VECTOR

vSignalyzer

Product Information

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Contents

1. Overview 4
1.1 Introduction 4
1.2 Overview of Advantages 4
1.3 Fields of Application 5
1.4 Functional Expansion Through Additional Options 5
1.5 Using CANape With a vSignalyzer License in Analysis Mode 5
1.6 System Requirements 5
1.7 Further Information 5
2. Functions 6
3. Visualization and Manual Evaluation of Measurement Data 6
4. Advanced Evaluation Through Functions and Virtual Signals 8
5. E-mobility Analysis in High-Voltage Networks 9
6. Automated Analysis of Measurement Data and Data Mining 9
6.1 Scripts as a Simple Method for Automation 9
6.2 Evaluation and Analysis of Multiple Measurement Files 9
7. Report Generation 11
8. Supported Measurement Data Formats 13
9. Analysis of Logged Bus Communication 13
10. Visualize the Vehicle Position in a Map 14
10.1 Fields of Application 15
11. Analysis of Data Recorded With Loggers 15
12. Development of Driver Assistance Systems 16
13. Measurement Data Management With vMDM 17
14. Display of Thermodynamic Measurement Data 18

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15. Engineering Services 19

16. Trainings 19

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1. Overview

1.1 Introduction

vSignalyzer is the convenient tool for efficient evaluation and analysis of all types of measurement data. It offers extensive data visualization options as well as functions for manual and automated analysis and report generation.

The measurement data recorded during the acquisition of physical values, network development, analysis and ECU calibration can be read in from various file formats. Extensive function libraries and the integrated data mining functionality allow your measurement data to be evaluated manually or automatically and conveniently displayed. Powerful printing and reporting tools are integrated for documenting the results. The visualization of GPS data with various map materials is already included in the standard functional scope.

The option "Driver Assistance" extends vSignalyzer by adding a verification solution for driver assistance systems (ADAS).

1.2 Overview of Advantages

> Convenient and individually customizable display of recorded measurement data
> Efficient handling – even with very large measurement files
> Direct coupling between vSignalyzer and Vector Measurement Data Management for easy access to centrally managed measurement data
> Automated analysis of arbitrary data sets according to specific criteria using Data Mining functions
> Indexing of MDF files on the workstation computer for fast and convenient search of measurement data
> Extensive mathematical function library for creating data analyses
> Users can create their own functions or link to MATLAB/Simulink models for custom analysis extensions
> Intuitive reports and documentation of analysis results

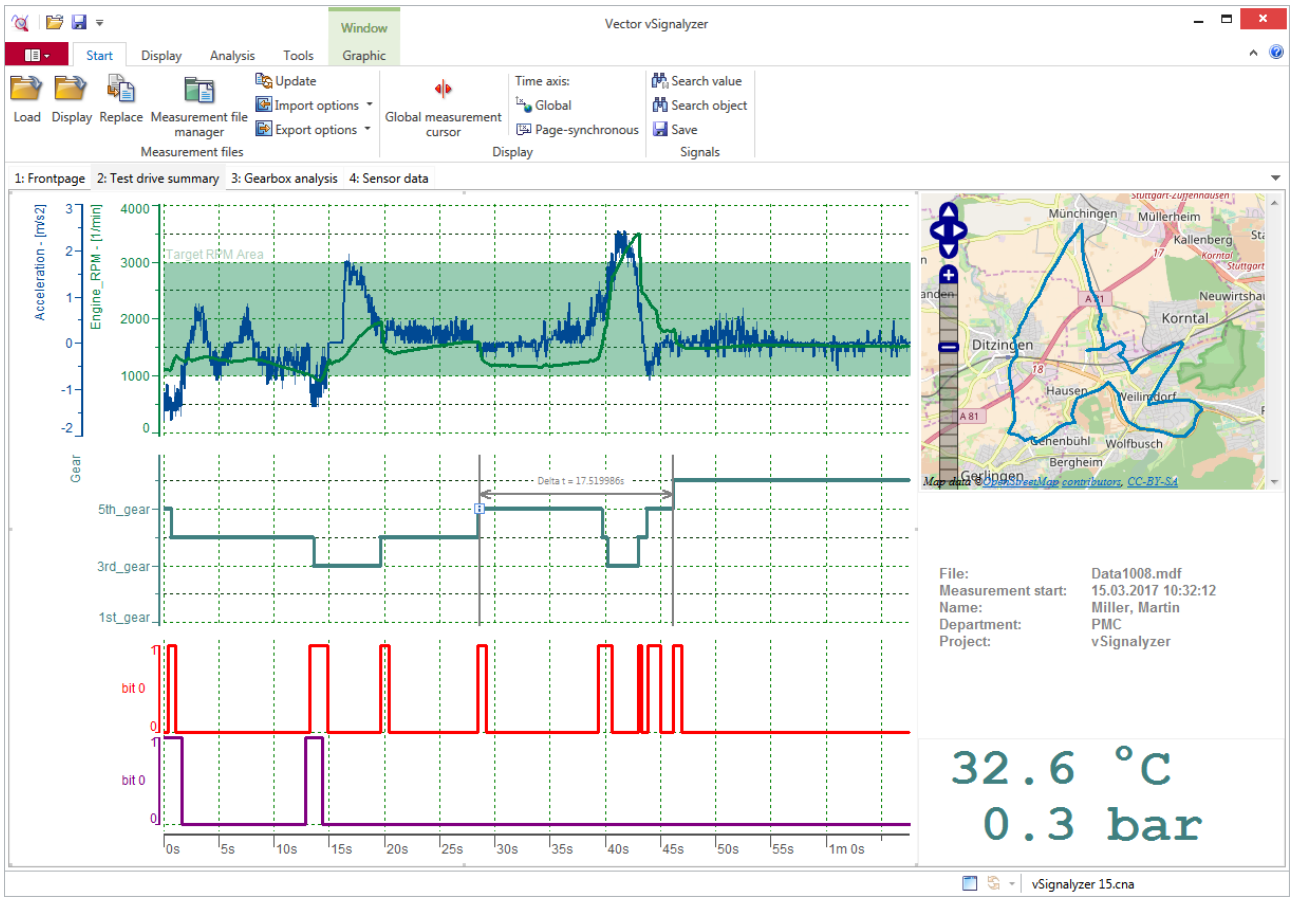


FIGURE 1: Convenient display and evaluation of measurement data with vSignalyzer

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1.3 Fields of Application

With vSignalyzer, you focus on the measurement data that is relevant to you. You simply create panel interfaces to control the analysis process and visualize your measurement results. Even extensive analysis functions and data mining calculations can be started with just a few mouse clicks and run completely automatically. This enables even less experienced users to perform complex analyses with vSignalyzer. The high degree of automation allows you to easily analyze very large amounts of data.

vSignalyzer offers extensive tools to insert the measurement results easily and quickly into your report or to print them directly. The adjustable print view gives users a preview of the document during analysis. Drag-and-drop functions make it easy for you to insert the results into external tools such as Word or PowerPoint.

A wide variety of data formats from the field of measurement technology, vehicle and ECU development are supported. You can load several measurement files in parallel to compare them against one another, save measurement signals together in a new measurement file or simply extract and save the data and time ranges that are relevant to you. vSignalyzer is optimized to work quickly even with very large measurement files. vSignalyzer helps you to effectively analyze the measurement data generated by data loggers, measurement and calibration systems, test benches or analog measurement modules.

