Overview – features

	MAP 2.X 2000	MAP 3.0 2007	MAP 4.0 2013	MAP 5.0	MAP 5.0 PV 2022	3D-Modul
1 Image rectification according to scale						
1.1 Image rectification by geometry						
1.2 Image rectification using coordinates and automatic detail rectification						
1.3 Image rectification of image sequences of thermographic images						
1.4 Image rectification of mappings from image processing software						
1.5 Image rectification based on laser scanning data						
2 Image montage, layout, plan design						
2.1 Image montage and multi-layer export (TIF)						
2.2 Calibration/distortion correction, colour adjustment						
2.3 Legend, title block, page layout						
2.4 Grid crosses, auxiliary lines						
2.5 Title block with project attributes and marker areas						
2.6 Scale bar, detail photos						
3 2D mapping						
3.1 Vector-based mapping and dimensioning tools						
3.2 Bezier Curve, combined object/vector symbols, CAD commands						
3.3 Intersection functions for outlines of polygon areas						
3.4 Enhancements for mobile mapping with tablet PC						
3.5 Drawing options and CAD class with extended CAD functionality						
4 Mapping template						
4.1 Mapping groups						
4.2 Quantity determination and analysis in legends						
4.3 Extended group management (e.g. loan traffic, excavations)						
4.4 Mosaic project for partial mappings						
4.5 Multilingual mapping project						
5 3D mapping						
5.1 3D area and line polygons, area intersection						
5.2 2D orthogonal projections for print output						
5.3 Extended range of commands as in 2D mapping						
5.4 Interface for virtual reality						
6 Analysis						
6.1 Size ranges and volume calculation using attributes						
6.2 Analysis by attributes and reference areas						
6.3 User management / mapping history						
6.4 Individual control of attribute display in the tool window						
6.5 Crack analysis in the image plan						
7 Object hierarchy						
7.1 Project organisation in an object hierarchy with navigation map						
7.2 Extension of the title block with variable entries for the hierarchy						
7.3 Class analysis in the object hierarchy						
8 Quantity determination						
8.1 Quantities export for same class types in a CSV file						
8.2 Quantities export in MS Excel and OpenOffice						
8.3 Evaluation of manual measurement for areas and volumes						
8.4 GAEB interface for importing/exporting items of the tendering specification						
8.5 Class-related cost calculation by labour, material, equipment						
9 Interfaces and data exchange						
9.1 Import class structure from MAP projects						
9.2 True-to-scale image and print output						
9.3 CAD import / export of mapping / mapping base						
9.4 3D surface models (STL, VRML, SHP, OBJ)						
9.5 Export of read-only mapping project with viewer						
9.6 PDF interface						
10 3D-module: Evaluation of laser scan data						
10.1 Point cloud pre-processing (merging and segmenting)						
10.2 3D evaluation with 2D projections for section drawings						
10.3 Structured point cloud incl. IFC interface						
10.4 Orthogonal projection of point cloud and sections						
10.5 Deformation analysis						

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Laser scanning refers to the line-by-line scanning of object surfaces with a laser beam in order to measure them three-dimensionally. The result is a three-dimensional point cloud with a greyscale colouring according to reflection intensity. Using additional image captures, the points can also be coloured with the real object colour. With a suitable orientation software, the individual point clouds are auto oriented in a uniform coordinate system.

In the separate 3D module for laser scan data evaluation, these oriented point clouds of the individual scanner positions can be imported, cleaned and merged into a total point cloud with defined point spacing. This can then be used to create sections for a CAD evaluation of horizontal and vertical sections as well as for the orthogonal projection of the point cloud for vertical sections and façade elevations.

In addition, functions for deformation analysis based on point clouds and crack analysis based on rectified image plans are available.

