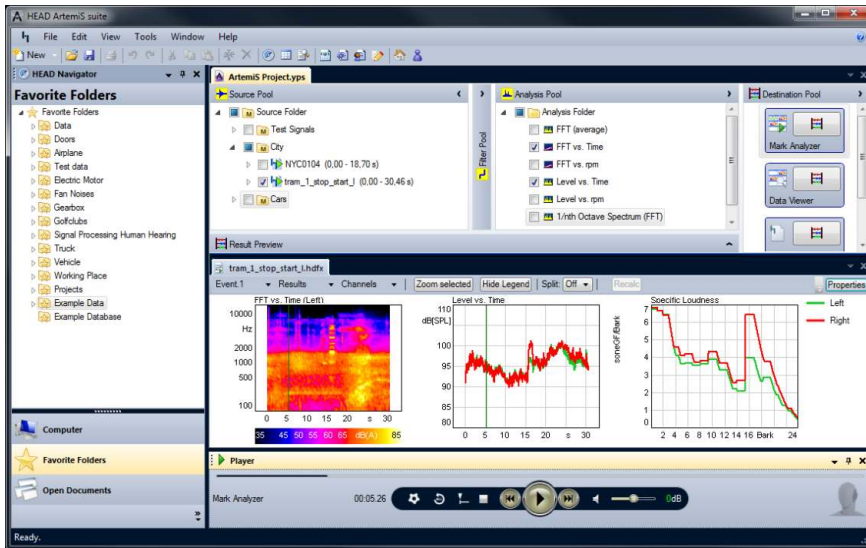


ArtemiS SUITE Basic Analysis Module (Code 5001)

Expansion module for basic analysis functions and filter operations



Overview

The Basic Analysis Module allows the calculation of basic analysis functions using various pre-processing functions such as filtering, sampling rate conversion etc. The saved analysis results can be subjected to statistical evaluations. For performing your tasks, the Basic Analysis Module provides the familiar pool and project structure known from ArtemiS, which has been modernized in the ArtemiS SUITE, as well as additional tools like the Mark Analyzer, the Data Viewer and the Mark Editor.

The ArtemiS SUITE comes with an additional ArtemiS 12 license. Existing ArtemiS 12 projects can be imported into the ArtemiS SUITE for further use.

Features

- Expansion module with basic analysis functions and filter options
- Modernized pool structure
- Mark Analyzer for displaying analysis results and playing time domain signals
- Data Viewer for customized display of analysis results with straight-forward channel routing
- Mark Editor for cutting and playback of time domain signals
- Analyses:
 - FFT vs. time / FFT (average) / FFT (peak hold) / FFT vs. RPM
 - Level vs. time / Level vs. RPM
 - Third octave / octave analyses (from FFT)
 - Order Spectrum vs. time / Order Spectrum vs. RPM
 - Specific Loudness according to DIN 45631 and ANSI S3.4-2007
- Various filter options:
 - IIR filters with configurable filter characteristics
 - Parametric IIR filters
 - Filters with variable time and frequency curves
- Simultaneous activation of any number of filters
- Variable filters / tracking filters with variable attenuation or amplification
- Filters for frequency weighting: A, B, C, D, G, W_{dr} , ... W_m weighting
- Equalization filter for channel-specific equalization of the input signal
- Sampling rate conversion of input signals (Filter Pool)
- Various statistical functions for saved analysis results:
 - Minimum / maximum / mean / median etc.

Requirements

- ArtemiS SUITE Basic Framework (Code 5000)

Project window (pool structure)

The straightforward project structure based on the pool principle known from ArtemiS has been adopted and further enhanced for the ArtemiS SUITE. It makes the individual work steps and the processing procedures very transparent and easy to handle for the user. Existing ArtemiS 12 projects can be imported into the ArtemiS SUITE and used further (with some limitations).

Mark Analyzer

The Mark Analyzer is used for the interactive analysis and playback of time domain data from the ArtemiS pools or a saved HDFX folder (a managed folder containing all data and information related to a specific measurement).

Data Viewer

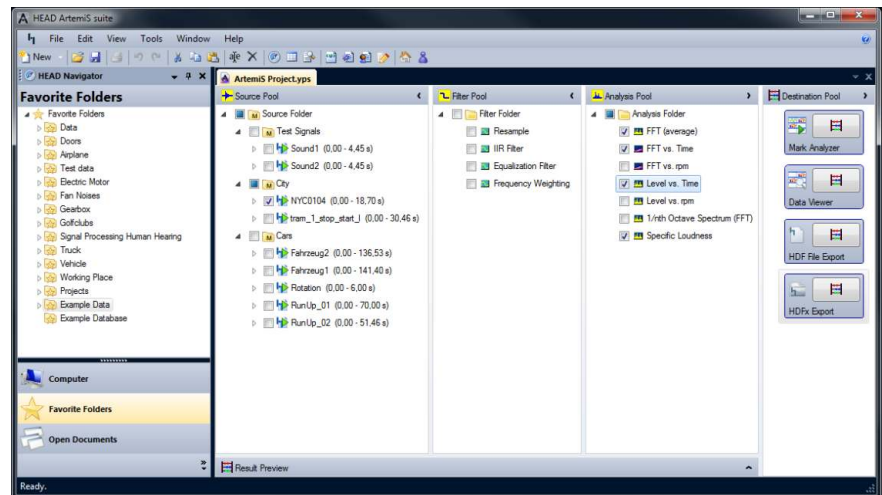
The Data Viewer is used to display analysis results in one or several diagrams. Furthermore, the Data Viewer allows the layout of analysis results to be customized and offers straightforward channel routing.

