

## Road Doctor® 3.4 and Modules

Software is designed so that there is Road Doctor® CORE and this can be accompanied with 6 modules according to customers needs. It is possible to purchase the needed combination as

1. Rental license which is invoiced annually. This price includes software support and all updates and upgrades
2. Permanent license which is invoiced once. For this option we highly recommend annually invoiced software support service which includes software support and all the updates and upgrades.



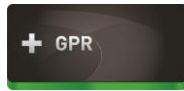
### Road Doctor® 3 "CORE"



- Project Management
  - New project creation
  - Line creation and coordinates handling
  - Supports almost all coordinate systems in the world + others as user defined format
  - Linking Ground Penetrating Radar, Falling weight, Profilometer, Map, Image, Point Cloud, Thermal Camera, Ground truth, Document files and Video data
  - Linking to file Databases and Database servers
  - Analysis database creation
  - Project transfer (Zipping, folder copy)
  - Multiple data removing and restoring
  - Users and operations control
  - Converting videos to smaller size by reducing the video image size and using fixed distance videos
  - Classification and showing of all classified data

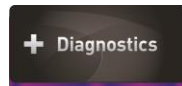
- Viewing all linked data including data created in special Modules
  - All data in the same view synchronized by the distance (Video, GPR, Data base, Profilometer, images, maps)
  - Multiple GPR data in the same view with interpretations.
  - Viewing predefined 3D data views with slice and cross-sections views
  - Showing Distances as m, km and km+m, hm and hm+m, or in imperial units (miles, feets, miles+ft, mi + mi/1000) also shown in reverse direction if necessary
  - Data specific legends
  - Database data shown as Line graphs, Bar graphs, Area graphs, Surface plot (2D grid) and From-To plots, cross-section plots, Line graphs with point symbols and user defined line width and colour
  - Saving the views with external videos for later use or use in free Road Doctor Viewer version
  - Multiple views, videos, or imagelists synchronized, 360 videos
- GPR data handling features
  - linking GSSI, Malå, IDS, Sensors & Software, and 3D Radar data format
  - GPS coordinates linking, limited rescaling, joining, channel splitting and data reversing
  - on-screen GPR-data processing: background removal, dc-level removal, vertical and horizontal filtering, migration, Hilbert transform, Savitzky-Golay filtering
  - single scan view for frequency content analysis
- Data analysis
  - marking and classification of interesting sections
  - making annotation and notes to data sections
  - digitizing interfaces and other features of interest in surface and GPR data
- Printing out all data
  - Printing to images and all supported Windows printers
  - Automatically splits long printouts
- Exporting GPR interpretation and Analysis Data
  - Exporting to predefined and user definable text outputs
  - Coordinates included with the output
  - Analysis data output to Google KML and Esri shape files
- Thematic maps
  - Analysis and Database data shown on Maps
  - Data shown as classified to different colors
  - Maps linked from TIFF, JPG, etc. images
  - Support for WMS servers and Google maps
- Viewing point cloud data
  - Importing point-cloud data from LAS-files or from Road Doctor Survey van / Road Doctor Camlink data
  - Viewing point-cloud data in a built in Point Cloud view
  - Viewing interpretations with cross-section data and as separate layers in point-cloud data
- Result outputs
  - Printing result profiles to images and all supported Windows and pdf printers
  - Automatically splits long printouts
  - Output/capture screen videos from results profiles together with videos/images, map and profile data.
  - Exporting to predefined and user definable text outputs
  - Coordinates included with the output (GPR and analysis data)
  - Database and Analysis data output to Google KML and Esri shape files

## GPR Module



- Advanced GPR data handling
  - Horn antenna data processing including bouncing removal and template removal
  - data reversing, joining, channel splitting, cutting and scale correction operations
  - Voids content estimation based on surface reflection
  - Batch linking of GPR Data
- GPR data interpretation
  - interpretation point database
  - manual picking layers
  - semiautomatic picking layers
  - marking notes
  - combination of GPR interpretation from several measurements
  - calculating Dielectric value / Velocity using known layer depths.
  - calculating Dielectric values using hyperbola fitting
- 3D GPR data handling
  - time-slices from selected time-interval (average, minimum, maximum, from level amplitude)
  - cross-section view
  - 3D-interpretation

