

TUnIS Navigation Roadheader

TUnIS Navigation Roadheader from VMT, the leading provider of measurement and navigation systems in tunnelling worldwide, provides exact measurement accuracy, top performance and high efficiency in conventional tunnelling for Roadheader excavation (e.g. NATM). The system combines robust hardware and modern analysis software.

Challenges: Poor visibility and manual profile marking

When using a roadheader one of the main problems affecting the precise cutting of the face is visibility of the cutterhead. Frequently the amount of dust produced, or residual shotcrete in the air, is such that the operator is unable to see the position of the cutterhead. Marking of the face area to be excavated is time consuming for the survey crew and it takes place in an area where stability of the working area is potentially at its most vulnerable. In order to provide better information to the operator and reduce unnecessary excavation (over cut), VMT has developed TUnIS Navigation Roadheader to support precise excavation of the tunnel profile when using roadheaders.

Precision and speed

TUnIS Navigation Roadheader is a high-performance navigation system for roadheaders that supplies reliable data to the operator for precise control of the cutting arm. It was developed with the goal of maximising the advance performance by putting the operator in the position to conduct the excavation faster, but still exactly in accordance with the design profile, even under adverse conditions.



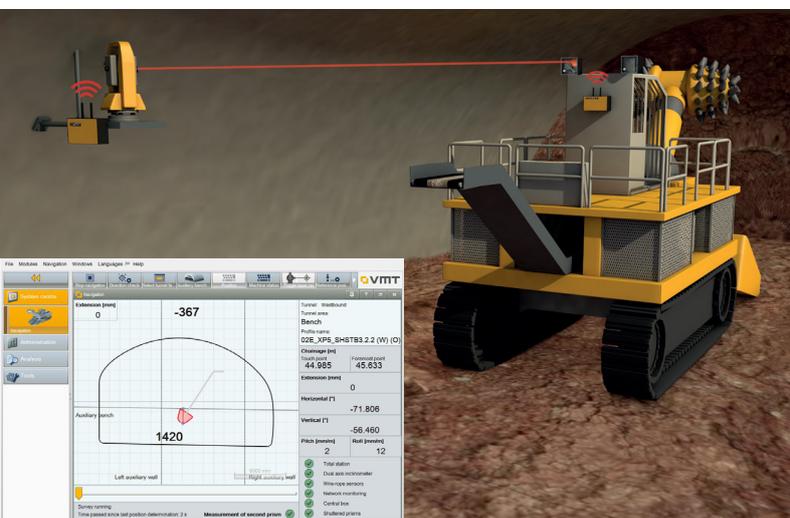
Benefits

- ▣ Precise cutting even with poor visibility
- ▣ Continuous comparison of the actual profile and the design profile for optimised machine operation
- ▣ Precise excavation of the design profile with reduced shotcrete consumption and minimised rework for fast advance
- ▣ Facilitates safer working conditions for personnel underground

The Total Station based navigation system determines the exact position of the machine as well as the cutterhead and provides all relevant information in visual and numeric form in the control cabin for the operator. In addition to the current information of the cutting process, the TUnIS software captures and calculates excavation data for analysis. The navigation system ensures excavation in accordance with project specifications to avoid time consuming rework.

Safety and Efficiency

Tunnel personnel are no longer required to enter the unsupported area at the tunnel face which greatly improves safety in the tunnel. The reduction of manual measurement at the tunnel face saves time and improves the advance process. TUnIS Navigation Roadheader enables the operator to cut a precise tunnel profile with minimal overcut. This translates directly to time and cost savings when considering shotcrete over the length of the tunnel.



TUnIS Navigation Roadheader

Navigation system for precise and efficient tunnelling using Roadheaders.

- Precision:** precise excavation of the design profile
- Speed:** continuous total station measurement reduces re-profiling
- Economy:** lower shotcrete use
- Safety:** no surveying personnel at the tunnel face

Multi-dimensional laser and sensor measurement

A total station mounted on the tunnel wall continuously measures the two shuttered prisms installed on the roadheader as well as the backsight prism installed about 50 – 100 metres behind the total station. The data transmission between total station and computer is carried out by radio signal. An external dual-axis inclinometer determines roll and pitch of the machine. Sensors (linear and rotary encoders) measure the position and movement of the cutting arm relative to the machine. All hardware components are specially manufactured for the harsh tunnel conditions and have proven themselves in countless tunnel jobsites.

Reliable and precise real-time data

The exact position and movement of the cutterhead relative to the design profile is displayed in real time on the system computer mounted in the machine cabin within the vision of

Feature: processing of excavation data

The positions of the cutterhead are captured and processed as a background 3D calculation function within the TUnIS Navigation Software. This allows a comparison of the excavated tunnel area with the design tunnel profile to be carried out directly on the machine after the end of the advance.

In addition, the data is transferred (if tunnel network link to the office is in place) to TUnIS Navigation Office, for further analysis. If multiple roadheaders are utilized in one tunnel, the data can be consolidated in TUnIS Navigation Office. Furthermore, reports can be generated and the point clouds exported.

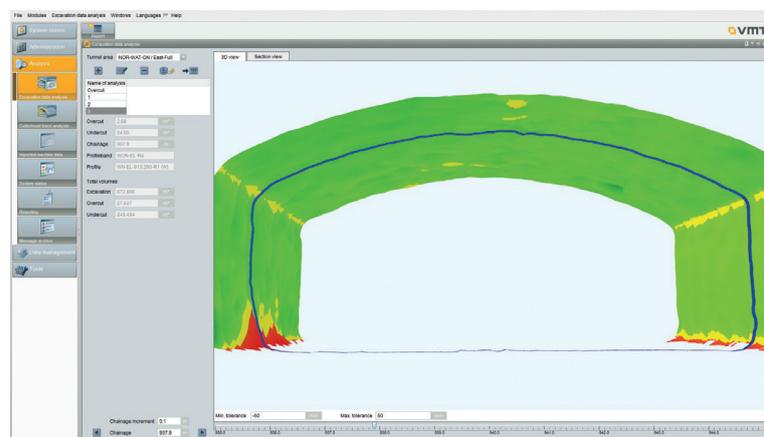


Features

- ▣ Continuous and automated determination of machine position respectively cutterhead using total station and sensors
- ▣ Tunnel proof and robust hardware (IP65-compliant)
- ▣ Data transmission between total station and the TUnIS computer by radio
- ▣ Independent navigation system – adaptable to all makes of roadheader
- ▣ Data analysis and data storage

the operator. The numerical and graphical software visualisation was programmed for optimum readability taking account of the operating conditions. Warning signals are issued when approaching and crossing the design profile. Using the Wi-Fi interface in connection with the tunnel communication network, advance data can be transferred to the site office, evaluated and archived.

The software design simplifies the storage of project-specific parameters in the system by specialist personnel. Adaptations necessary in the course of the project can likewise be easily made.



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