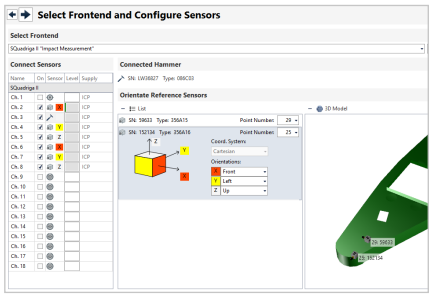
HEAD acoustics
Ebertstraße 30a
52134 Herzogenrath
Tel.: +49 2407 577-0
Fax: +49 2407 577-99
eMail: info@head-acoustics.de
Web: www.head-acoustics.de

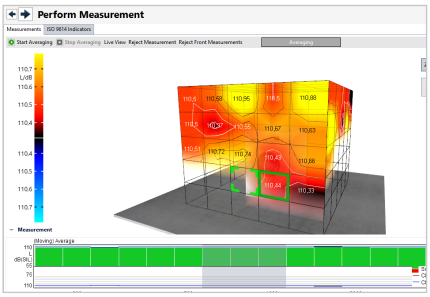
ArtemiS SUITE
ASM 18

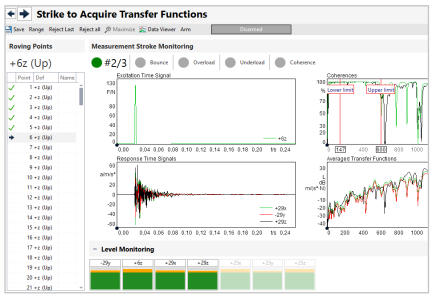
DATA SHEET

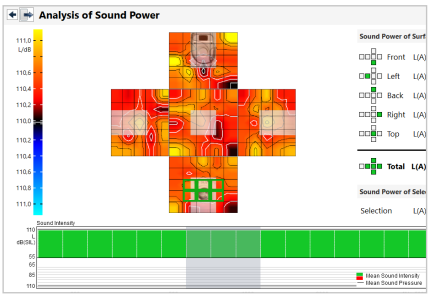
ArtemiS SUITE Online Analysis Module (Code 5018)

Extension module for impact measurements and determining sound power using sound intensity measurements









Overview

The Online Analysis Module (ASM 18) includes two different functions: impact measurement and sound intensity measurement.

While impact measurements are used to examine the dynamic properties of components, sound intensity measurements are used to determine the sound power emitted by a test object according to ISO 9614-1 by means of a sound intensity map of a 3D model or to perform quick diagnostics.

Software assistants for both functionalities guide the user through the standardized procedures step by step. For certain steps, automatic quality control functions with visual and acoustic feedback are provided, allowing even unexperienced users to achieve the desired results with little effort and a low risk of errors.

All results can be displayed in a Data Viewer or in a report (ISO 9614 compliance is supported). While results of impact hammer measurements can be further processed directly in the ME'scopeVES™ analysis software, sound intensity measurements can be examined in more detail using functionalities of ArtemiS SUITE.

HEAD acoustics offers suitable hardware for performing both functions.

Features

Impact measurement

- Methods:
  - "Roving hammer" method with fixed reference points
  - „Roving accelerometer" method with a fixed excitation point
- Coordinate systems:
  - Cartesian system
  - Cylindrical system for round, axially symmetric test objects
  - Spherical system for spherical test objects
- Automatic configuration of the desired measurement parameters with a few test strikes
- Optional reciprocity check
- Checking of coherence between the averaged strikes
- Representation of the time domain signal of the impact hammer, the time domain signals of the reference points, the coherence, and the transfer functions averaged over the individual hammer strokes, each in a separate diagram
- Display of the results in the Data Viewer and as a report (with the Basic Report Module ASM 02)

Sound intensity measurement

(as of ArtemiS SUITE version 10)

