

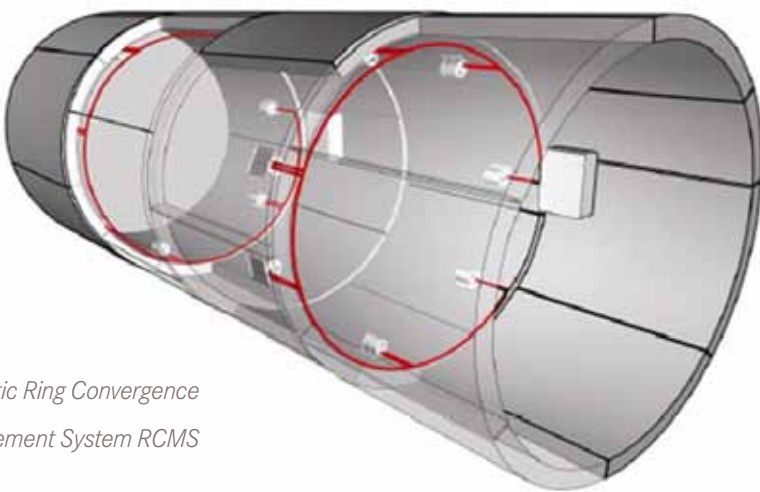
MONITOR Process

During a tunnel construction project with segmental lining, a number of different forces, either natural or linked to the advance, affect the tunnel and the rings installed. The ring convergence measurement system was developed to realize in time possible risks caused by deformations or convergences.

Ring Convergence Measurement System RCMS

With the Ring Convergence Measurement System (RCMS), one inclinometer per segment is installed in the ring to be monitored. The inclinometers de-

termine the change in inclination of the segments, which are assumed to have a rigid structure. Deformation of the ring can thus be recognized by relative changes in the angle of the segments to each other. For this, the longitudinal gaps are considered as the axes of the chain defined through the segments.



*Schematic Ring Convergence
Measurement System RCMS*

Ring Convergence Measurement System RCMS

Using the angle data from the inclinometers, the change in position of the segments and thus the deformation of the ring on its measured cross section can consequently be determined.

Advantages

- Permanent monitoring of ring convergence, quick intervention possible
- Minimization of damages in ring building by early recognition of deformations
- Installation at once after finishing ring building
- Minimal work effort because of automatic data acquisition

The angle values of the inclinometers are continuously transferred to the data logger and saved there. The values are sent from there via wireless LAN to the logging computer (alternatively by LAN). The changes in angle for the inclinometers can be converted to radial movements with suitable software. In this way, a complete analysis of the movement over a long period of time is ensured.

Features

- Field of applications:
Shield advances with segmental lining
- Fast and easy installation of components
- Significant precision in idle state:
about ± 1 mm
- Acquisition and analyzing in short intervals from 5 sec. upwards
- Flexible selection of reference distances to be monitored
- Permanent display of measured values
- Storage and reporting of all data
- Optional: Visualization in site-office

By installing a segment reference prism (SRP) it is also possible to record absolute movements (rising or sinking) of a ring. The movements of the prism can be recorded in the VMT Navigation System.

RCMS Visualization

