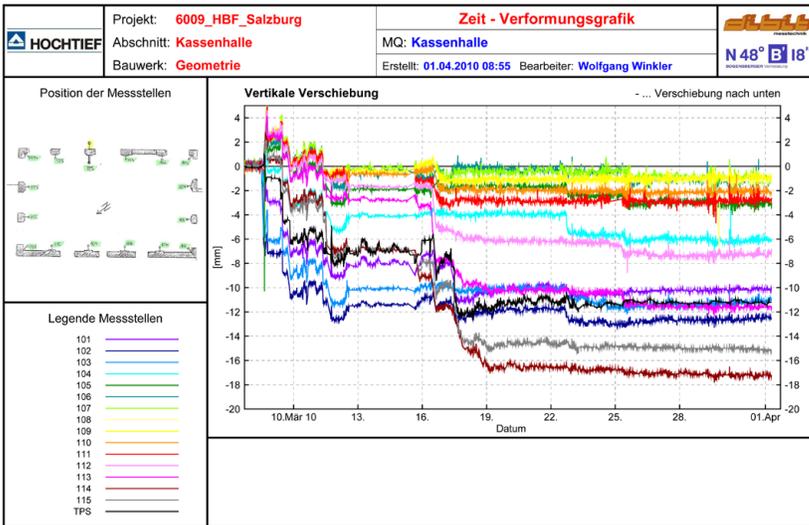
- user friendly handling
- independent on-board solution for TPS
- automatic data transfer from TPS to dibit office software module
- integrated data management and data base
- various depiction possibilities facilitate measuring results interpretation by the expert engineer



## INSTALLATION, RESULT PRESENTATION, WARNING

### Installation

The Total Station has to be situated at a position with a view to all reference and observation points. Their location should be discussed with all other professionals involved in the project, for a minimum of disturbance of the workflow on site. The location of observation points have to be determined by experts in the fields of civil engineering, rock mechanics and geology. If no electrical power supply is available, solar panels can be installed. A battery pack provides power blackout protection and serves as energy buffer for periods with low or no sunlight, i.e. bad weather conditions or night time.



### Time-Dependent Representation

The time-displacement-diagram for multiple 3D observation points displays deformation, displacement or movement over time. The graphs are shown in distinct colors for each point for easy data interpretation. This information can be correlated with external incidents like heavy rain showers, earthquakes or even construction activities. After collecting a significant amount of data, predictions for landslide or other events could be made by expert engineers.

### Marking Material

- adapter mounting for dowels, rock bolts or special solutions for landsliding
- glass prisms targets for highest accuracy

### Warning and Alarm Process

3D measurements intervals can be chosen individually. Thresholds for warning and alarm levels can be set. After each measurement sequence is completed, the epoch data is checked for exceeding these thresholds. Once exceeded, an individual warning or alarm message will be sent to a predefined address to adopt working plans or stop working progress for safety measures. Additional messages about system status will be sent in case of malfunctioning.



### System Components

- In the Field:
  - Total Station Leica TPS 1000, 1100 and 1200 series
  - Battery Pack
  - Power Supply
  - UMTS Modem
- Office:
  - PC or notebook with connection to the internet
- Everywhere:
  - Cell phone