Diagram

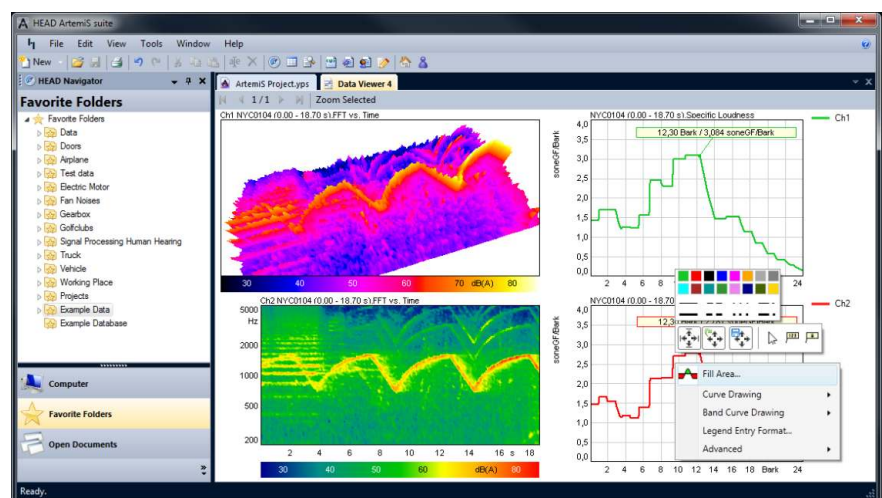
The diagram is used in the Data Viewer and in the Mark Analyzer to display 2D or 3D data sets. Extensive mouse-controlled editing possibilities make the diagram a flexible tool by itself for example, the magnet function allows information to be attached to curves, or tolerances between individual curves can be displayed.

Mark Editor

With the Mark Editor, individual sections of a mark can be cut interactively. The Player takes these changes into account and plays only the selected area.



The pool structure reflects the major steps of executing a project: data acquisition, processing (e.g. filtering), analysis, and calculation.



The Data Viewer is used for a customized display of analysis results. Channel routing allows the criteria for the layout of the individual diagrams to be selected.



The Mark Editor is a particularly easy-to-use tool for cutting the borders of marks.

Filter Pool

IIR Filter

Filter Kind:	Bandstop / Bandpass / Highpass / Lowpass / Allpass / Parametric Bandpass / Parametric Highpass / Parametric Lowpass / Octave Bandpass / 3rd Octave Bandpass / 6th Octave Bandpass
Filter Order:	1 - 4 (Octave Bandpass / 3rd Octave Bandpass / 1/6 Octave Bandpass: 6th Order)
Filter Type:	Butterworth / Bessel / Tschebycheff 0.5, 1. 2, 3 dB
Bandwidth Method:	Quality / Bandwidth Bark / Bandwidth Hz / Bandwidth Order
Filter Frequency (Hz):	The bandwidth in Bark can be specified
Tracking:	Selectable
Tracking Order:	Entering of the desired order
Tracking Offset (Hz):	Entering a fixed offset to the tracking order
Var Amplification:	Selectable
Var Amplification File:	Specifying the file containing the desired variable amplification
Amplification (dB):	Define the amplification inside the active filter area for parametric filters
All Channels:	A filter will be applied to all channels

Equalization Filter: Loading of the desired filter contained in an EQU file

Application: All Channels / Selected Channels

Resample

Audio Sampling Frequency:	Automatically
Sampling Rate (Hz):	Destination Sampling Rate Selectable
Target Sample Rate:	Adjustable

Frequency Weighting

Spectral Weighting:	None / A / B / C / D / G / W_d / W_k / W_h etc. Weighting (IEC 61672 / ISO 7196 / ISO 2631)
Channel Selection:	All Channels / All Airborne Channels / All Vibration Channels / Selected Channels

Analysis Pool

FFT (Average) / FFT v. time (peak hold) / FFT vs. time / FFT vs. RPM

Spectrum Size:	16 - 2 ²³ Samples
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectral Weighting:	None / A / B / C / D / G / W_d / W_k / W_h etc. Weighting / Equal Loudness / Integrate (1x) - (2x) / Differentiate (1x) - (2x)
Overlap:	Selectable
Smooth:	Off / Octave - 1/24th Octave (Intensity Averaging / dB Averaging)
Amplitude Scaling:	RMS / Peak
Phase:	None / Reference Channel
Store DC:	Selectable
Step Size (r/min):	0.01 - 1000
Slope:	Auto Detect / Rising / Falling / Angle / Rotation
Cuts:	Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

Specific Loudness vs. time

Method:	DIN 45631 / ANSI S3.4-2007 (FFT/FFT 3rd Octave)
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectrum Size:	16 - 2 ²³ Samples
Soundfield:	Free / Diffuse
Overlap:	Selectable
Frequency Scale:	Hz/Bark / Hz/ERB