1.4 Functional Expansion Through Additional Options

- Option "Driver Assistance" for object verification of driver assistance systems and optimization of image processing algorithms
- Option "Thermodynamic State Charts" for visualization of thermodynamic state diagrams

1.5 Using CANape With a vSignalyzer License in Analysis Mode

If you use CANape for measurement data acquisition but do not have access to your CANape license at all times (e.g. the license is permanently installed in the vehicle), you can operate CANape in Analysis Mode with your vSignalyzer license. This mode allows full access to all analysis functionalities. Switching between Analysis Mode and full CANape functionality is done smoothly without restarting the program.

1.6 System Requirements

Component	Recommendation	Minimum
Processor	Intel Core i5 3.0 GHz or higher	Intel Core 2 Duo 2.6 GHz
Memory (RAM)	16 GB (special tasks may place higher demands on the system. Please contact vSignalyzer support if required).	8 GB
Hard disk space	≥ 2.0 GB (depending on options used and operating system components required)	
Screen resolution	1920 x 1080 or higher	1024 x 768
Graphics card	DirectX 9.0c or higher	
Operating system	Windows 10 / 11 Note: Only 64-bit versions are supported	

TABLE 1: System Requirements

1.7 Further Information

Various documents regarding vSignalyzer are available online. In the demo version, you can get sample configurations for various application areas as well as detailed online help that describes all functions of vSignalyzer. Furthermore, you benefit from valuable know-how in the form of technical articles and application notes. You can find more information in the Vector Download Center.

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2. Functions

vSignalyzer provides you with all the functions for examining, comparing and editing measurement data:

- > Visualization and analysis of measurement data
- > Fast analysis and assessment of large amounts of data through automation
- > Report generation with PDF output and export to Office applications
- > Import and export of measurement files of all common formats
- > Analysis of logged CAN, CAN FD, LIN, FlexRay and Ethernet bus communication
- > Time-synchronous display of sensor data as superimposed objects in the video image with the "Driver Assistance" option
- > Time-synchronous display of measured values and the corresponding vehicle position on a map
- > Common project management with the CANape measurement and calibration tool and the vMeasure exp measurement software

3. Visualization and Manual Evaluation of Measurement Data

In vSignalyzer, signals with different scales and physical meanings can be displayed. For example, the mixed display of analog and digital signals in different sub-windows of the Graphic window allows the direct comparison of switch states and the resulting system reactions. A zoom operation on the time axis leads to a uniform resolution of all sub-axes.

vSignalyzer can display signals both over time and in an XY display over another signal. The global measurement cursor is an instrument that allows you to directly compare signal values of all display windows at the same time. The measurement cursor is always placed at the same position in time in all display windows. The corresponding values or image sequences for the current position of the global measurement cursor are displayed in the Text, Trace and Video windows as well. You can also synchronize the time axes in all windows and all display pages. Furthermore, a difference cursor, grid lines, various Y-axis display options, labeling options, zoom functions and much more are available for fast and effective analysis. Color functions support the analysis by overlaying the signal values with further information, such as highlighting limit violations or the combined display of two signals.

You can use drag-and-drop to insert statistic columns for all measurement signals into the windows. In addition to the name of the displayed signal, you are free to show additional columns in the legend, such as signal information or statistics values.

For comparison purposes, you can visualize signals from several measurement files simultaneously. The displayed signals can be saved in a new measurement file of any format directly from the Graphic window. The time range to be saved can be configured individually. Of course, you can also analyze statistical data measured with CANalyzer/CANoe, such as bus load, message rates and error rates.

The same window can be displayed on several display pages at different positions. Windows can also be displayed outside the vSignalyzer main window, so that their display is independent of the active display page. In the Data window you can comfortably visualize all properties of the measurement parameters. The display of structured signals is also realized in this window.

The selection of the signals to be displayed is done by drag-and-drop from the Symbol Explorer. In addition to displaying MDF metadata such as project, user name, etc. in the Symbol Explorer, you also visualize the signal properties to make it easier to select measurement data. The search function can be used over all measurement data.

With the event-based signal comparison, you can very quickly and conveniently compare signal characteristics at different points in time within a measurement, for instance to detect outliers or deviations from the target behavior. You simply specify the points in time with the signal value comment function, trigger events or Data Mining hits.

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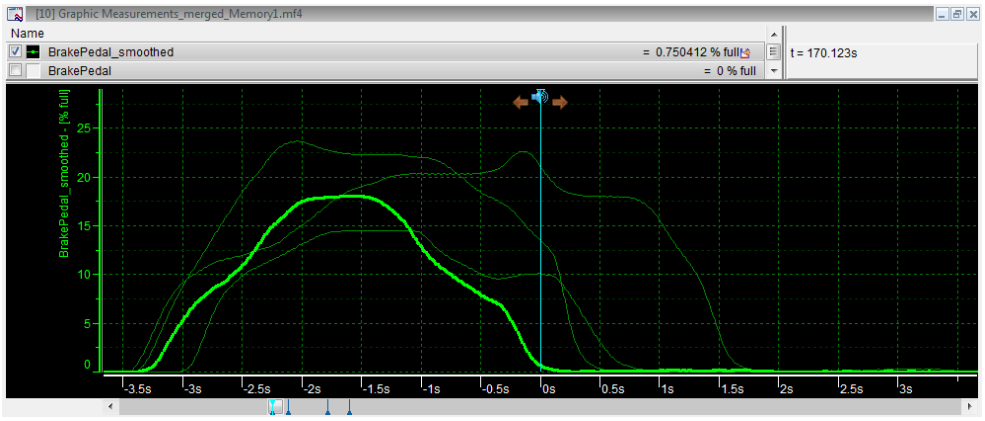


FIGURE 2: Comparison of a signal curve at different points in time

To compare signal characteristics of different measurements, simply drag the respective measurement files into the Graphic window. The desired signals are displayed in color shades on a shared axis for several files. Time differences between the individual files can be easily corrected using the time offset function.