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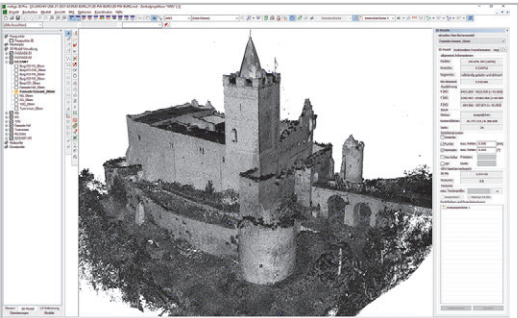Fon: +49 (0) 341 2 17 84 60
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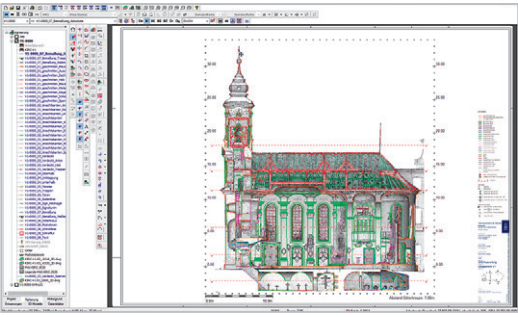

EVALUATION OF LASER SCAN DATA

3D Module

Data Pre-Processing

- Import of oriented single scans
- Merge with filtering to predefined point distances
- Structuring of the point cloud according to building parts

*Bad Kösen, Rudelsburg Castle.
View of the merged point cloud, true-to-shape building survey with 3D laser scan.
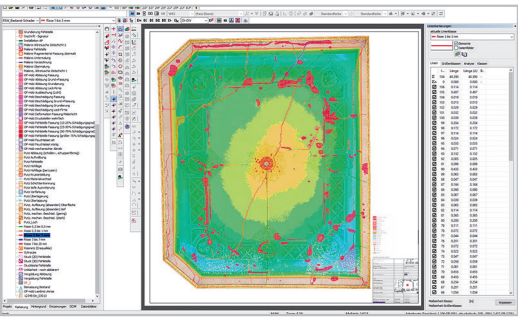fokus GmbH Leipzig (2021)*

CAD Evaluation

- Model view with orthogonal projection
- Generation of sections in the true position
- CAD evaluation based on 3D laser scan data

*Mainau, Castle Church.
Model view with CAD evaluation, true-to-shape building survey with 3D laser scan.
fokus GmbH Leipzig (2021)*

Deformation Analysis

- Image rectification based on 3D laser scan data
- Deformation analysis based on horizontal plane
- Crack analysis in the rectified image

*Weimar, Residence Palace, Room 12.3.48.
Condition mapping with deformation and crack analysis. Mapping:
Dipl.-Rest. Uwe Rähmer, Großröhrsdorf (2022)
Digital image plans: fokus GmbH Leipzig (2022)*

MEASUREMENTS IN DIGITAL IMAGES.

metigo® MAP

- True-to-scale image rectification
- 2D mapping on image plan and CAD drawing
- 3D mapping on surface model
- Material-related mapping templates
- Quantity determination and analysis of mapping data
- Organisation of mapping projects in an object hierarchy
- Export to image file, PDF file, CAD drawing, spreadsheets and database
- VR interface for virtual presentation of objects

*Isenhagen Monastery, Marienretabel.
Digital 3D mapping of the Madonna
Rest. R. Jachim M. A., HAWK Hildesheim
3D-object documentation
fokus GmbH Leipzig (2021)
Funded by the cloister chamber Hannover*