1/nth Octave / 1/nth Octave (peak hold) / 1/nth Octave vs. time

Method:	FFT Synthesis
Band Resolution:	Octave / 3rd Octave / 1/6 - 1/96 Octave
Band Order Frequencies:	Nominal / Octave / Decade
Spectral Weighting:	None / A / B / C / D / G / W_d / W_k / W_h etc. Weighting / Equal Loudness
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectrum Size:	16 - 2^{23} Samples
Overlap:	Selectable
Row:	A / B
Cuts:	Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

Level vs. time / Level vs. RPM

Spectral Weighting:	None / A / B / C / D / G / W_d / W_k / W_h etc. Weighting / Equal Loudness
Time Weighting:	Fast / Slow / Impulse / Manual (0.01 - 60000 ms) / Rectangle (0.01 - 60000 ms)
Time Constant:	Selectable
Downsampling:	Selectable
Step Size (r/min):	0.01 - 1000000
Slope:	RPM (Auto Detect) / RPM (Falling) / RPM (Rising)

Bypass

Instead of analyzing Bypass displays the time signal in the Mark Analyzer or the Data Viewer

Order Spectrum vs. Time / Order Spectrum vs. RPM

Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectral Weighting:	None / A / B / C / D / G / W_d / W_k / W_h etc. Weighting
Amplitude Scaling:	RMS / Peak
Spectral Range:	Min. Order / Max. Order
Spectral Resolution (Ord.):	Selectable
Width Definition:	Off / Order / Frequency / Frequency Factor / Bark
Width (Ord.):	Selectable
Order Algorithm:	Variable DFT Size / RPM Synchronous Resampling / Time Domain Averaging
Phase:	Off / Ref. Channel / Ref. Order / Ref. to Pulse
Reference Channel:	Selectable
Frequency Offset (Hz):	Selectable
Time Weighting:	Fast / Slow / Manual
Time Constant:	Selectable
Step Size (time):	Selectable
Slope:	RPM (Auto Detect) / RPM (Falling) / RPM (Rising)
Cuts:	Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

**ArtemiS basic software
 (Code 5000_5001)**

Multi-channel analysis software for acoustic and vibration analysis

The ArtemiS basic software is included in the purchased parts package of ASM 00 (Code 5000) and ASM 01 (Code 5001) of the ArtemiS SUITE.

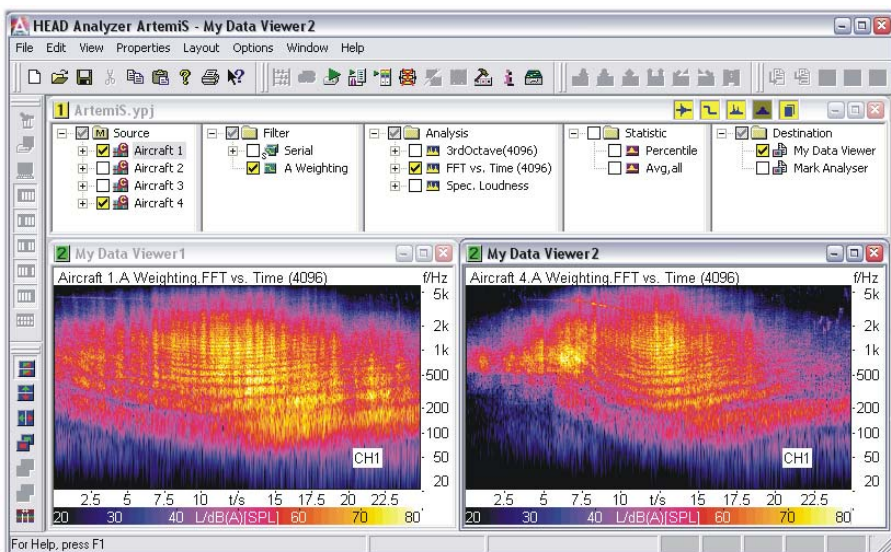
The project-oriented arrangement

of the user interface, which is subdivided into five areas ("pools"), as well as the clearly arranged controls, make your individual working steps and the progression of the entire analysis process as transparent as possible.

In the data pool, the files to be analyzed are listed in a clearly arranged folder structure. For further processing, you simply use the mouse to pick the desired filters, analysis methods, statistic functions, export and display options from the filter, analysis, statistics, export or destination pool, respectively.

The modular design

of ArtemiS allows a flexible adaptation even for special requirements. Using the ArtemiS Tool Packs (ATPs), you can make use of extended functionality - more than 140 analysis, at that statistic calculations, import and export functions - and thus turn ArtemiS into a customized system for your special applications.



Features

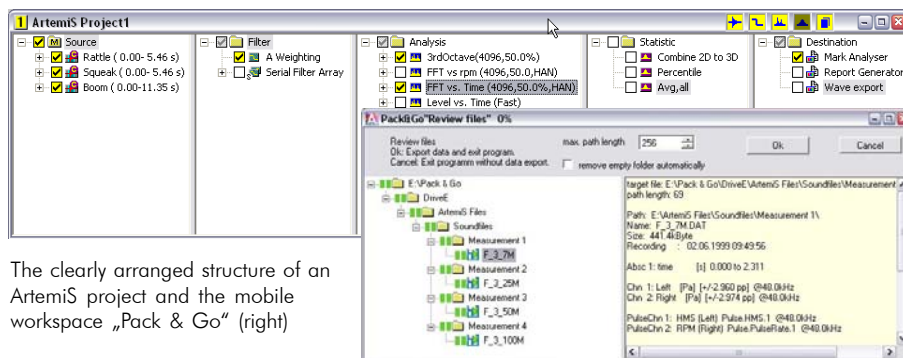
- Programmable flow control for automating frequently needed procedures
- Multi-processor support
- Filters, analysis, statistic calculations, display functions, import/export functions
- Network support
- Modular design
- Automatic multiple analysis
- Multi-language user interface and context-sensitive help
- Automated documentation with standardized templates

