AMBERG STRUCTURAL DEFORMATION

AS-BUILT ANALYSIS OF TBM SEGMENTAL RINGS

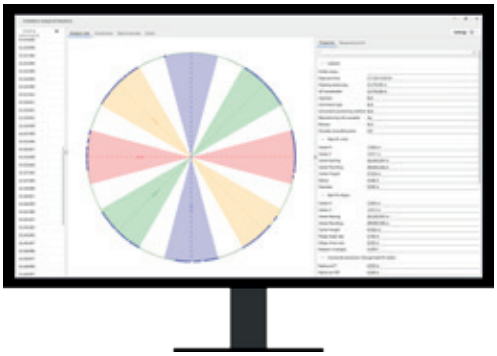
Amberg Structural Deformation is a powerful software solution for analysing and reporting deformations in segmental tunnel linings. It streamlines the extraction of detailed deformation data from as-built profiles and supports both laser scanning and total station work-flows. The software performs ovalisation assessments based on International Tunnelling Association (ITA) guidelines.

Applications

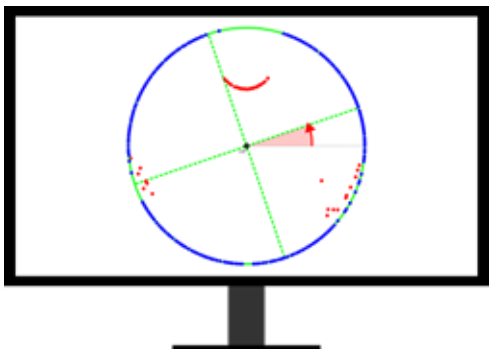
- **Ovalisation Assessment:** Perform precise ovality calculations per ITA guidelines
- **Clearance Analysis:** Evaluate clearances from the theoretical centreline
- **Ring Deformation Monitoring:** Track changes in ring deformation over time to assess structural integrity
- **Mechanical and Electrical Fit-Out:** Facilitate installation of systems with accurate as-built data

Key Features and Benefits

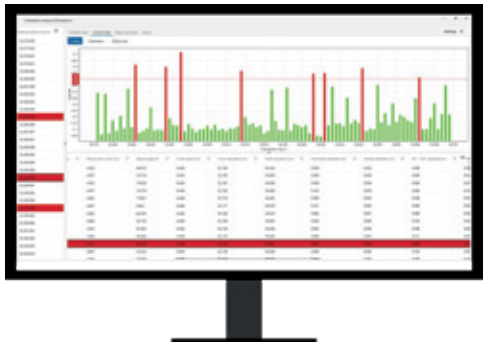
- **Instant Ovality Calculation:** Instantly calculates ovality using ITA-compliant methods
- **Best-Fit Shape:** Provides highly precise best-fit ellipses and circles for deformation analysis
- **As-Built Centreline Measurement:** Measures and reports as-built centreline for alignment and verification
- **Automatic Data Cleaning:** Filters irrelevant points, improving analysis accuracy
- **Amberg Tunnel Portfolio Integration:** Integrates with the Amberg Tunnel suite for all tunnel construction and maintenance stages



Profile view of geometric calculations



Automatic removal of non-tunnel wall points



Overall view of geometric deformations

Amberg Technologies AG
Trockenloostrasse 21
8105 Regensdorf

Phone +41 44 870 92 22
info@amberg.ch
ambergtechnologies.com

AMBERG TECHNOLOGIES

TECHNICAL SPECIFICATIONS

Theoretical design import / creation	
Tubes	Supported
Shafts	Supported
Construction stages	Supported
Theoretical profile shape	Circular profile (fixed radius) is required for the Structural Deformation analysis
Design import formats	LandXML, DXF, manual input (Note: IFC is not supported for the Structural Deformation analysis)
Transverse slope (superelevation)	Supported
Block definition	Supported (used for assigning ring numbers to as-built profiles)

As-built profile import	
From total station	ASCII
From point cloud	Supports extraction of as-built profiles from georeferenced point clouds (LAS, E57, PTS, ASCII)
From Amberg Navigator tablet	Supported
From Amberg Applications	Supported
From Tunnelscan analysis	Profiles can be extracted directly from the point cloud analysis into the Structural Deformation analysis

Automatic cleaning / outlier removal	
Filter outliers	Non-wall points automatically detected and removed based on user-defined deviations from the best-fit shape
Visualise outliers	Turn on / off in the profile view

Calculations	
Inner diameters through as-built centre	Horizontal, vertical, both diagonals (45° spacing)
Inner diameters through design centre	Horizontal, vertical
Best-fit shape	Ellipse or circle
Ellipse parameters	Major and minor axes lengths, best-fit centre deviations from the design centreline, ellipse orientation
Best-fit circle parameters	Best-fit circle radius, best-fit deviations from the design centreline
Ovality calculation	User-defined: based on the International Tunnelling Association (ITA) guidelines, optionally choose the standard ovality formula
Crown and invert elevations	Calculated based on best-fit arcs

Visualisation	
2D profile view	Highly customizable display (inner diameters, labels, best-fit shapes, outliers)
2D profile data tables	Profile point coordinates, diameter values, profile attribute info, best-fit shape parameters
Profile navigator	Sort profiles, filter profiles, add additional profile navigator columns
Overall view	Charts of overall deformations, main table view

Deliverables
Layered DXF (2D profiles)
Profile graphical report (PDF)
Excel export (all calculated values and attribute information)
Measured profile points - with and without outliers (non-tunnel wall points)

AMBERG TECHNOLOGIES