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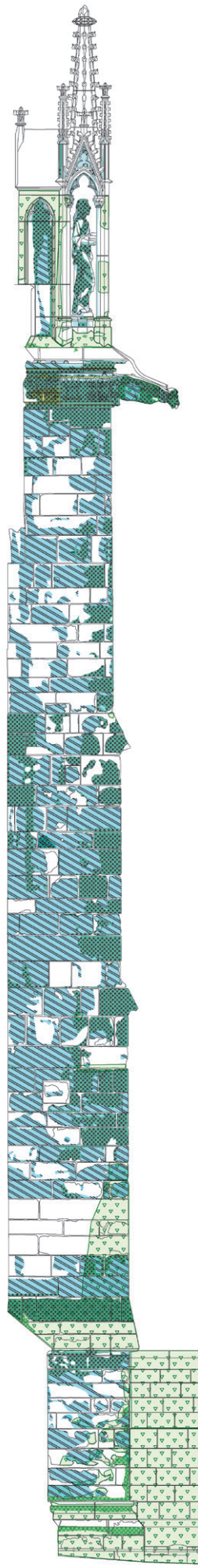
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fokus GmbH Leipzig – Service Provider and Software Developer

Since 1993, fokus GmbH Leipzig has been providing services in the fields of building surveying, photogrammetry, image processing and develops application concepts and the corresponding software solutions.

In the documentation service high-quality graphic, photographic documentation for restoration, conservation and monument preservation are created:

- true-to-shape CAD evaluation of floor plans, sections and facade elevations based on 3D laser scanning
- digital image plans, developments and ortho-projections
- true-to-scale textured surface models using SfM
- photogrammetric analysis of historical photographs
- large-scale image plans in high photographic quality of wall paintings, room settings, floors and furnishings

In close cooperation with restorers, conservators and architects, we develop the mapping software **metigo®MAP** for 2D image rectification, mapping, quantity determination and analysis for our customers. The software has been available for sale since 2000. Currently, more than 1,400 licences (as of 03/2023) are in use.

metigo®MAP offers the user the possibility to create a true-to-scale mapping with quantity determination based on rectified image plans, CAD evaluations or orthogonal projections of textured surface models. The appropriate combination of image processing and CAD functionality allows you an user-friendly operation in the office as well as with a tablet PC on site. Since version 4.0 (2014) we support 3D mapping on textured surface models. The user interface is available in different languages: English, Spanish, French, Chinese, Polish and Czech (as of 03 / 2023). From version 5.0 onwards, mapping projects can be created multilingually for international conservation projects.

You are welcome to visit us at the denkmal trade fair in Leipzig at our joint stand Documentation (every 2 years) or at one of the many specialist conferences at which we are involved as an exhibitor. On every 1st Friday of the month we organise a software training with **metigo®MAP** in our office in Leipzig. We are also happy to come to your office for training or to support you in your project work online.

You can find more information on our website at **www.fokus-GmbH-Leipzig.de**

*Cologne Cathedral,
East side of buttress F14.2 at the ambulatory chapel of the medieval choir.
Mapping of the accumulation phenomena and the biogenic growth on the basis of a plan.
© Cologne Cathedral Building Lodge, Stone Conservation Workshop (2022)
Mapping basis: GBVD mbH*

Anlagerungsphänomene

| Krusten	Biogener Bewuchs
Salzefflorescenz	Kruste (anfänglich)	Flechten und Algen
Farbspritzer	Schwarze Kruste	Höhere Pflanzen
Staubauflagen	Blumenkohlkruste	Moose
Verfärbung		
Vogelkot		
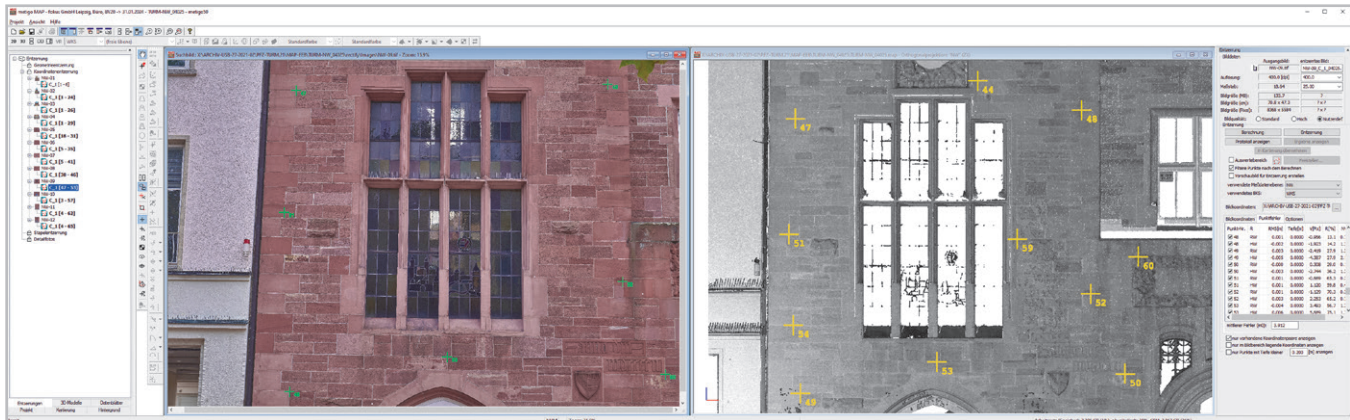
2D Image Rectification