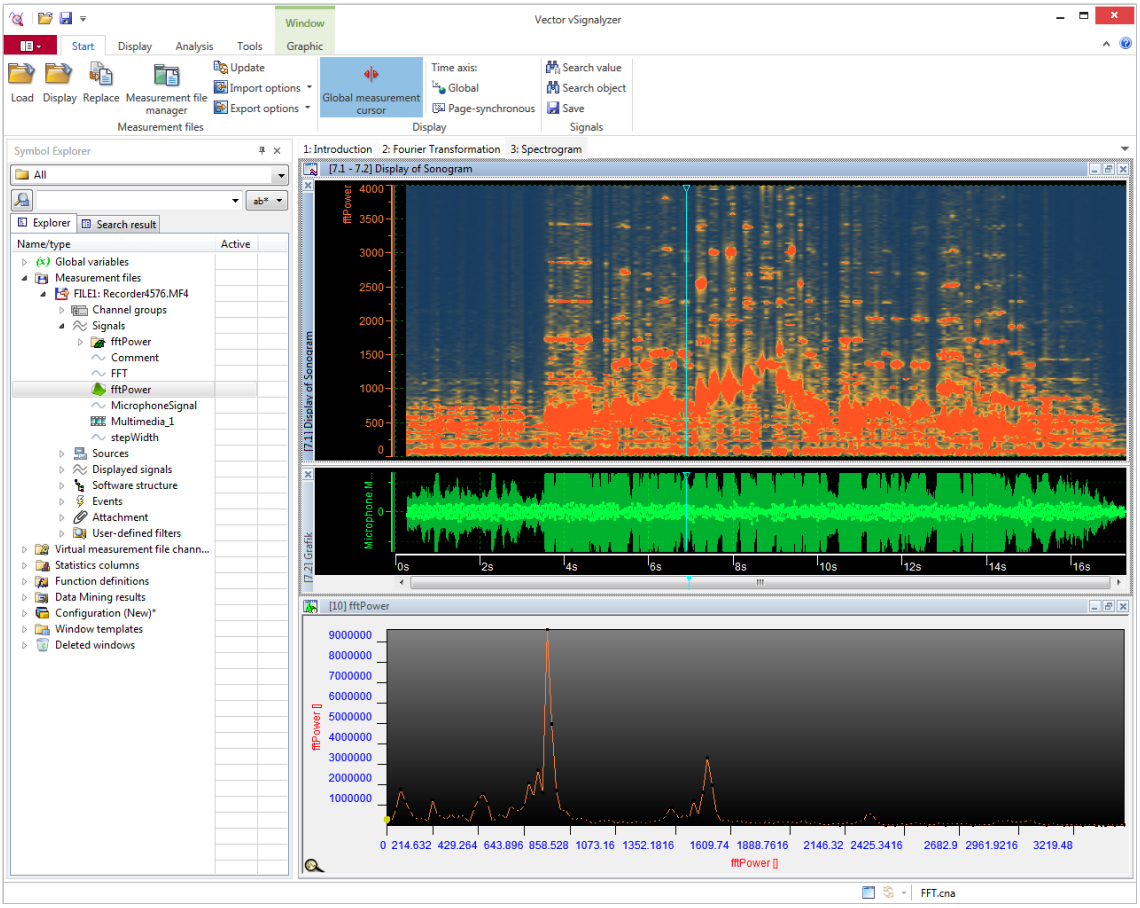


FIGURE 3: With the spectrogram display - in this example of an audio source - you visualize the power spectrum of a signal.

The key functions in detail:

> Import and export of different measurement file formats
> Easy handling of measurement files, e.g. loading of several measurement files, clear display of the contained signals
> Signal display over time or in XY representation
> Manual analysis of signal curves using zoom, search function and cursor

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> Synchronous movement of measurement and difference cursor across all display windows
> Envelope curve display in the Graphic window shows the signal curve with all outliers while simultaneously accelerating the loading process
> Numerical, graphical and spectrogram displays of recorded characteristics and fields including operating point
> Superimposition of further information over signal curves and maps by means of color functions
> Common display of measurement data recorded with different time rasters
> Time-synchronous display of signal responses and video sequences
> Comparison of signal curves within one measurement file or between several measurement files
> Flexible configuration of the axis display in the Graphic window
> Display of statistical parameters directly in display windows as a separate column
> Free commenting of signal points and areas; comments appear in the Graphic window and on the printout and are saved in the MDF file
> Export of sequences from measurement files including the synchronous video clip
> Display of the data structure of measured ECU signals

4. Advanced Evaluation Through Functions and Virtual Signals

To analyze the measurement data, you can apply any analysis algorithm to your measurement data using existing functions from the library or functions you have created yourself. The result of the functions is available as a virtual signal and can be displayed like a real signal in the display windows or used again as an input variable for further functions. To calculate the virtual signals, the functions and their input signals can be integrated into the display windows simply by dragging and dropping from the Symbol Explorer. Filter functions such as the moving average are realized via indexed access to signal values of different sampling times. The output of intermediate results or status information in the Write window facilitates the development of the calculation functions for the virtual signals.

To simplify the creation of your own functions, the function editor provides you with a specially adapted working environment. With this editor, you create and compile the functions and, if required, also integrate them into the library. To facilitate access to individual signals and functionalities of vSignalyzer, CASL (Calculation and Scripting Language), a C-code-like, easy-to-learn scripting language, is available. It also allows developers to integrate their own C code or Simulink models.

To create virtual measurement signals, MATLAB/Simulink models can be included in addition to functions, or the graphical editor can be used. With the editor you create simple functions with a few mouse clicks.

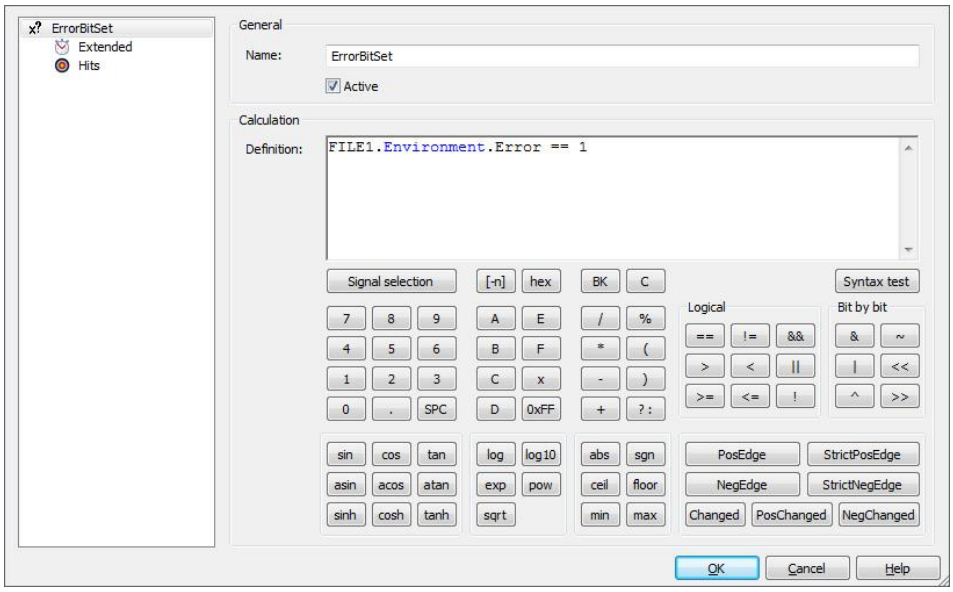


FIGURE 4: Easily create virtual functions with the graphical editor

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5. E-mobility Analysis in High-Voltage Networks

The integrated function library eMobilityAnalyzer forms the core of scalable analysis solutions in a high-voltage environment. The relevant characteristics of the drive, the HV components or the vehicle electrical system are calculated from voltage and current signals acquired at a sampling rate of up to 1 MHz. Among other things, you can precisely calculate the efficiency, the effective, apparent and reactive powers.

6. Automated Analysis of Measurement Data and Data Mining

With large amounts of data, as they occur in vehicle development, a purely manual analysis often is no longer possible. With powerful functions, scripts and data mining functionality, vSignalyzer enables efficient analysis of measurement data even with large data volumes as well.

6.1 Scripts as a Simple Method for Automation

Scripts are a quick method to automate workflows. Regardless of whether you want to automatically reconfigure the Graphic window for new measurement files or automate entire test sequences - both are possible with scripts. In the function editor you create and compile the scripts quickly and easily, just as you can do with functions.

Scripts are either executed manually, or they are coupled to specific events, such as loading a new measurement file, starting, or closing the project, etc. The Task Manager provides an interface that allows you to manage and overview the linking of your scripts to events.