## Diagnostics Module



- Bearing capacity analysis using Swedish formula BCI
  - calculates the Swedish bearing capacity index (BCI) based on pavement thickness and falling weight deflections
  - estimates the residual pavement lifetime calculated from given Traffic information and BCI
  - calculates the strain at the pavement bottom and subgrade moduli
- IRI and rutting analysis
  - takes measurements from several years and calculates the rutting and IRI increase
  - estimates the residual lifetime based on Rutting/IRI increase and given threshold value
- Pavement distress inventory
  - tool for picking the pavement distress or furniture or any almost any other user definable parameter from video data
- Automatic analysis
  - uses the profile data shown on the screen
  - classifies data automatically based on set threshold and data combination rules
  - writes the results to analysis database
- I MSI Analysis
  - Modified Swiss Index for pavement damage inventory
  - manual classification of road condition at fixed intervals
- Odemark dimensioning analysis for Initial structure
  - calculation of bearing capacity of current structure
  - see Design Module
- Forward calculation of layer moduli
  - see Design Module
- Road feature measurement tool
  - measure the size of objects in a video or image
  - measure road width and distance
- Elmod™ back-calculation link

- see Design Module
- Thermal diagnostics tools
  - importing Thermal camera data in to Road Doctor
  - viewing the Thermal camera data and picking features of interest
  - minimum, maximum, and average temperatures from selected points



## Design Module

- Creation of design database
- Rehabilitation design tools
  - select and draw quickly new structures
  - operations Remove, Mix, Add new layer, Add to layer, Strengthen, Off road left/right
  - define wedge structures
  - overlay with the existing structures
- Fill & Mill tools
  - optimize the pavement milling and filling using precise Point Cloud data
- Odemark dimensioning analysis for initial structure and new structure
  - Bearing capacity (BC) for existing structure using Odemark formulas and measured or estimated layer thicknesses and forward or back calculated layer moduli
  - BC for new structures using Odemark formulas for the given rehabilitation measures and layers
  - Compare to Target BC and correct if needed right away
- Forward calculation of layer moduli
  - Forward calculation of layer moduli using FHWA formulas (Hoggs).
- Elmod™ back-calculation link
  - transfers the falling weight deflection and layer thicknesses to Elmod for back-calculation
  - returns, saves and shows the results on the screen for further use

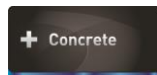


## Surface Analysis Module

- Point Cloud
  - Projecting different measurements on point-cloud data
  - 3D view synchronized with Road Doctor data view
  - zoom, rotate and pan point cloud view
  - filtering of imported point cloud data
- 3D surface data extraction from laser-scanner data
  - extract from Road Doctor Survey Van data (SICK laser) or from LAS data
  - user definable output grids
  - picks minimum, maximum, or average value from given cell
  - possible to output all the points to LAS or XYZI Point Cloud formats
- Rutting calculation from laser-scanner data
  - calculate rutting using several methods: straight lines, water, string, cutting edge
  - fully automatic calculation or visually controlled manual or semiautomatic calculation
  - define the location for RUT calculation manually or automatically based on road edge or centerline
  - filters error points
- IRI calculation from Accelerometer data
  - IRI based on the accelerometer or Pitch parameter
- Semiautomatic road shape calculation from laser scanner data
  - extracts ditch depth, road's inner slope, road width
  - manually and visually controlled

- parameters can be changed at any time
- Accelerometer data analysis
  - calculates running or fixed distance deviation of data
  - Hilbert transform for data envelope detection
  - wavelength analysis using Fourier transform
- Database tools
  - data filtering in profile direction using convolution, Fast Fourier Transform or butterworth filtering
  - Database distance adjusting using marked point, data in single or multiple files
  - Semi-automatic data base data distance adjustment
- Batch linking of RDSV rdls-data files and videos.
- Automatic project and line creation based on measured RDSV - data.

### Concrete Module



- Special tool for concrete bridge decks and other concrete structures which are no more than 0,5m thick
- Calculates frequency and amplitude response of structures to GPR Data
  - low, medium and high frequency window
  - calculation from fixed time window or from interpreted layer level
  - response presented as surface maps and tables
  - attenuation compensation
- Needs GPR module
- Used with 3D GPR data

### ROCK Module



- Calculates the Excavation Damage Zone based on the given threshold criteria
  - manual tracking the surface
  - automatic tracking the EDZ surface
  - attenuation compensation
- The calculation uses Frequency analysis of the data.
- Needs GPR Module
- Takes use of 1D or 3D GPR data