- Image rectification according to geometry approaches (rectangle, parallels, line mesh, circle) [1.1].
- Scaling function for historical drawings and 3D models [1.1, 5].
- Image rectification using reference coordinates (tacheometry, image plan, orthoprojections, CAD plans) [1.2].
- Automated image rectification of detailed images by means of image matching [1.2].
- Automated image rectification of image stacks:
  — image sequences of thermographic images [1.3]
  — hyperspectral images incl. correction of spectral-dependent diffraction
  — mapping projects as multi-plane TIF [1.4]
- Image rectification using control points in 3D laser scan / SfM data in combination with UCS definition [1.5]

Software Interface

- Program interaction via project tree, menu bar or mapping dialogues
- Special extensions for mobile mapping with pen on tablet PC on site [3.4]
- Individual control of the attribute's display in the tool window [6.4]
- Free viewer to share mapping projects for third parties review [9.5]
- VR interface for virtual display of 3D mapping data [5.4]

Image Montage, Layout, Plan Design

- Multi-layer TIF export for montage in image processing software [2.1]
- Calculation of correction parameters for lens distortion and chromatic aberration [2.2]
- Combination of images of different image qualities (resolution, scale, RGB/B&W) in one mapping project
- Colour adjustment/cropping function for image montage [2.2]
- Export in true-to-scale image file (TIF) [9.2] with automated integration into CAD file (DWG/DXF) [9.3]
- Legends [2.3], stratigraphies and deformation legends [10.5]
- Title blocks with project attributes, image and vector graphics as well as transparent marking areas [2.3, 2.5, 7.2]
- Grid crosses [2.4], auxiliary lines [2.4], scale bar [2.6]
- Integration of unscaled detail photos [2.6]
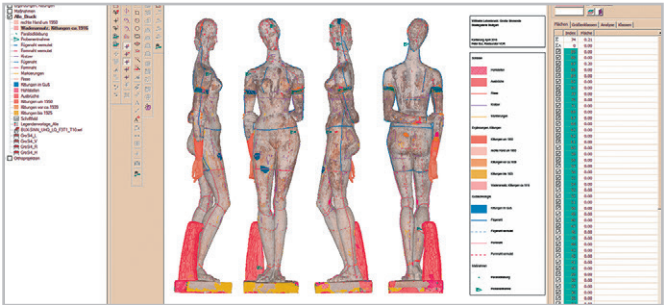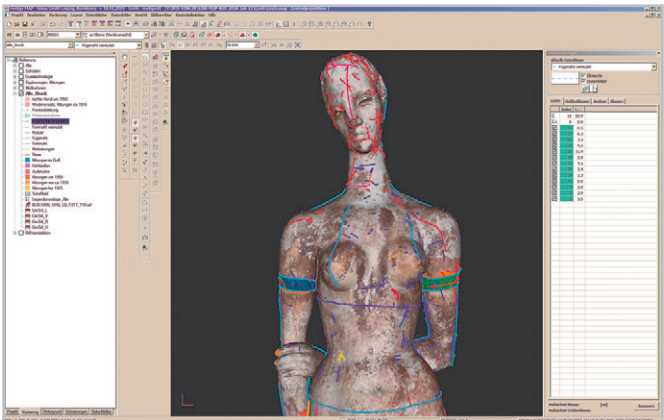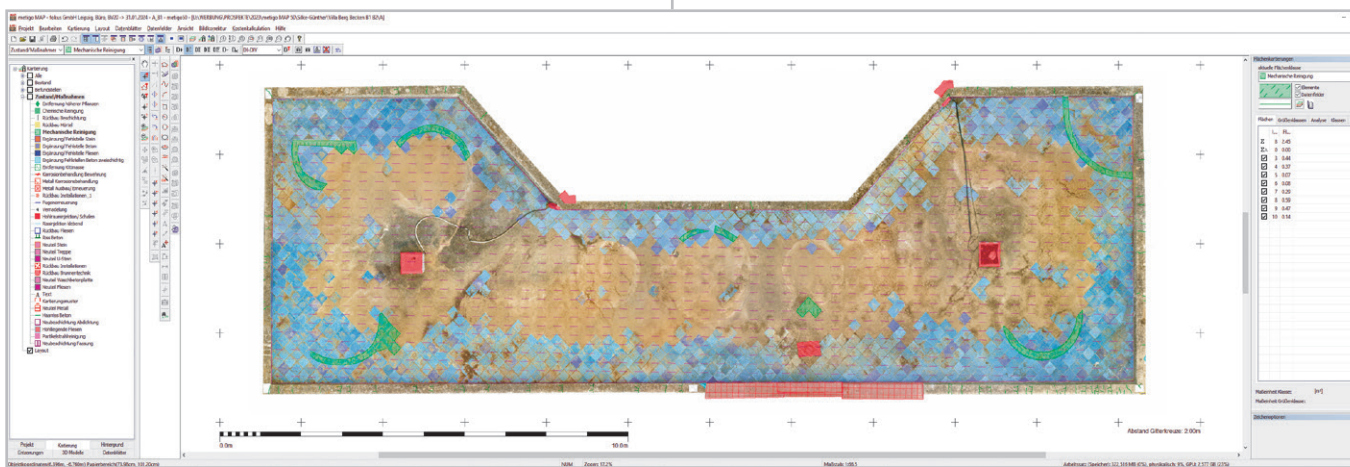
2D Mapping

- true-to-scale mapping on image plans, CAD drawings (DWG, DXF) or 2D model views / orthoprojections of 3D object data (SfM / TLS)
- Vector-based mapping tools for polygons, freehand lines, curves (spline) and circular arcs, rectangle and circle or arc functions [3.1, 3.2]
- Labelling and dimensioning functions
- Object snap modes, CAD commands for stretching, trimming, offsetting, mirroring [3.2]
- Area intersection functions for processing the outlines of adjacent areas and the incorporation/cutting out of inclusions [3.3]
- Dimensioning functions for dimensional chains, lengths and heights [3.1]