- Determining sound power according to ISO 9614
  - Discrete points (creation of sound intensity maps and measurement of sound power)
    - Measurements at discrete points (ISO 9614-1)
    - Sound intensity mapping of a 3D model during measurement
  - In preparation:
    - Measurement by scanning (ISO 9614-2)
    - Precision method for measurement by scanning (ISO 9614-3)
  - Assistant-guided procedure for standardized measurements
- Quick diagnostics (troubleshooting)
  - Quick localization of sound sources, comparative measurements, etc.
- One-click report, either ISO-compliant or freely designed
- Export to Excel or image file (PNG)
- Further analysis, processing, etc. with ArtemiS SUITE

Impact measurement

Assistant-guided usage

With a number of automated features, the impact measurement function guides the user through the configuration and the measurement of the data required for a modal analysis.

Impact measurement projects can be saved and can later be reloaded and re-used with all original settings.

Methods

For data acquisition, two different methods are available.

- The “roving hammer” method is ideal for small components and requires little preparation time.
- The “roving accelerometer” method, where excitation with the impact hammer takes place at a fixed position and orientation, while the sensors are relocated for each measurement, is particularly suited for large, complex components.

Configuration

Depending on the shape of the measurement object, users can choose between cartesian, cylindrical and spherical coordinates. For measurement objects with a complex geometry, it is also possible to combine different coordinate systems in one measurement.

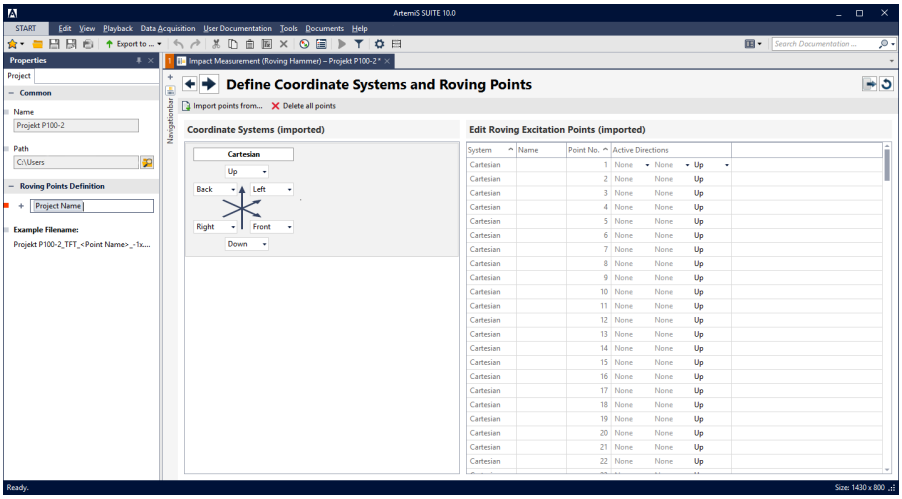
Parameter acquisition

All that is needed to determine the required measurement parameters are some test strikes, from which the desired sampling rate, the window size and windowing function, the pre-triggers for the hammer, the threshold values for triggering the hammer and the appropriate measurement range will be determined. Each strike is followed by both visual and acoustic feedback on the quality of the strike.

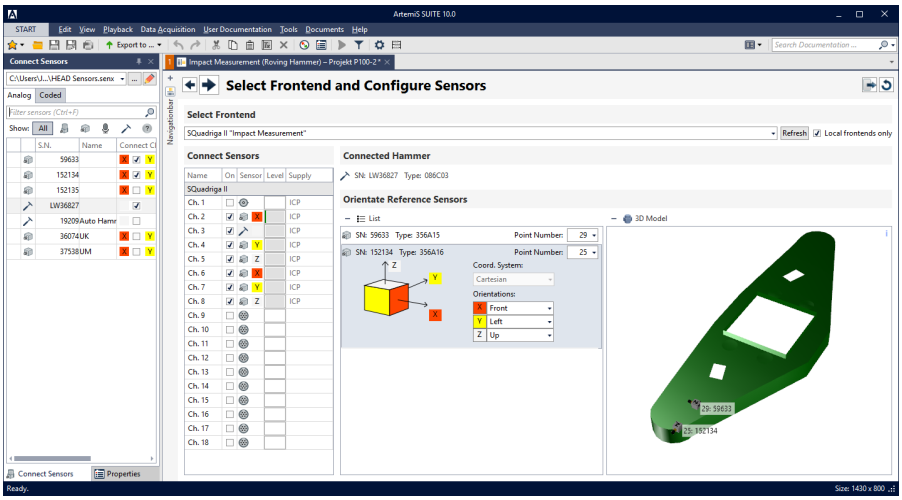
Double impacts, signal clipping, and impacts with an insufficient signal level are detected automatically, and the ranges are adapted accordingly.