You can define global variables to make working with functions and scripts easier. These can be used within functions and scripts. Using Calibration windows or Panels you have the possibility to assign values to the variables, change them or adjust them.

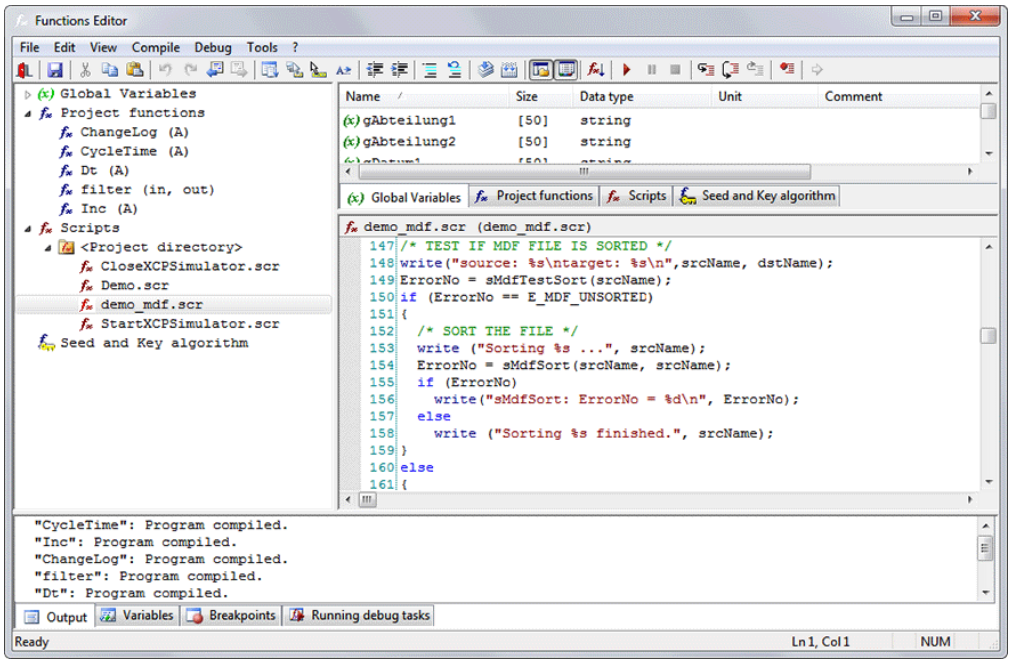


FIGURE 5: Create functions and scripts quickly and conveniently

6.2 Evaluation and Analysis of Multiple Measurement Files

If you want to extend an automated analysis to cover several measurement files, the Data Mining functionality provides a method for automated analysis of signals in a series of stored measurement files. In this process, several files can be processed in one search run. The same analysis algorithm is applied to all selected measurement files. The points in time that fulfill the condition for which you have searched are listed as so-called hits.

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All functions and scripts already used in vSignalyzer are available to you in Data Mining. You can view the results of the analysis either in the Data Mining dialog or in the "Symbol Explorer" of vSignalyzer. All hits of the currently loaded measurement file are highlighted in the different display windows of vSignalyzer. Double-clicking on a hit in the list moves the measurement cursor directly to the corresponding position in the display window. If you select a hit that is not contained in the measurement file currently loaded, vSignalyzer automatically loads that measurement file, replacing the original measurement file.

In addition to the hits, further information is available, such as the search method used (this is important if your analysis contains multiple criteria), the measurement file and the configuration. Analyses that have already been performed can be repeated at any time on new or different data files.

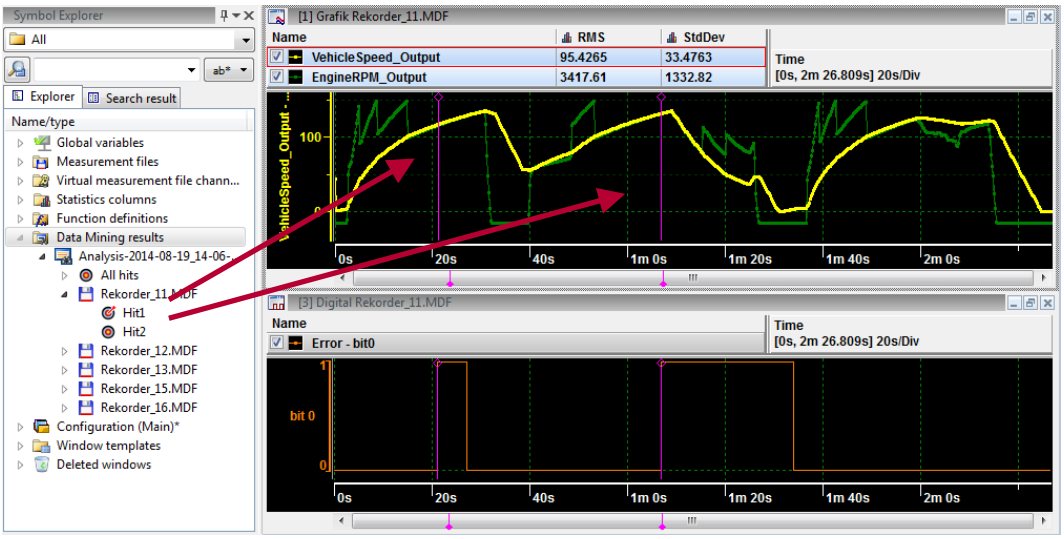


FIGURE 6: Direct links lead you to the found hits in the measurement files

The entire Data Mining process can be automated. You can set up panels that conveniently control the process. This enables even those users who do not have deep know-how to analyze measurement files and create reports.

A typical workflow contains the following steps:

> Selection of the measurement files to be analyzed
> Execution of Data Mining over all selected measurement files
> Evaluation of the analysis results
> Report generation