3D Mapping

- Import of 3D surface models (OBJ, VRML and STL format) for 3D mapping [9.4]
- Scaling function for true-to-scale model import
- Generation of 2D model views with true-to-scale orthogonal projection for 2D print output [5.2]
- 3D mapping directly on 3D surface model or indirectly on model views [5.1]
- Calculation of 3D surfaces and lines on surface model [5.1]
- Surface area intersection functions for editing the outlines of adjacent areas and incorporating / cutting out inclusions [5.3]
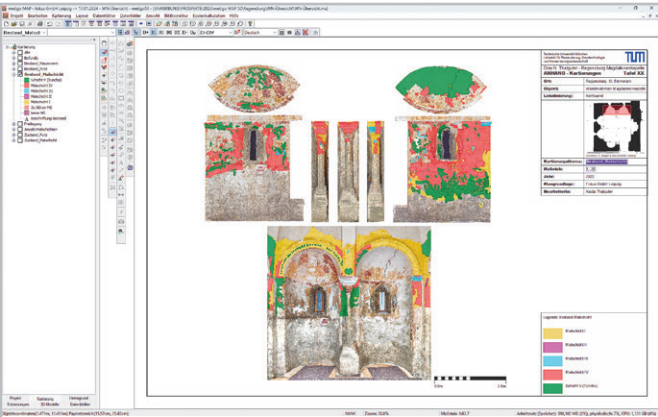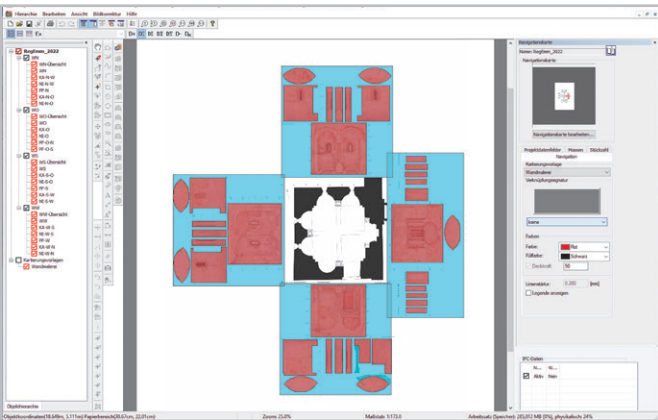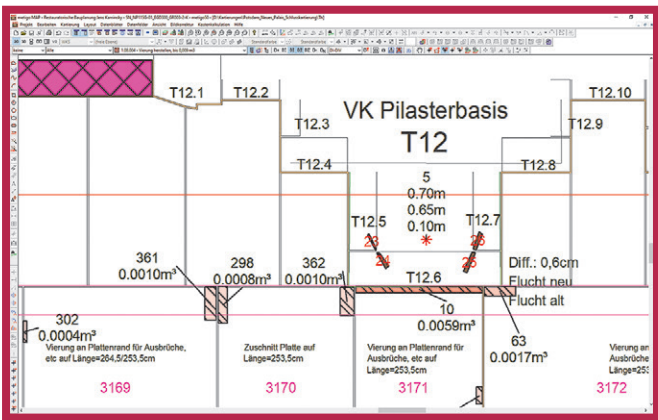
Mapping Template