Users can turn off the automatic functions and do the configuration manually.

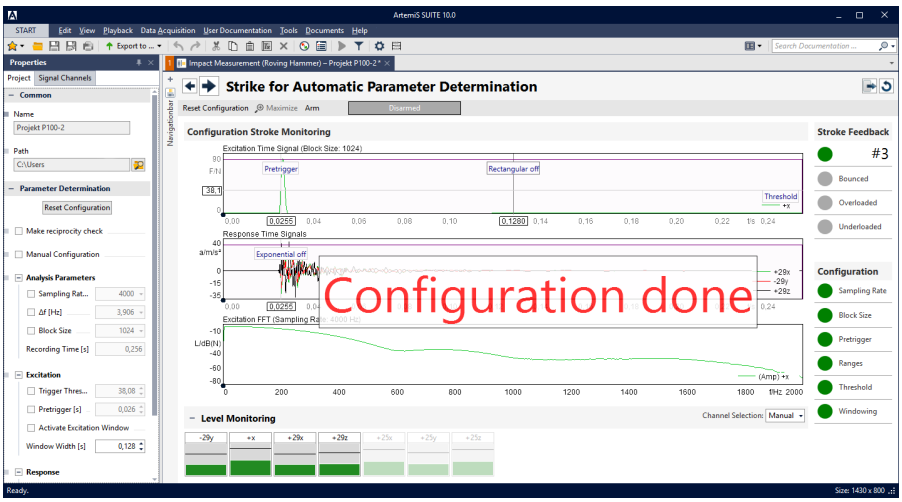
As an alternative to the manual procedure, a UFF model or a 3D model created with ME‘scopeVES™ can be imported. Using the 3D model, sensors can be automatically orientated to the surface of the model for minimizing the error rate.



The configuration and orientation of triaxial acceleration sensors is done quickly and safely thanks to easy handling and the use of common names.



The front-end and sensor configuration can be used to select the front end, to connect the desired sensors and to specify the orientation of the reference sensors.



During the automated acquisition of the measurement parameters, users get both acoustic and visual feedback (via colored LED icons) as well as information as to whether the strike was double, too strong or too weak.

Reciprocity Check

Using the optional reciprocity check, transfer functions are measured crosswise in both directions and their results are overlaid in the diagram.

Measurement

As with the previous steps, the software also guides the user, step by step, through the measurement of the transfer function.

The software displays which point is to be struck in which direction. Each strike is subjected to quality control. As during parameter acquisition, users get immediate feedback both visually and acoustically. The acoustic feedback allows the user to fully concentrate on the measurement points to be struck during the impact measurement, which allows a quick measurement without looking at the computer.

The quality control function checks for double strikes, too high or too low strike signals and coherence. If any of these criteria is violated, the strike is repeated.

Besides acoustic control, four diagrams also allow visual control of the results by displaying the time domain signals of the excitation and all defined reference points, the calculated coherences and the averaged transfer functions after each successful strike.