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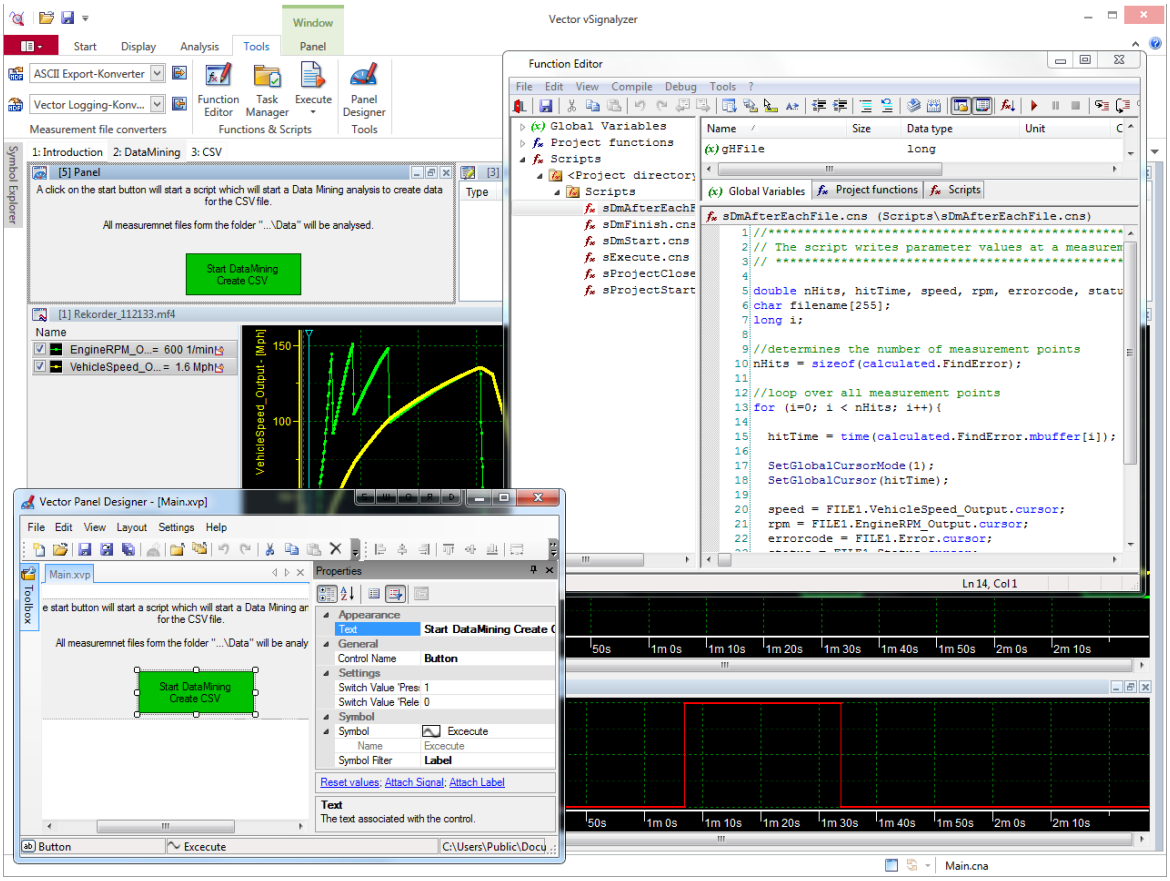


FIGURE 7: User-definable panels facilitate measurement data evaluation. With the editor you easily create functions and scripts.

The following functions are available for automated analysis:

- Script-driven analysis of measurement files
- Conveniently search and analyze large amounts of data via the Data Mining user interface
- Extensive function library for standard analyses
- Easily formulate your own analyses with algebraic expressions in the graphical editor
- Complex mathematical analysis via the integrated function language CASL, your own C/C++-based functions or with MATLAB/Simulink models
- Display of Data Mining hits in graphic display windows
- Automated export of analysis results in CSV and PDF format
- Execution of complex analyses via simple and understandable panels

7. Report Generation

With vSignalyzer, analysis and documentation of measurement data go hand in hand. The display pages you create for analysis can be displayed either in normal view or in print view. In the print view, all analysis windows and display elements are displayed as they will later appear on the printed page. Use the headers and footers to create layout templates to match your company's corporate identity and use display elements such as text boxes, graphics or arrows for expressive reports.

You can switch the display mode to either use the analysis pages you have already created for documentation or create your own individual print view pages. In the print menu, you simply decide which pages you want to use for the report. The result can be printed or saved as a PDF file.

Drag and drop individual analysis windows or entire display pages to conveniently save them as JPG, PDF or PNG on the desktop or paste them directly into Word or PowerPoint.

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FIGURE 8: In the print view you create meaningful reports

Overview of key functions:

- > Use the Print Template Manager to create professional layouts
- > Support of any paper format, even mixed formats in one report (e.g. portrait and landscape)
- > Switch between print and normal view in the display pages
- > Quick overview thanks to the page overview
- > Easily create reports using drag and drop
- > All display options of the analysis are also available for report generation
- > Fully automated report generation of data mining results
- > Documentation of analyses with flexible layout of display elements
- > Text elements with predefined or user-specific, script-controlled macro functions
- > Export reports in PDF or EMF, PNG, JPG, GIF, BMP formats
- > Easily export entire display pages or individual analysis windows via script or drag-and-drop to other windows applications, such as Microsoft Office

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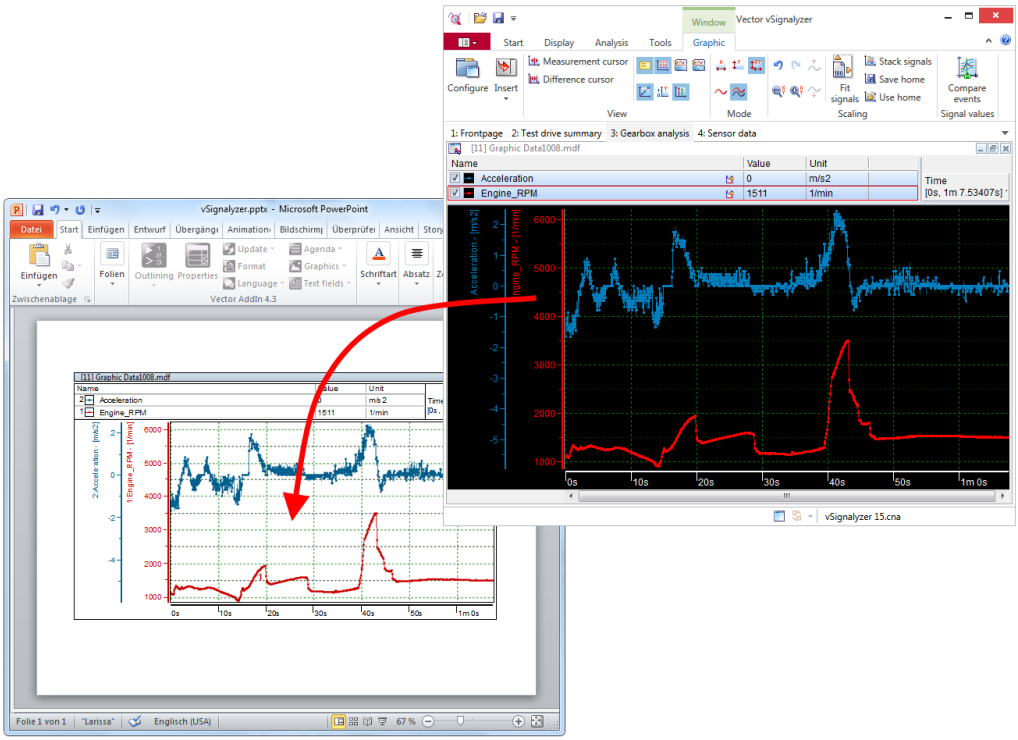


FIGURE 9: Drag-and-drop operation makes it easy for you to paste into external tools such as PowerPoint, Word, etc.

8. Supported Measurement Data Formats

vSignalyzer makes it possible to work with measurement data in various file formats:

> MDF-3.x, ASAM MDF-4.x, INCA DAT, XLS, XLSX, MATLAB MAT 7.3, HDF5, TDMS

For formats that vSignalyzer cannot process directly, import converters are available. The conversion is done automatically when the file is opened with vSignalyzer:

> BLF, ASC, LOG, ASCII, ATFX, CLF, CSV, GLX, GPX, KME, NMEA 0183, PCAP, TTL, UBX, XLG, XLX

If further processing of measurement files in a different file format is necessary, vSignalyzer supports the conversion of MDF files into several target formats:

> ASCII, MATLAB (M/MAT), Excel

9. Analysis of Logged Bus Communication

The logged CAN, CAN FD, LIN and FlexRay bus activities, such as messages or error frames, are listed in the Trace window. If you associate a network database, it is possible to display the individual signals of the messages in decoded form and to extract them directly from the Trace window, for example into a Graphic window. Due to the global measurement cursor, the trace messages are synchronized with all other displayed measurement signals in vSignalyzer. By clicking on a message or a signal directly in the Trace window, the global measurement cursor jumps directly to the corresponding temporal position in all analysis windows used.