- Creation of sample projects for subsequent mapping projects [4]
- Mapping classes for area and line mapping, vector symbols with automated quantity determination
- Library with hatchings, line types, image and vector symbols and colour tables
- Transparent fill colours for area mapping
- Symbol editor for the creation of individual hatchings, line types, colours and vector symbols
- Grouping of mapping classes and mapping bases within a mapping project to show and hide different mapping themes (e.g. condition and damage mapping, planning of treatments and accounting) [4.1]
- Integration of piece count and quantity determination as well as analysis/calculation of percentage shares in the legend [4.2]
- Extended group management for repeated application of class sets (loan service, excavation strata, project phases) [4.3]
- Mosaic functionality for subdividing and rejoining partial mappings for simultaneous processing by several project partners [4.4]
- Multilingual mapping template with description and image sample for each mapping topic [4.5]
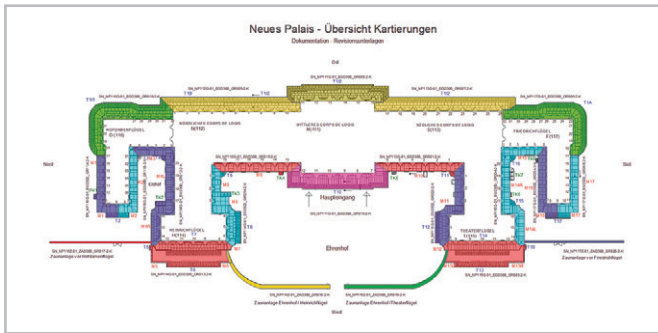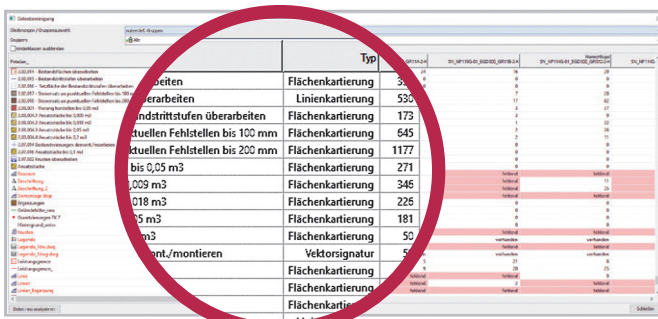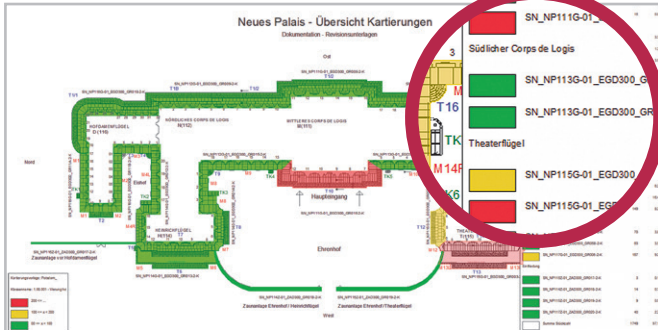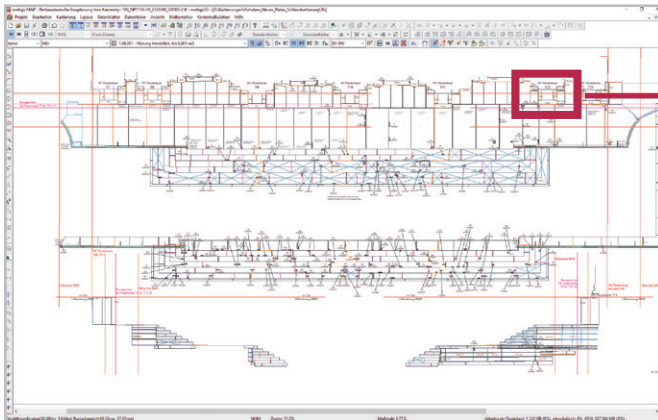
Cost Calculation

- Input of individual cost factors for work performance (work steps and qualifications), material and equipment
- Calculation of the actual costs for each individual class separately for labour, material, equipment via mapping elements and cost factors [8.5]
- Creation of different cost calculations (surcharges, prices, different quantity approaches)

Quantity Determination

- GAEB interface for importing tendering specification items as mapping classes [8.4].
- Individual data fields for entering object properties (dimensions, findings, technological information on the treatment)
- Input and evaluation of manual measurement values for invoicing quantities (number of pieces, length, area, volume) [8.3]
- Different approaches for area calculation (mapped polygon, smallest surrounding rectangle, manual measurement)
- Minimum billing sizes for length, area and volume calculation
- Administration of settlement usage for mapping elements (partial invoices)
- Export of mass determination and attribute data for further processing in spreadsheet, GAEB file or database [8.2, 8.4].