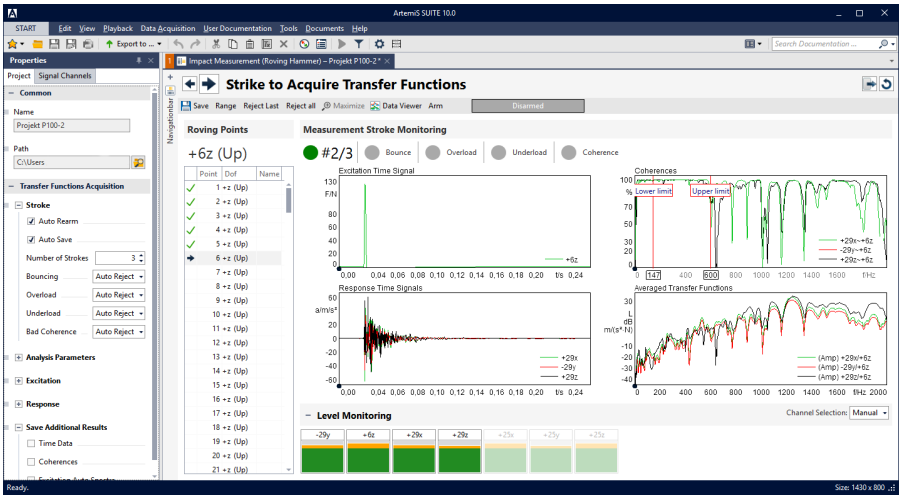
Export to ME'scopeVES™

The entire data set can also be exported to the BLK format in order to use it for further processing with the ME'scopeVES™ analysis software from Vibrant Technology (not included). This allows users to view animations of the oscillation modes and to perform advanced structural dynamic analyses.

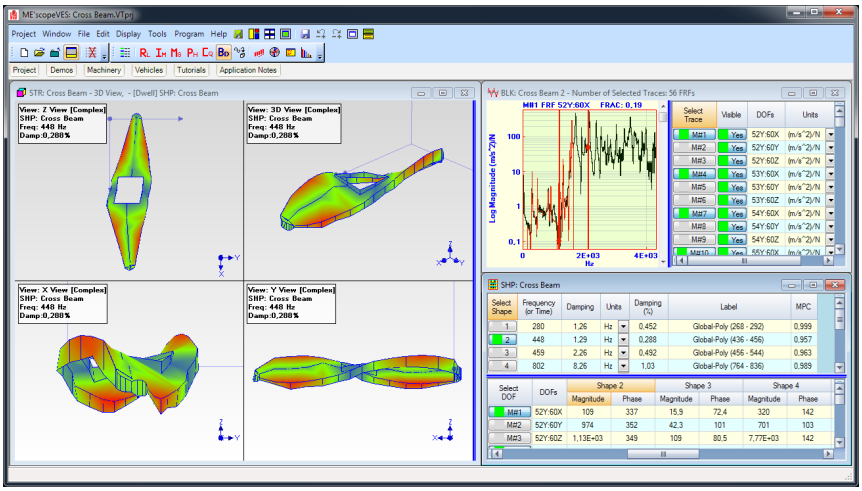
Further processing in ArtemiS SUITE

The measured transfer functions can be viewed in a Data Viewer or in a report (with ASM 02).

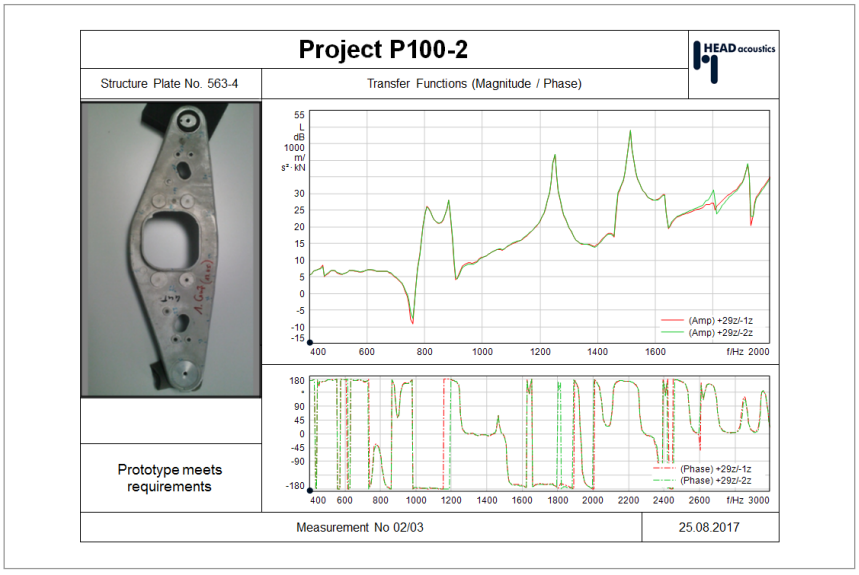
Furthermore, the results can be exported to Excel and to other licensed third-party formats (e.g. for activating the export to UFF, the Advanced Import & Export Module, ASM 23 is required).