Applications

- Sound and vibration analysis
- Sound engineering
- Product development and quality control
- Sound design
- Acoustic fault diagnostics
- Psychoacoustics

The ArtemiS multi-channel analysis software

is the proven solution for all types of sound and vibration analysis. Using the latest multi-processor-compatible software technologies, ArtemiS is not only a highly efficient and versatile analysis tool, but also provides easy handling. All major functions can be accessed via drag & drop, greatly facilitating your every day working routine. Even complex tasks can be performed intuitively and



The clearly arranged structure of an ArtemiS project and the mobile workspace „Pack & Go“ (right)

quickly with ArtemiS. Any number of measurement channels can be filtered, displayed, archived and exported in one step, where each activated file is automatically subjected to all desired analysis steps.

General tools

ArtemiS possesses general tools, which facilitate handling and a working with ArtemiS substantially.

- The flow control module allows repeatedly performed procedures to be automated quickly, easily and without any programming knowledge. A fully automated workflow is possible as well as user interaction via dialogs and buttons.

The flow control module also allows other software products to be connected to ArtemiS automatically, e.g. Microsoft® Excel® and Word.

- The mobile workspace (Pack & Go) allows for an uncomplicated archiving of complex ArtemiS projects, the individual work environment respectively its dislocation e.g. to an other computer included.

- The Mark Editor is a tool for the quick and convenient editing and playback of audio signals. Signals can be cut in consideration of a reference variable, and the sequences can be saved as new files.

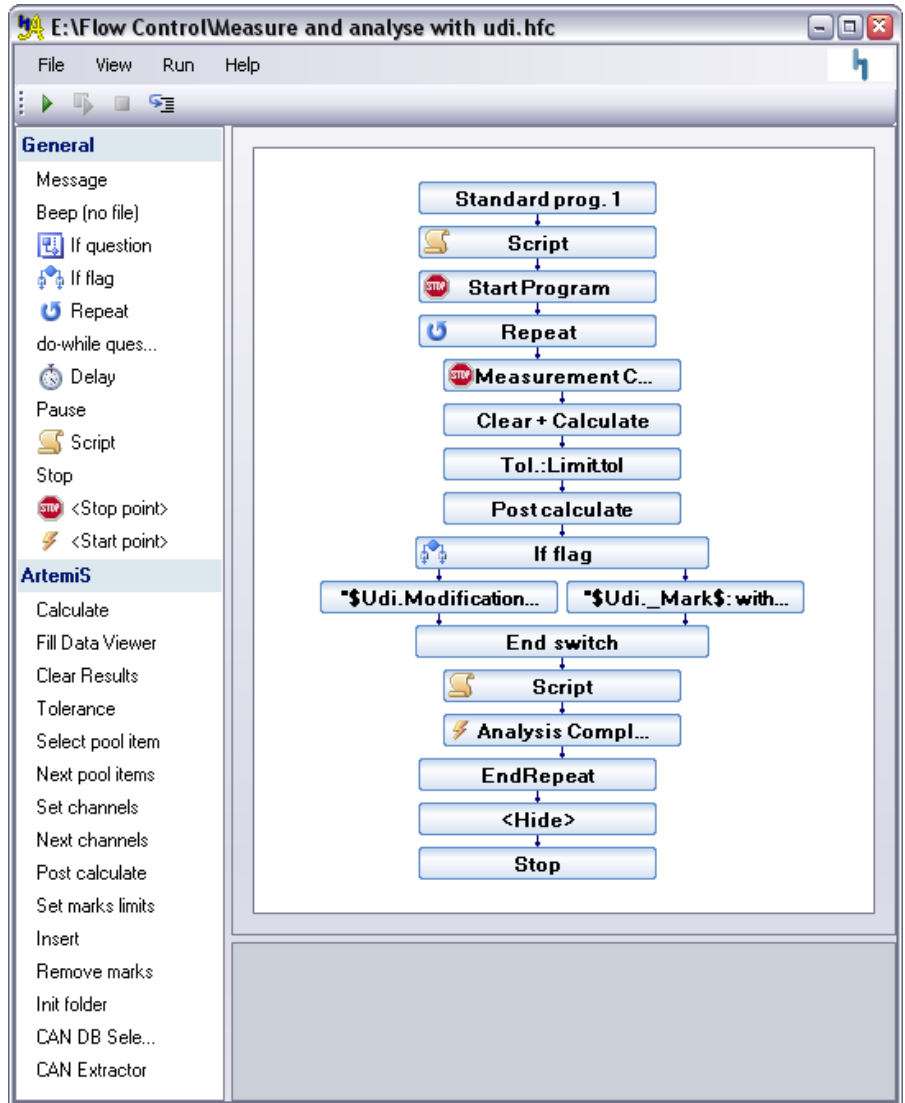
- The Tolerance Scheme Editor allows to create and to edit tolerance curves.