Object Hierarchy

- Object hierarchy for managing and aligning several mapping projects on one object [7.1]
- Central mapping template with mapping classes, groups, attributes, legends and title blocks
- Subsequent changes can be automatically transferred to participating mapping projects
- Navigation in object hierarchy via project tree or navigation maps [7.1]
- Cross-project use of title blocks with variable entries [7.2]
- Visual quantity analysis of mapping contents and project data fields via navigation map
- Class analysis via complete object hierarchy (mapping contents, class and group structure) [7.3]
- Cross-project output of mass tables (CSV, MS Excel, Open Office) [8.2]
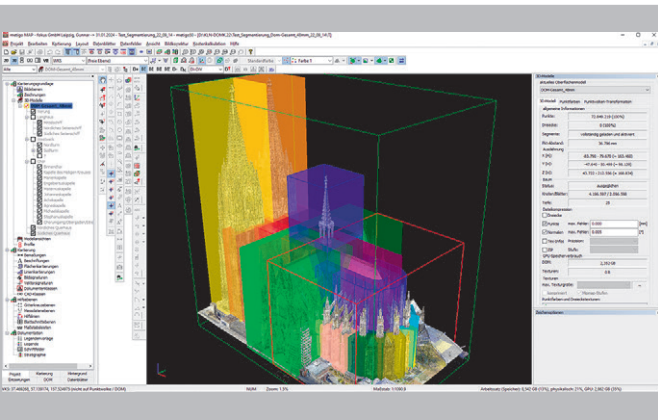
Structured Point Cloud with Segments

- Definition for regional evaluation [10.3]
- Hierarchical structuring of an object point cloud (e.g. → building part → floor → room → wall) [10.3]
- Selective evaluation of larger point cloud data [10.3]
- Further use of the outline structure e.g. for object hierarchy, database application (e.g. MonArch), IFC interface for other applications [10.3].

Interfaces and Data Exchange

- true-to-scale print output of the mapping [9.2]
- Export of mapping to scale image file (TIF, multilayer TIF), CAD file (DWG, DXF) or PDF with separate layers [9.2]
- CAD interface for import of DWG/DXF files as mapping basis [9.3]
- Extended import functions for uploading and continuing existing CAD mappings [9.3]
- Export of quantity tables sorted according to classes or groups (CSV, MS Excel, Open Office) [8.2]
- Export of data sheets (PDF file) with mapping content via individual layout
- Export of read-only mapping project [9.5]
- Import of measurement data and visualisation in 2D / 3D display via freely definable coordinate interface
- IFC interface for structured point clouds [10.3]
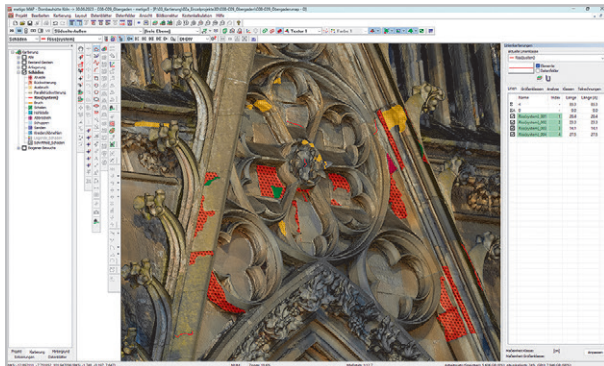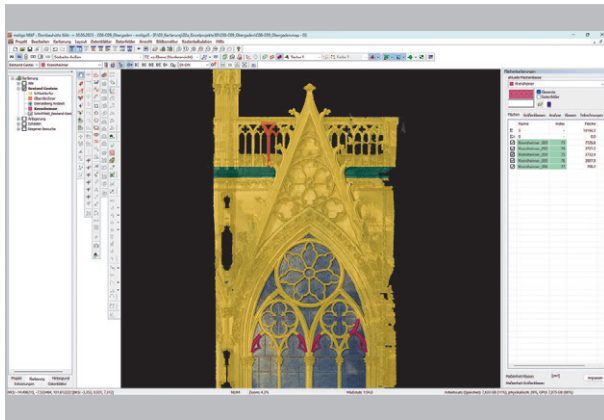
Analysis

- Sorting of elements within a mapping class by size ranges [6.1]
- Visual analysis of mapping sequences, quantities and data fields within a class [6.2]
- Area-based analysis (stone, material area, scaffold path, project section) of existing mapping data with integrated mass export [6.2]
- User administration for analysis of mapping history (user, creation and modification date) [6.3]
- Assignment of rights for the protection of third party mapping elements (e.g. loan traffic, project phases)