The measurement window provides four different diagrams, showing the time domain signal, the time domain signals of all specified reference points, the coherence, and the transfer function.



The ME'scopeVES™ analysis software allows the creation of an animated model of the measured transfer functions.



The options for further processing of the measured transfer functions include reports in ArtemiS SUITE.

Sound intensity measurement

ASM 18 provides several methods for sound intensity measurement:

- Measurement of sound power according to ISO 9614-1 (discrete points)
  - Creation of sound intensity maps
- Quick diagnostics for locating sound sources (troubleshooting)
- In preparation:

  Measurements according to ISO 9614-2 / ISO 9614-3

Assistant-guided procedures

From front-end and sensor configuration to compliance with the ISO standard, users are supported by software assistants and safely guided through the respective procedure. In addition, acoustic and visual feedback functions are provided, allowing users to detect violations of the standard immediately during the measurement, for example.

Workflow concept

The workflow concept not only allows users to repeat individual configuration or measurement steps, but also to switch between ISO measurement and quick diagnostics.

Saving as a project

All measurements, including their configurations and settings, are saved as a project, allowing users to re-use or modify them later.

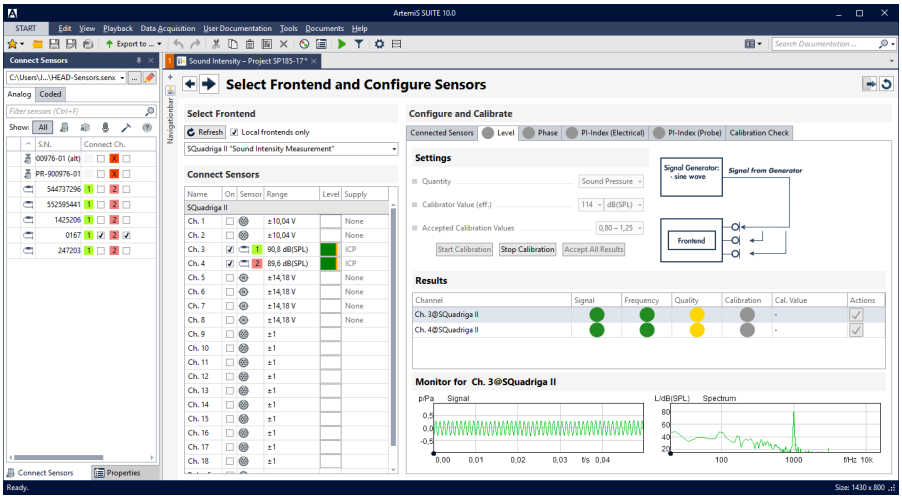
Front end and sensor configuration

- Front ends

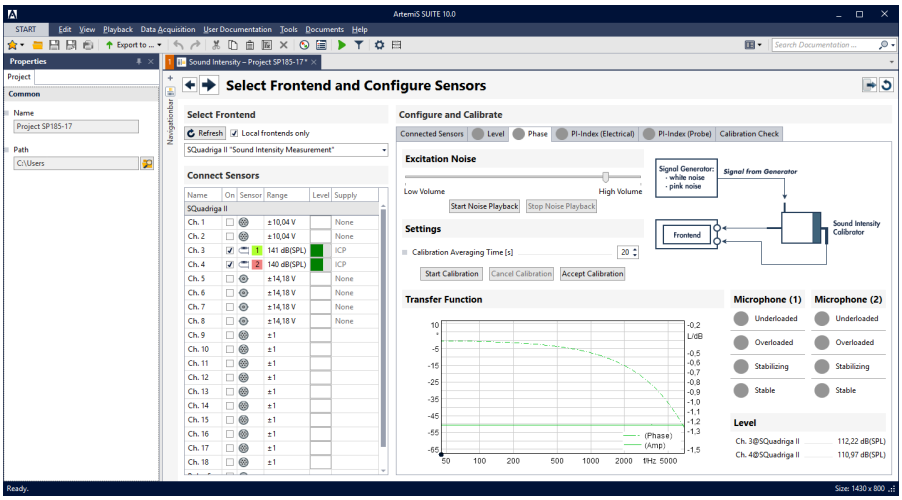
Various front ends from HEAD acoustics are available for the measurements. Using the powerful, lightweight, battery-powered SQuadriga or SQobold front ends is recommended if the hardware is to be used for mobile applications.

- Sensors

