

TAUROS TBM GUIDANCE SYSTEM

FIELD OF APPLICATION:

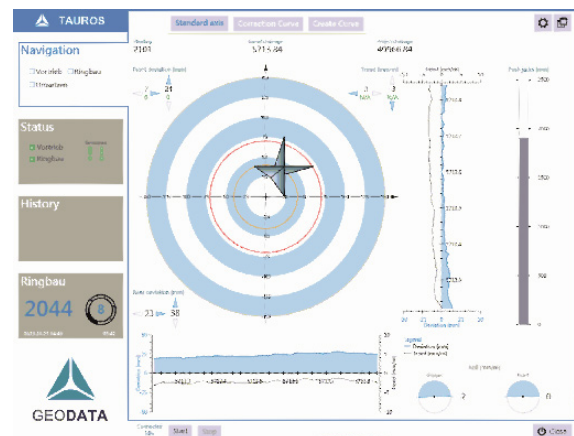
Successful tunneling with TBMs demands a Guidance System of the best quality and the highest achievable accuracy.

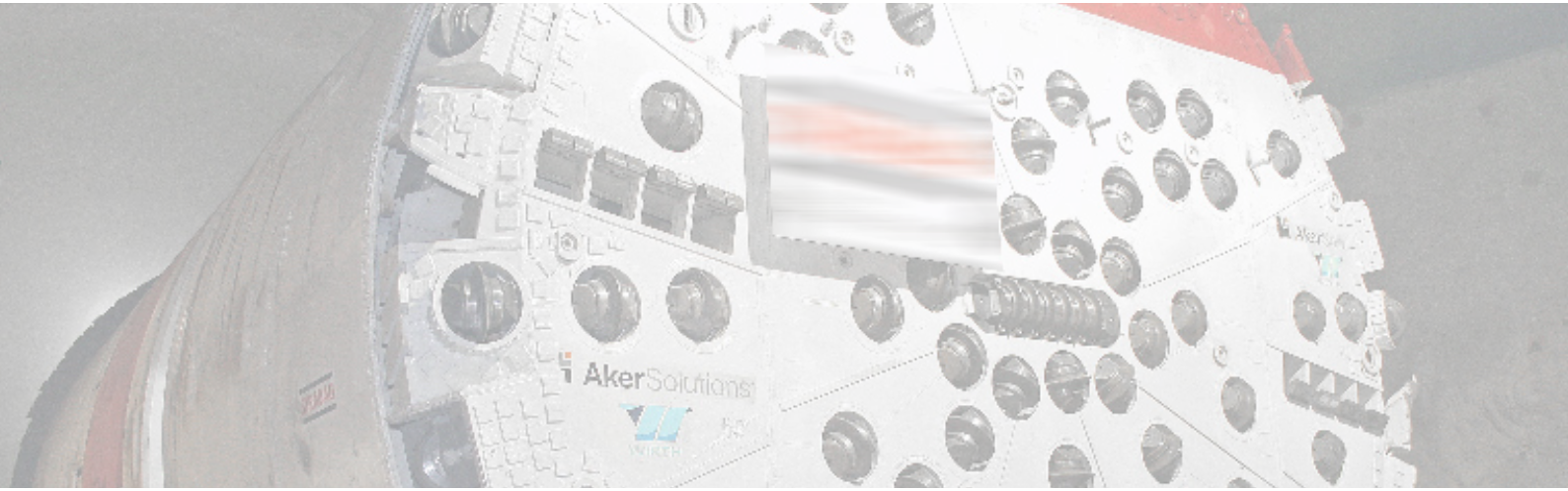
TAUROS TBM is a brand new development by Geodata which offers just that – and much more.

The modular system consists of tunnel proof hardware and offers intuitive solutions for guidance of gripper and double shield TBMs.

HIGHLIGHTS:

- Clear and Intuitive User Interface
- Fully Automatic TSC Measurement System
- Ring Sequencing Module
- Robust Camera Measurement Unit
- Single and Double Shield Mode
- Semi-automatic Correction Curve Calculation





SYSTEM COMPONENTS

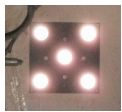
A continuous display of the current position and heading of the TBM is the main task of this system. Additional data and information necessary for operating and guiding the machine is displayed within an intuitive and straightforward user interface which demands only limited user interaction.

The guidance system consists of several sensors and measurement systems which are equipped

with the latest technology and which are influenced by more than 25 years of experience in tunneling.

These sensors and systems are linked, providing a position determination of the TBM with an accuracy of a few centimeters which results in a high-quality tunneling process.

FRONT SHIELD



Camera Target



Push Jacks

GRIPPER SHIELD



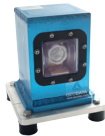
Camera



Two Axis Inclinometer



TSC Sensor



Motor Target

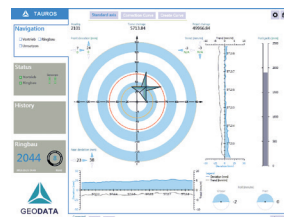


Interface Unit



Thrust Cylinders

OPERATOR'S CABIN



PC with Touch Screen,
Radio and Software
TAURUS TBM

TUNNEL BACKWARD



Total Station with Radio Box
and Power Supply



Reference Target

WORKING PRINCIPLE

The continuous acquisition of the current machine's position is based on measurements taken from a total station, which is connected to the software via Bluetooth radios. The total station is mounted on a bracket at the back of the tunnel and measures two motor targets which are mounted on the machine. At an arbitrary interval, an automatic orientation check is performed to a back-sight prism. The system adds data acquired by the two-axis inclinometer for pitch and roll to determine the machine's current 3-dimensional position.