With its AUTOSAR 4.3 support, vSignalyzer also enables offline analysis of PDUs in CAN/Ethernet log files, regardless of the database format used (ARXML, FIBEX). CAN/CAN FD frames with more than one PDU are supported and can be analyzed in the Trace as well as in other signal windows.

Drag and drop measurement files directly from Windows File Explorer or vSignalyzer's Symbol Explorer into the Trace window.

Various methods are available for analyzing the data in the Trace window:

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- **Filtering:** The Trace window offers various filters. You can filter on a specific bus or with block and pass filters on individual messages to reduce the amount of data shown. Additionally, a filter can be applied to each displayed column.
- **Predefined column displays**: For the standard bus systems such as CAN, LIN, J1939 and FlexRay, the Trace window can be optimized quickly. Additionally, you can easily insert individual columns with further information in the Trace window.
- **Search:** Messages/signals can be found via search conditions.
- **Color buses**: For easy differentiation of the displayed buses, they are highlighted in color.
- **Display statistics:** You can use different views to show details of the messages/signals including their values or to calculate differences between timestamps or signal values.

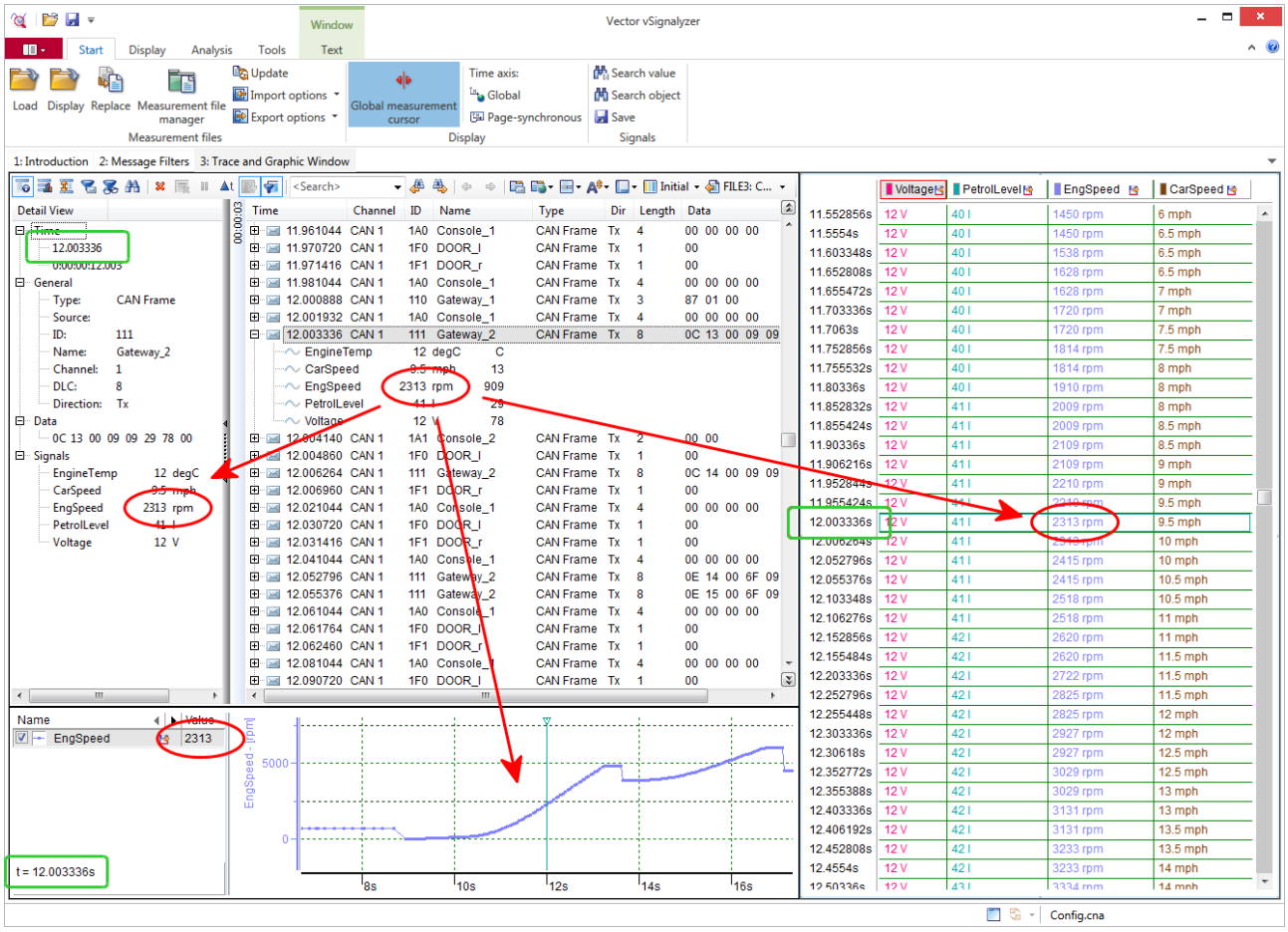


FIGURE 10: Trace window with time synchronization using the global measurement cursor

10. Visualize the Vehicle Position in a Map

vSignalyzer lets you visualize logged GPS data on electronic maps. This significantly simplifies the interpretation of logged measurement data, as the geographical conditions can be considered during the analysis. In the offline analysis, the measurement values are displayed synchronously together with the corresponding vehicle position in the Map window.

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FIGURE 11: The total route with the current position of the vehicle is displayed. With the "Driver Assistance" option, detected vehicles can be visualized as red crosses, for example, as shown here.

10.1 Fields of Application

The possibility of synchronizing measurement data from a test drive with geographical positions and displaying this on a map makes it much easier to track certain events. This supplemental information often leads to more reliable interpretation of the behavior of your ECU; one example is when upshifting is performed on a mountain.

Overview of key functions:

> Display the vehicle position in the Map window
> Configurable display of the distance driven so far
> Simultaneous visualization of geographical and vehicle-specific data in the various display windows
> Synchronization of measurement cursor and vehicle position on the map
> Simultaneous display of several vehicles (e.g., with Car2x communication)
> Level of detail of the map display changes depending on the zoom setting

11. Analysis of Data Recorded With Loggers

In addition to signal-oriented visualization, a high-performance automated data analysis is particularly important for the large amount of data that is usually generated by data loggers. With Data Mining, vSignalyzer offers the ideal tool for this. For the analysis of recorded bus messages, the Trace window displays the messages time-synchronously to the signal characteristics in the Graphic window.

Recorded environmental data, such as GPS position and video data, are also visualized synchronously in time and facilitate your measurement data analysis. Data loggers often record sequences of individual images instead of a continuous video stream to use the available storage space as efficiently as possible. These single image sequences can of course also be displayed time-synchronously with vSignalyzer.