- For all order analyses a frequency offset can be adjusted, e.g. for calculation of electric motors

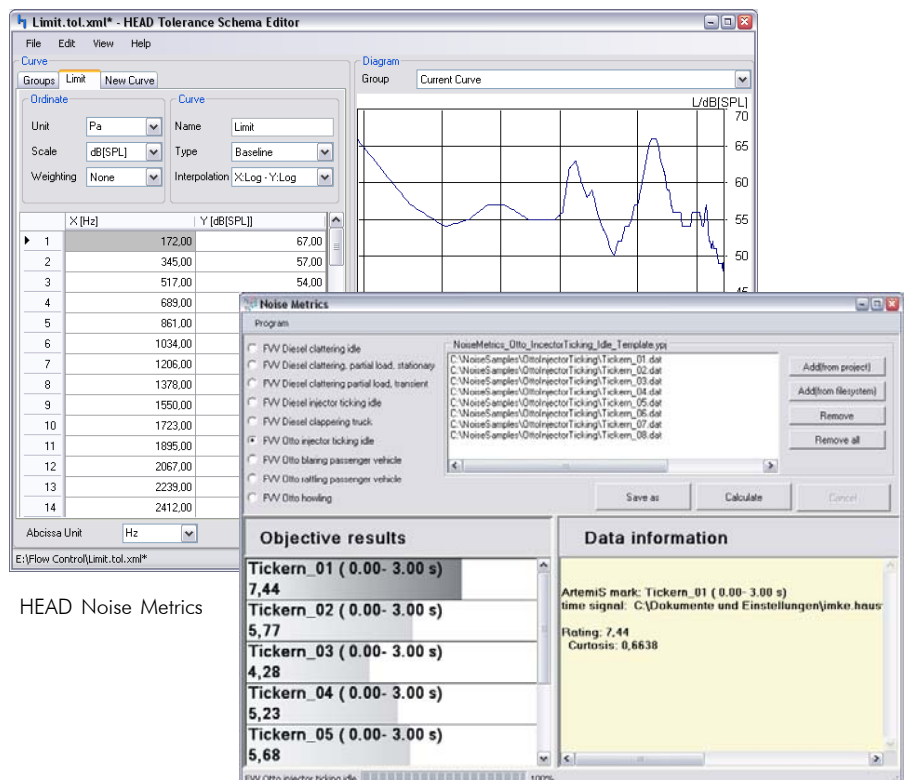
- Channels can be selected by means of editable filters

- HEAD Noise Metrics allows various - predefined - noise metrics (for combustion engines) to be calculated

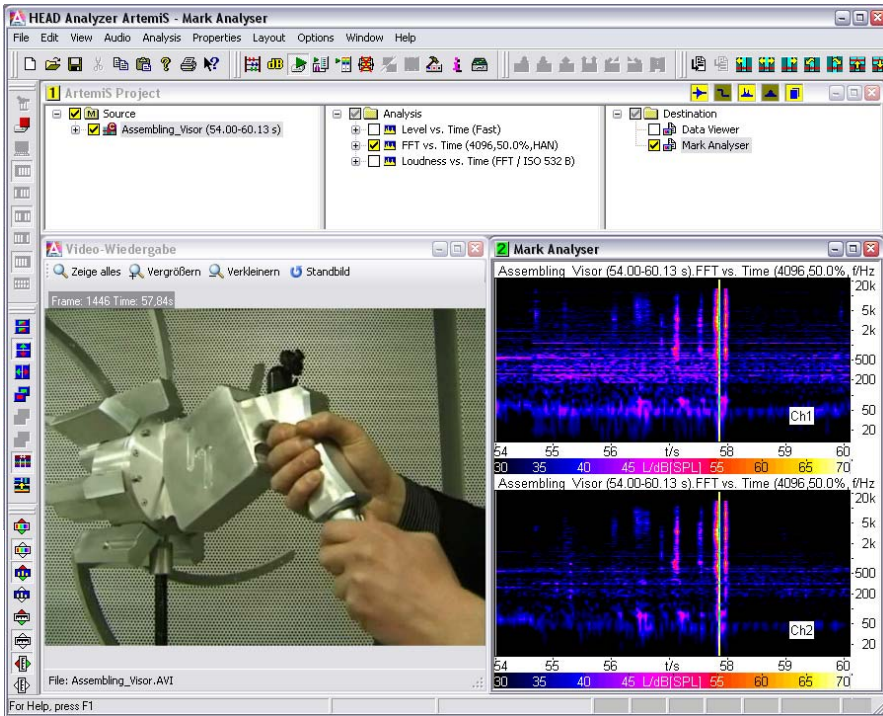
- Beyond that ArtemiS offers the possibility of storing individual working environments (e.g. automatically), informs about the projects, measurements or diagrams used last, permits a storing of result diagrams as pixel diagram or as meta file and much more besides.



Example of a flow control in ArtemiS



HEAD Noise Metrics



Videos (AVI) recorded with the HEAD Recorder can be used, for example, to attribute transient sound events to a filmed action. Single frames can be displayed as well.

Data Pool

- The Pulse Wizard provides, among other functions, a correction mechanism for the optimization of revolution speed (rpm) data generation. A missing rpm value can be inserted manually or numerically or can be determined automatically from a significant order in the signal.
- User-defined information about measurement objects, measurement location, time etc. can be saved along with the measured data and used in further applications.
- Import of Wave, ASCII and MP3 files via individual templates

Filter Pool

- The base version of ArtemiS allows the simultaneous use of up to four IIR filters, which can be configured individually.
- Spectral weighting: for airborne measurements A, B, C, D weighting curves are available.

