

Bolt Plan Navigation

Technical specification



Bolt Plan Navigation is a support software that enables planning, guidance and logging of the rock bolting operation in mining and tunnelling projects.

Introduction

To use a correct bolt pattern adapted for existing rock conditions, is essential to obtain a safe rock support system. Today, different methods of installing the correct bolt pattern are used, but the one thing they all have in common is that they rely on the operator's ability to manoeuvre the bolting equipment.

Atlas Copco's Bolt Plan Navigation system enables planning of the rock support in underground mining and tunnelling operations. With the Total Station Navigation function, which is included, the rig can rapidly be navigated into precisely the right position - every time, and with limited need of surveyors.

With Bolt Plan Navigation it is easy to see where bolts are to be installed without guide marks painted on walls and roofs. You will receive reports about bolt types, amount of cement used and other data that can be saved for future analysis. The logging function shows how many bolts have been installed and their exact position.

Benefits

» Quality

- Operator will get guidance on how to install the bolts with correct burden, without having to do painting on the wall and roof
- All bolts will be logged with exact position, amount and type of bolts, cement/resin volume and more for future analyzes if needed
- General navigation accuracy is better than 1cm

» Safety

- Bolts can be installed correct according to planned bolt pattern
- Bolts can be installed the same way regardless of who is operating

» Production

- Faster positioning
- Reduced secondary rock reinforcement

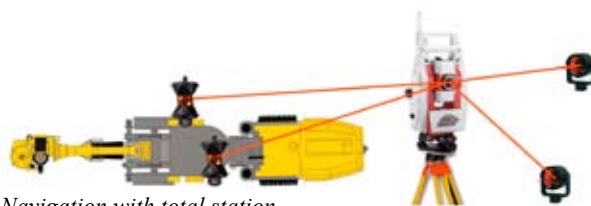
Navigation

Navigation is one of the most time-consuming and error prone activities in the tunnelling cycle. By automating this process, the set-up of the drill rig can be done by the drill rig operator alone. The tunnelling cycle does not have to wait for the surveyor to come out and deploy the drill rig.

With the Total Station Navigation the effectiveness of the tunnelling cycle will improve, as will the quality of the navigation.

» Navigation with total station

- Fix points and tunnel line prepared in the office software, TM - Tunnel Manager
- Prisms on drill rig
- Automatically controlled from drill rig
- Tunnel and fixpoints will be displayed
- After navigation rig will be displayed as navigated



Navigation with total station.

Operating

» View 1 (as seen from above)

- All black dots are bolts that have been installed, the thin line shows the direction and end point
- The red circle shows the position of the bolting unit and where the next bolt will be installed in this position. (a thin red line will appear to show the direction and end point if the bolting unit is positioned with tilt/rotation angle)

» View 2 (as seen from the rig)

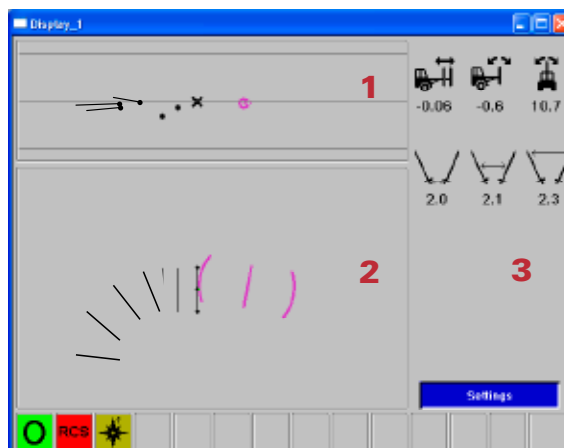
- In this view the black bolts have been installed
- The red line is where the bolting unit is positioned at the moment and how the bolt will be installed in this position
- The red “distance indicators” show the distance between bolts, entered in settings, and is relative to the previous bolt marked with black dots in the beginning and end.

» View 3

- “Row” distance, rotation/tilt angle
- Distance between bolts in figures at start, middle, end.

Logging

- Coordinates: x,y,z start/end, for all installed bolts
- Inflation OK, W/C ratio (cement)
- Bolt length
- Bolt type



» Following will be logged and saved

- Coordinates: x, y, z, start/x, y, z end, for all installed bolts (according to coordinate system)
- Date/time
- Penetration rate (drilling)
- Time drilling
- Time bolt installation
- Cartridges type 1 (resin)
- Cartridges type 2 (resin)
- Inflation OK (Swellex OK/not OK)
- W/C ratio (cement)
- Mass (cement)
- Bolt length
- Bolt type

Components

- Navigation system consisting of a Total Station (Power Tracker) on a tripod and corresponding RCS software
- Two prisms and attachments mounted on the drill rig
- Two prisms to be mounted on known fixpoints in the tunnel
- Bolt Plan Navigation RCS software
- TM - Tunnel Manager

Requirements

- Rig with Rig Control System
- Fixpoints and tunnel line defined with correct coordinates