Voice comments recorded during the measurement drive often provide important insights for understanding a particular driving situation and thus for evaluating the measurement data. In vSignalyzer, these voice comments can be displayed as symbols in the Graphic window and played directly by double-clicking on them. You can simply hide irrelevant voice comments in the Symbol Explorer to concentrate on the essentials.

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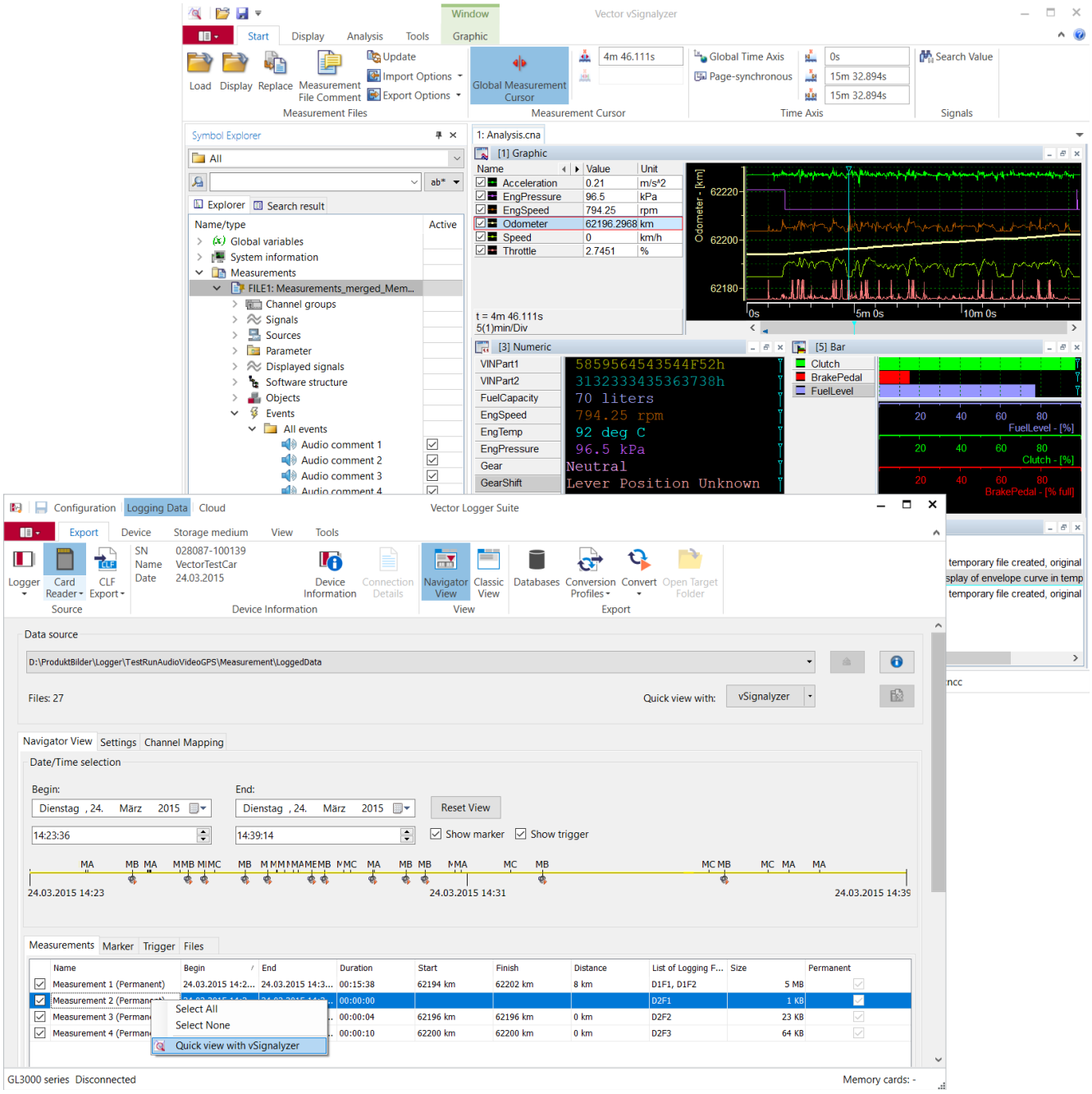


FIGURE 12: Start a data analysis directly from the Vector Logger Configurator with the quick view function

12. Development of Driver Assistance Systems

The option "Driver Assistance" enables developers of driver assistance systems (ADAS) and systems for automated driving to visualize recorded sensor data time-synchronously in specific windows. In this process, the sensor data is superimposed on the video image as graphical objects in a perspective view. Sensor data can also be visualized in a side view or from a bird's eye perspective. In addition to being superimposed on the video image, the captured data can also be displayed in a map in true-to-position form.

On the basis of the video image, you verify the recorded data and thus evaluate the reliability and operational safety of the system, regardless of whether it is a radar system such as ACC, a lane detection system or a parking assistant. The Scene window is available specifically for displaying the point clouds of the LIDAR systems.

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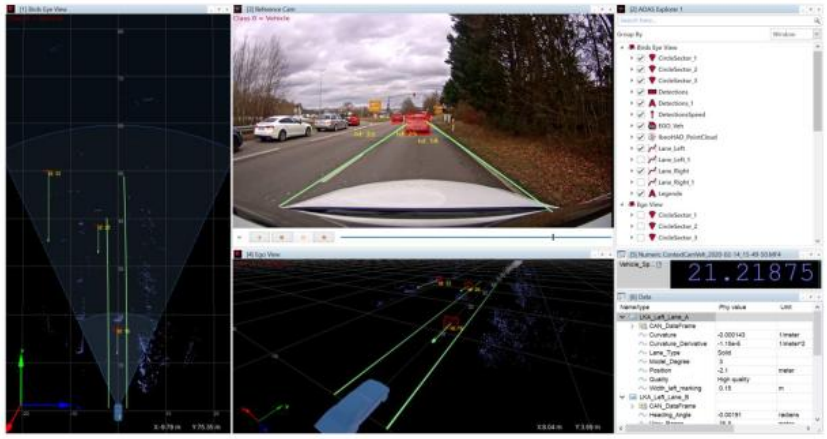


FIGURE 13: Option "Driver Assistance" - Object verification for driver assistance systems and optimization of image processing algorithms

13. Measurement Data Management With vMDM

vMDM (Vector Measurement Data Management) is the solution for efficiently managing large amounts of data from development, test bench runs and driver testing.

With the vSignalyzer function "Local vMDM" you can automatically index the measurement files on the hard disk of your workstation.

With vMDM, you store measurement data securely in the cloud, protect the data from unauthorized access, and facilitate the exchange of measurement data between distributed teams.

The vMDM Explorer in vSignalyzer allows direct access to all measurement data managed by vMDM, whether on local disk or in the cloud.

By using freely definable metadata, you create flexible organizational and search criteria. Both the test vehicle and the measurement technology or control unit hardware/software used can be described with characteristics that are important for you. This ensures that all measurement data can be found quickly and reliably at any time and can be used for data analysis.

This is not limited to the manual analysis of individual files. With freely definable search queries, you can find the matching measurement files and start the automatic analysis in the cloud at the push of a button.