Infrasonic measurements can be weighted with the G weighting according to ISO 7196.

For vibration measurements, the W_d , W_k , W_h - etc. weightings according to ISO 8041 and ISO 2631 are available.

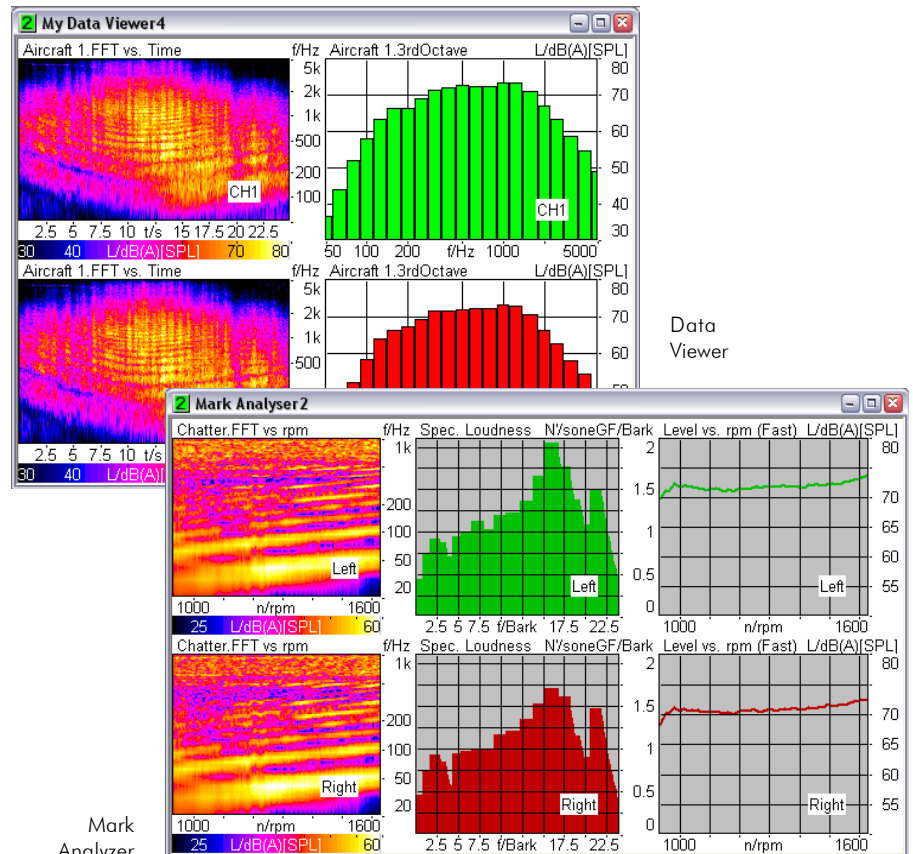
- Vector summation e.g. for the determination of the vector sum of triaxial accelerometer signals.

- Conversion of physical units (e.g. g to m/s^2)
- The delay function allows a channel selective time shifting, e.g. for compensation a delay between the audio signal and the rpm.

Analysis Pool

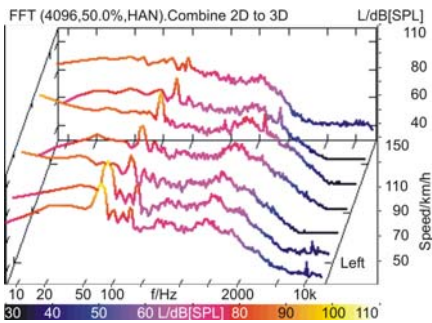
The following analysis types are available in the base version:

- 1/3-octave spectrum / 1/3-octave spectrum (peak hold) / 1/3-octave spectrum vs. time
 - Level vs. time / level vs. rpm
 - FFT (averaged) / FFT vs. time (peak value) / FFT vs. time / FFT vs. rpm
 - Order levels vs. time (cut) / order levels vs. rpm (cut)
- For all order analyses and all order filters (that applies to the ATPs too) a frequency offset can be adjusted
- Harmonic distortion / Harmonic distortion vs. time / Harmonic distortion vs. frequency
 - Power spectral density (PSD) (averaged) / power spectral density vs. time / power spectral density vs. rpm
 - Specific loudness can be chosen according to DIN 45631, ISO 532 B, ANSI S3.4-2007 (based on FFT or digital filters) or HEAD algorithm
 - Reverberation time vs. band



Statistic Pool

- ArtemiS can determine the average value, the maximum and minimum value, the sum and the difference of time signals.
- Furthermore, calculation results can be displayed in a diagram and exported as single value (minimum, maximum, mean values).
- Two-dimensional results from different data sets can be combined into a three-dimensional data set.

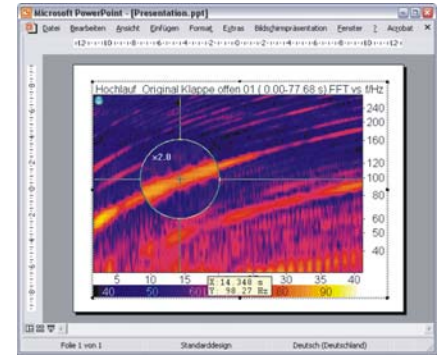


Two-dimensional results can be combined into a three-dimensional data set

- ArtemiS automatically performs a tolerance check and displays the tolerance curves in the result window and in the Mark Analyzer.
- Two or more phase-shifted digital pulses allow for the extraction of the reference variable rotation angle, which can be used as new analog channel.