The basic guidance system can be complemented by the robust camera measurement system for Double Shield TBMs to determine the 3-dimensional position of the front shield.

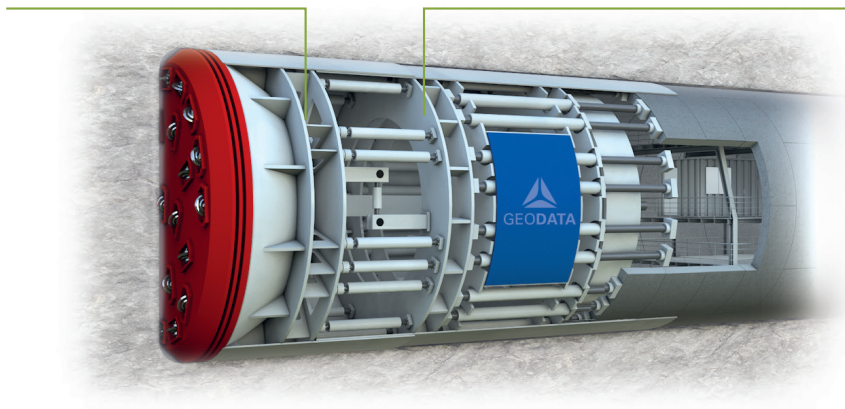
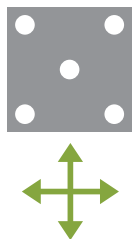
The fully automatic tail skin clearance (TSC) measurement system in combination with the ring sequencing module enable the automatic calculation of the best fitting ring and ensure an optimum ring sequence, therefore saving time and reducing the risk of damages to the shield.



CAMERA MEASUREMENT UNIT FOR DOUBLE SHIELD TBMS

HIGHLIGHTS:

- Robust and Sturdy Hardware
- Fast and Easy Setup
- LowCost Sensor Type
- Highly Accurate Positioning of the Front Shield



The camera measurement unit is used for Double Shield TBMs to complement the basic guidance system.

The system consists of a camera which is mounted on the gripper shield and a target which is mounted on the front shield. The camera acquires an image of the target and determines the vertical and horizontal offset between the two shields.

Additional information such as the length of the push jacks is added in order to determine the

3D position of the front shield.

The advantages are obvious.

There is no direct line of sight from the total station up to the front shield needed any longer. The system can be mounted basically anywhere on the shield. This setup is both space and cost-saving.

The easy setup and simple two-step calibration make this the ideal alternative to conventional guidance systems.

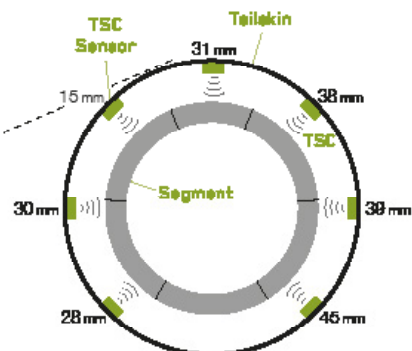
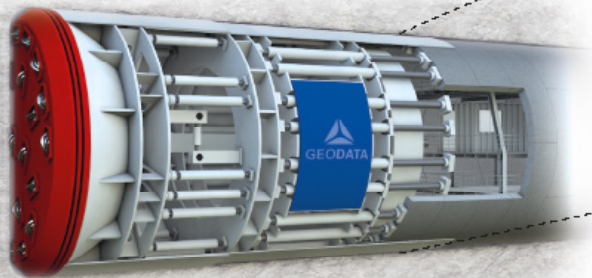


TSC MEASUREMENT SYSTEM & RING SEQUENCING

HIGHLIGHTS:

- Durable LowCost Sensors
- Data Acquisition and Ring Sequencing within Seconds
- Redundant Number of Sensors ensures Integrity
- TSC Measurement with Millimetre Accuracy
- 3dimensional Ring Sequencing

TSC Sensor



The newly developed Tail Skin Clearance (TSC) Measurement system consists of industrial ultrasonic sensors which are mounted within the tail skin. The sensors measure the tail skin clearance automatically and directly. The ring sequencing module then uses these measurements and adds the current position of the machine, the length of the thrust cylinders

and the position of the previous rings to calculate the optimum next ring. Important information such as the current lead of the ring and the TSC are displayed graphically and numerically. This whole process happens literally within seconds and therefore reduces the operator's workload drastically.



Leoben Head Office
GEODATA group

Hans-Kudlich-Straße 28
8700 Leoben
Austria

Phone: +43 (0)3842 26555-0

Fax: + 43 (0)3842 26555-5

Mail: office@geodata.at

www.geodata.com