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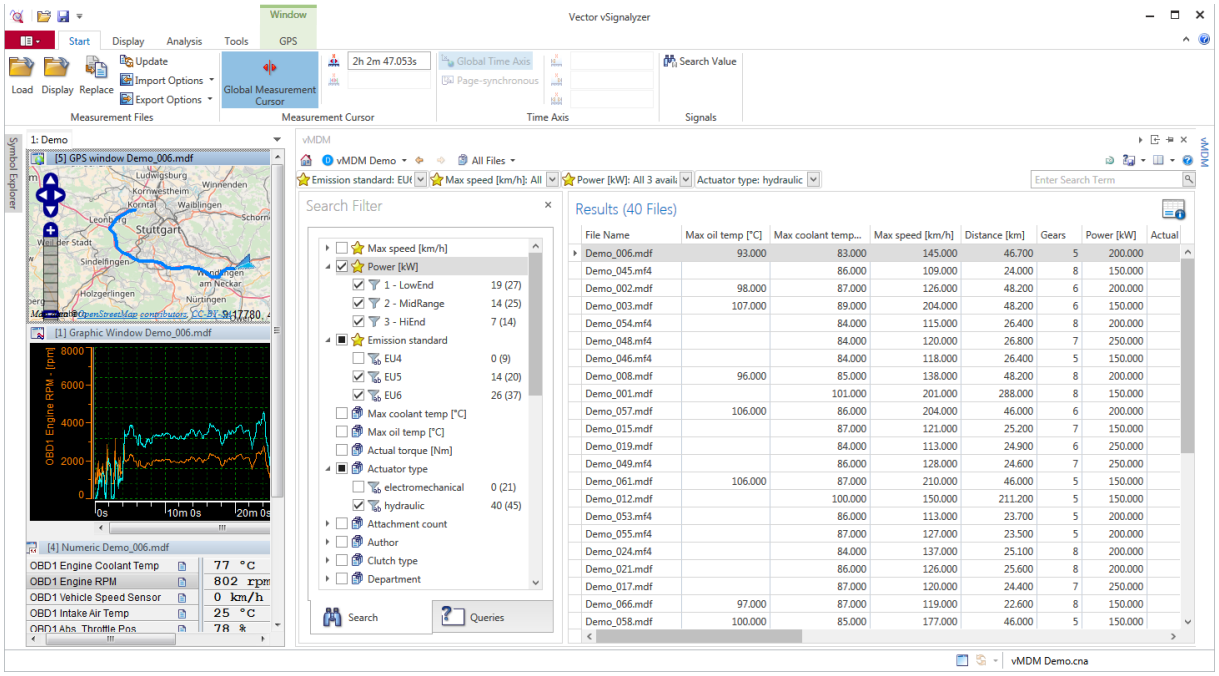


FIGURE 14: Quick access to measurement files with the vMDM Explorer window

14. Display of Thermodynamic Measurement Data

During the development and testing of all types of air conditioning and cooling systems, physical variables such as pressure and temperature are recorded on the test bench or test vehicle, usually together with other measurement signals and variables internal to the control unit. To evaluate the system parameterization and the components and coolants used, engineers from the field of air conditioning technology require a specific data visualization for thermodynamic data.

With the vSignalyzer Option Thermodynamic State Charts, you can now display thermodynamic data time-synchronously with other measurement data and generate meaningful state diagrams for offline analysis.

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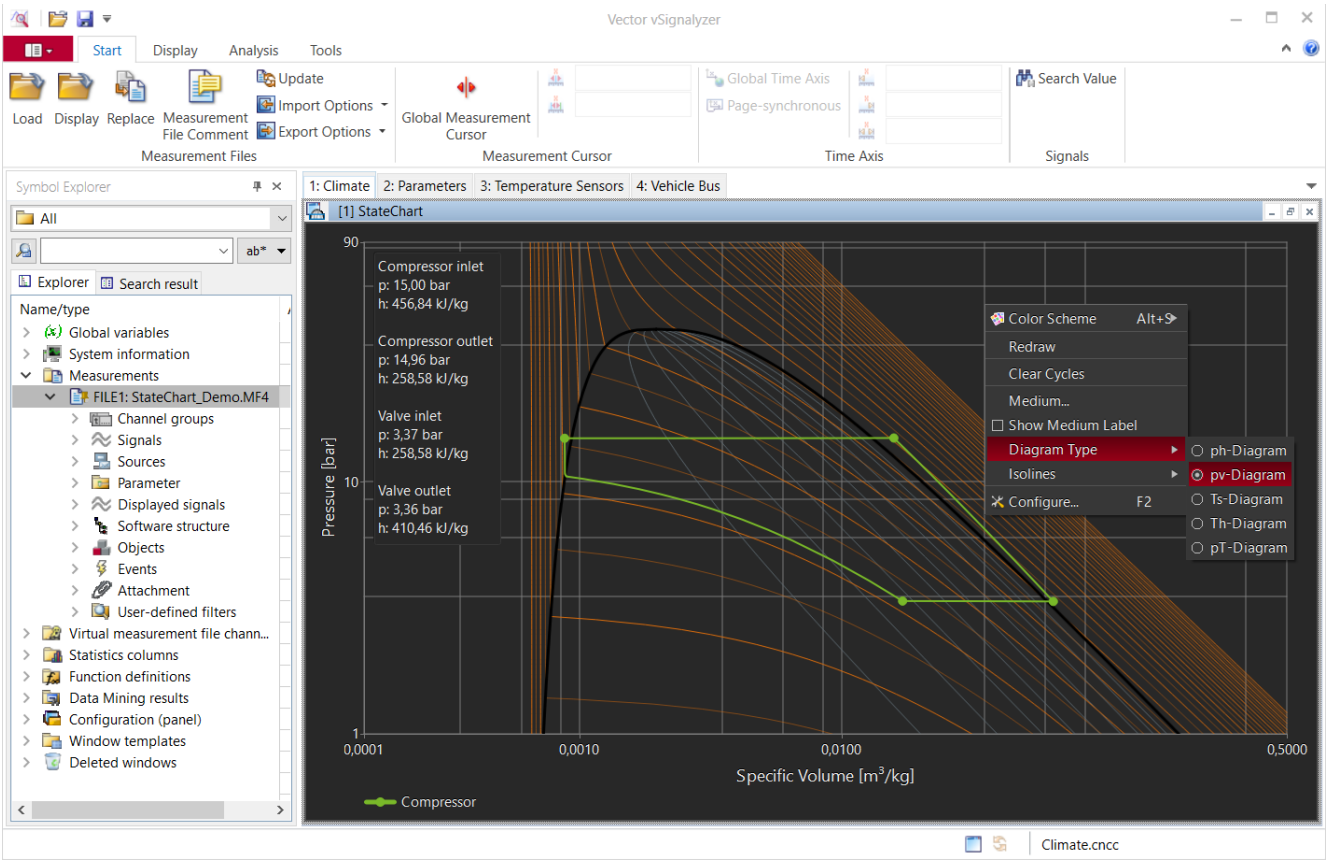


FIGURE 15: Professional display of thermodynamic state diagrams with the Thermodynamic State Charts option

15. Engineering Services

Vector can assist you with know-how and complete solutions tailored to your tasks, so that you can concentrate fully on ECU development. Our services range from consultation work, including developing specific analysis scripts, providing integration support, or posting a Field Application Engineer at your business site.

16. Trainings

As part of our training program, we offer training events for vSignalyzer in our seminar rooms or on-site at your location.

More information about the training courses and dates can be found on the Internet at: www.vector-academy.com.

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