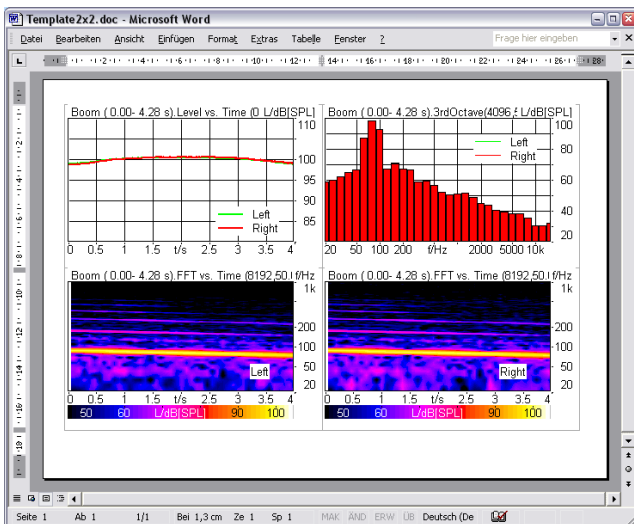
Destination Pool

- The Mark Analyzer is a complete analyzer for time signals. Simply drag marks, filters or analysis functions onto a Mark Analyzer with the mouse, and the analyzer will automatically perform the corresponding calculations.
- For data exchange with third-party systems, the base version of ArtemiS provides several import and export options – Wave, ASCII, Excel, ATFX and MP3. In addition, other useful options – such as fading for Wave export etc. – are available.

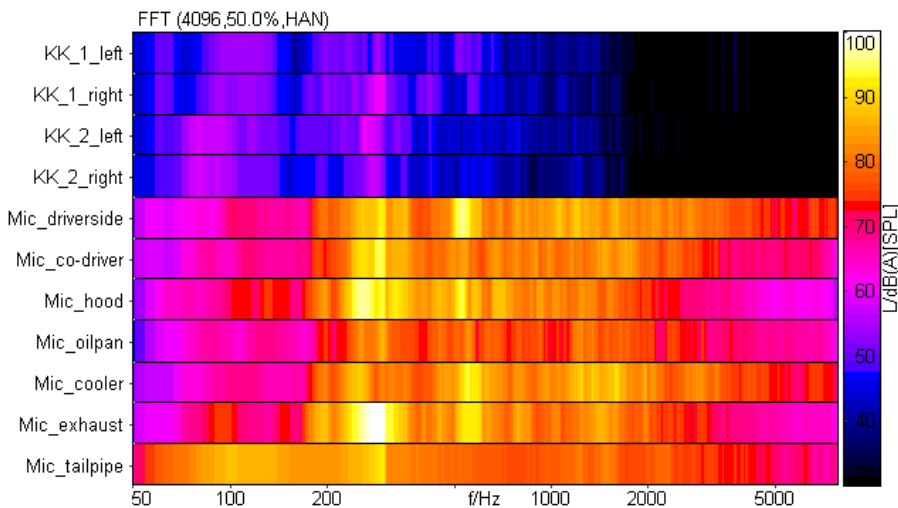


„Living“ diagram in PowerPoint®

- „Living“ diagrams can be inserted into Microsoft® PowerPoint®, Word or other programs supporting the integration of properties. At the same time, the usual functionality of the diagrams with ArtemiS (zooming, scaling, magnifying) remains unaffected.
- Easily and safely analysis results can be automated exported by means of an easy to use report generator in standardized Word documents.
- The Data Viewer provides a clean overview of the results (up to 64 diagrams) and a wide range of possibilities for your individual layout of the analysis result presentation. Furthermore, the Data Viewer allows the diagrams to be exported to various formats (Word, BMP, TIFF, JPEG, PNG).



Example of a report in MS Word



Color band display, e.g. displayed in the Mark Analyzer

**ArtemiS basic software
 (Code 5000_5001)**

Technical Data

Filter Pool

IIR-Filter

Filter kind: Bandstop / Bandpass /
 Highpass / Lowpass /
 Allpass
 Frequency: 1 - 24000 Hz
 Filter Type: Butterworth / Bessel /
 Tschebycheff 0.5 - 3 dB
 Filter Order: 1 - 4
 Filter Quality: 0.1 - 1000
 Export / import: HIS data (for headphone
 equalization)

Equalization: Lin / BHM III / BHM III.2 /
 BHM III.3 / FF, DF, ID for
 HSU II / HSU III / HSU III.1

Calculate

Enables the time signal operations multiplication of the
 levels, constant component and change of the sampling
 rates before the analysis

Differentiation / Integration

Single or multiple differentiation or integration of the time
 signals

Resample Signal

Adjustable target frequency
 Stretch faktor: 0.1 - 10

Unit conversion

Acceleration: m/s^2 ; g ; ft/s^2 ; in/s^2
 Speed: m/s ; ft/s ; in/s
 Distance: m ; ft ; in

