

TUnIS Navigation Double Shield

TUnIS Navigation Double Shield is a navigation system specially designed for Double Shield TBMs. Based on a total station and a target unit, mounted inside the TBM shield, the navigation system determines the actual TBM position.

In addition, the system has appropriate sensors and software modules that are tailored to the particular conditions of use. For this purpose, a laser target is mounted in the gripper shield of the TBM along with a measuring camera, which is aligned to a set of marker plates in the front shield.

The system provides complete documentation of the shield run in a database. Based on this information, data may be prepared, for example in the form of reports, data exports (CSV, XLSX) and others.

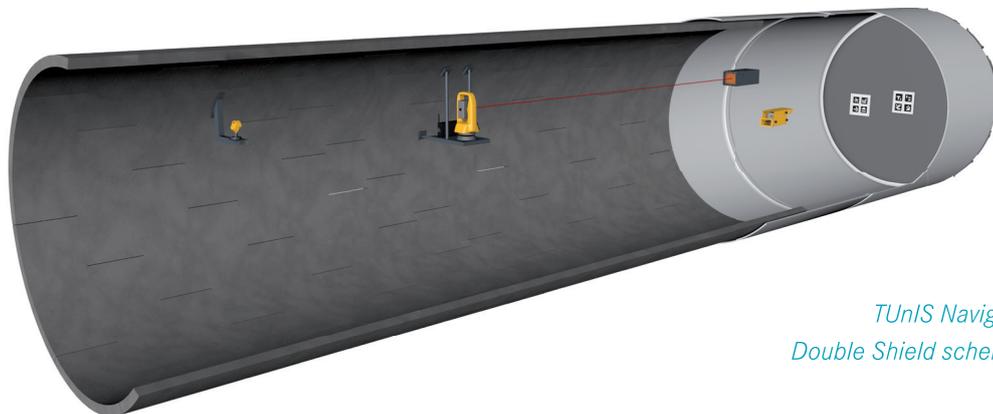
All hardware components are designed for the demanding use in the tunnel. A visible laser beam (class 3R) from the total station to the laser target is used to determine the position of the gripper shield. The measuring camera identifies the marker plates and determines the position of the front shield at a high frequency.

The visualisation can be used to analyse the machine's drift, which can be used to compensate the steering and in ring selection. A significant assistance offers a TUnIS software routine for automation and reporting the relocation of the total station.



Benefits

- ▣ The combination of hard rock-suitable laser target for the gripper shield and camera technology for the front shield guarantees a **continuous, exact position determination** of all machine parts - for a construction which follows the plan, and thus maximises the quality of the tunnel structure
- ▣ Thanks to the determination of the gripper shield, TUnIS Navigation Double Shield in combination with TUnIS Ring Sequencing can **provide ring sequencing** - thus supporting the TBM driver in the advance calculation of the ring sequence
- ▣ **New:** TUnIS Navigation Double Shield can now be **enhanced with the assistance system TUnIS.mono cam**. This means that the navigation system can also be used on double shield TBMs without length measurement systems in the thrust cylinders



*TUnIS Navigation
Double Shield schematic*

This procedure is of big advantage especially in machines with limited or small laser windows: even during short-time interruptions of the laser beam it is possible to calculate the position and indicate it to the machine driver continuously. Another mode of visualisation is the display as "Track Chart" which shows all calculated positions of the Gripper shield.

Advice and competence from VMT

You won't be alone in the configuration and operation of TUnIS Navigation Double Shield. We offer competent and continual support, with over 25 years' experience and more than 2,400 tunnelling projects successfully completed worldwide.

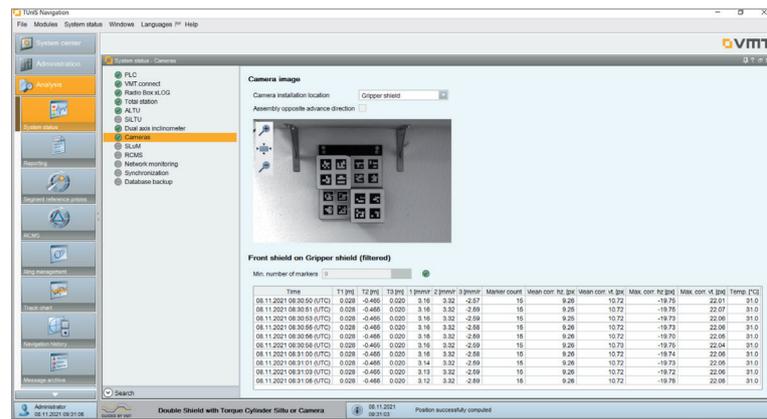
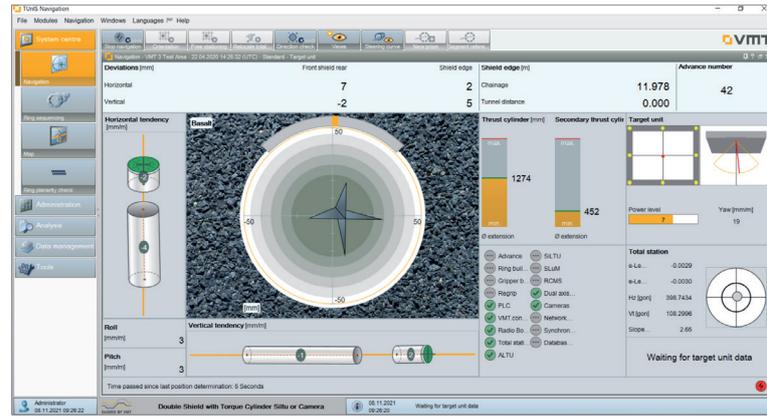
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The high information content of the data displayed ensures optimum control of the machine position and thus helps to maintain a uniform shield run with small deviations from the tunnel axis. The position and tendencies are continuously displayed to the shield operator.

Features

- ▣ Field of application:
Large tunneling with Double Shield TBM
- ▣ Precise automatic calculation of TBM position
- ▣ Continuous and permanent visualisation of positions
- ▣ Calculation for all machine parts including gripper shield and tailskin
- ▣ Control of roll differences from gripper- to front shield
- ▣ Software routine for relocating total station
- ▣ PLC connection for various types/producers

Advanced image-measuring software along with sophisticated algorithms
The assistance system TUnIS.mono cam works photogrammetrically: a special camera is installed in the gripper shield, individual markers are applied and surveyed in the front shield. Thus, the 3D position of the front shield in relation to the known position of the gripper shield can be calculated.



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