Delay

Delay of individual or multiple channels by an adjustable
 value (positive or negative)

Frequency weighting

A / B / C / D / G / W_d / W_k / W_h etc. weighting
 (IEC 61672 / ISO 7196 / ISO 2631)

Vector summation

Vector summation e.g. for the determination of the vector
 sum of triaxial accelerometer signals

Analysis Pool

**1/nth Octave / 1/nth Octave (peak hold) /
 1/nth Octave vs. time**

Method: FFT synthesis
 Band resolution: Octave / 3rd octave
 Band order frequencies: Nominal / Octave / Decade
 Spectral Weighting: Lin / A / B / C / D /
 G / W_d / W_k / W_h etc.
 Weighting / Equal
 Loudness
 Window Function: Rectangle / Hanning /
 Hamming / Blackman /
 Bartlet / Kaiser-Bessel 8 -
 16 / Flat-top / Gauss 8,
 16, 32
 Spectrum Size: $16 \cdot 2^{20}$ Samples
 Overlap: 0 - 99.9 %
 Row: A / B

Level vs. time / Level vs. RPM

Spectral Weighting: Lin / A / B / C / D /
 G / W_d / W_k / W_h etc.
 Weighting
 Downsampling: adjustable
 Time Weighting: Fast / slow / impulse /
 manual (0 - 60 s) /
 rectangle (0 - 60 s)

Reverberation time: Decay range selectable

Level vs. RPM

Step size (RPM): 0.001 - 1000
 Slope: RPM (Detect) /
 RPM (Falling) /
 RPM (Rising))

Bypass

Instead of analyzing Bypass displays the time signal in
 the Mark Analyzer or the Data Viewer

Differentiation / Integration

Differentiation and integration of a selected time signal

Reverberation time vs. band

Band resolution: Octave / 3rd Octave /
 6th Octave
 Row: A / B
 Time constant (ms): 1 - 1000
 Fixed / Frequency dependent
 (for 1 kHz)
 Frequency range (Hz): 10 - 30000
 Show correlation: selectable
 Reverberation time: Decay range selectable
 Representation: Reverb time / Level (original) /
 Level (regression)

Analysis Pool

FFT (Average) / FFT v. time (peak hold) / FFT vs. time / FFT vs. RPM

Spectrum Size:	16 - 2 ²⁰ Samples
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectral Weighting:	Lin / A / B / C / D / G / W _d / W _k / W _h etc. Weighting / Equal Loudness / Integrate (1x) - (2x) / Differentiate (1x) - (2x)
Overlap	0 - 99.9 %
Smooth:	Off / octave - 24th octave (intensity av. / dB averaging)
Amplitude scaling:	rms / peak <i>FFT vs. time / FFT vs. RPM</i>
Phase:	none / reference channel <i>FFT vs. RPM</i>
Step (RPM):	0.001 - 1000
Slope:	RPM (Falling) / RPM (Detect) / RPM (Rising) / CA / Rotation

Order Spec. vs. time / Order Spec. vs. RPM

Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectral Weighting:	Lin / A / B / C / D / G / W _d / W _k / W _h etc. Weighting
Amplitude scaling:	rms / peak
Step Size (s):	0.001 - 1000
Spectral Resolution (order):	selectable
Spectral Range (order):	selectable
Time Weighting:	fast / slow / manual
Algorithm:	Variable DFT size / RPM-sync. resampling / Time domain averaging
Phase:	off / Ref. channel / Ref. order / Ref. to pulse
Frequency offset (Hz):	selectable
<i>Order vs. RPM</i>	
Step (RPM):	0.001 - 1000
Slope:	RPM (Falling) / RPM (Detect) / RPM (Rising)
Order cut display:	Hz / RPM

Power Spectral Density (Average) / Power Spectral Density vs. time / Power Spectral Density vs. RPM

Spectrum Size:	16 - 2 ²⁰ Samples
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectral Weighting:	Lin / A / B / C / D / G / W _d / W _k / W _h etc. Weighting / Equal Loudness / Integrate (1x) - (2x) / Differentiate (1x) - (2x)
Overlap	0 - 99.9 %
Smooth:	Off / octave - 24th octave (intensity av. / dB averaging)
<i>Power Spectral Density vs. RPM</i>	
Slope:	RPM (Falling) / RPM (Detect) / RPM (Rising) / CA / Rotation

Spec. Loudness

Calculation Method:	DIN 45631 ANSI S3.4-2007 (FFT/FFT 3rd Octave) ISO 532 B (Filter/FFT HEAD algorithm)
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectrum Size:	16 - 2 ²⁰ Samples ⁰
Sound field:	Free / Diffuse
Overlap	0 - 99.9 %
Frequency Scale:	Hz / Bark
Filter order:	4. / 6. order

Resample Signal

Assignment of new sampling frequencies	
Stretch faktor:	0.1 - 10

Harmonic Distortion / Harmonic Distortion vs. Frequency / Harmonic Distortion vs. time

Overlap:	0 - 99.9 %
DFT size:	256 - 2 ²⁰ Samples
Frequency range:	0 - 500 000 Hz
Reference:	Signal Power / 1st Harmonic / All Harmonics
Results:	THD / THD+N / SN / Sum / Single

Harmonic Distortion vs. Frequency

Frequency Scale:	Lin (selectable in Hz) / Octave / 3rd Octave / 6th Octave
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