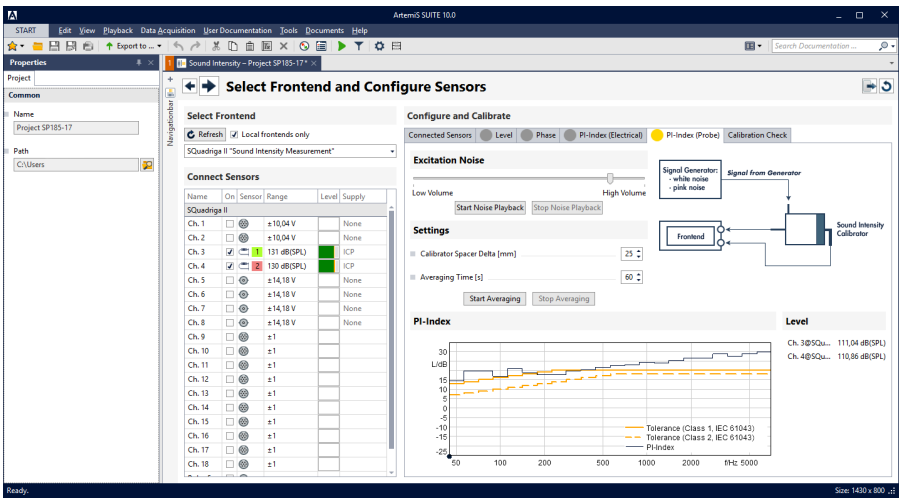
When assigning sensors, users can make use of the Sensor Library, which contains the technical specifications of common PU and PP probes. If no matching probe is in the list, new probes can be easily added to the library.



During level calibration, the current progress and the status of all channels currently handled by the calibration are displayed. To the right of the settings, a setup scheme facilitates the creation of a measurement setup suitable for channel calibration.



For the phase calibration of a PP probe, it is also possible to use noise playback via an internal or external sound card (e.g. the *lab*O2 equalizer), where the noise volume can be adjusted with a slider.



The diagram shows the pressure-residual intensity index resulting from the averaging, together with the tolerance curves for class 1 and class 2 according to IEC 61043. In addition, all connected and active channels are listed along with their current signal levels.

Measurement according to ISO 9614-1 (discrete points)

- 3D model representation

A 3D representation simplifies the specification of the geometry of the test object and the surrounding measurement area. The test object is displayed as a freely rotatable, movable, and zoomable 3D box, surrounded by a three-dimensional, rectangular grid, which can be configured very easily. Custom images of the test object (JPG or PNG files) can be mapped onto the faces of the object box for better orientation and use in the resulting report.

Thanks to the 3D representation, the measurement procedure can be performed very easily. The individual measurement points can be measured step by step, assisted by visual and acoustic feedback functions indicating any violations of the standard. In this case, individual steps can be repeated.

- Sound intensity map

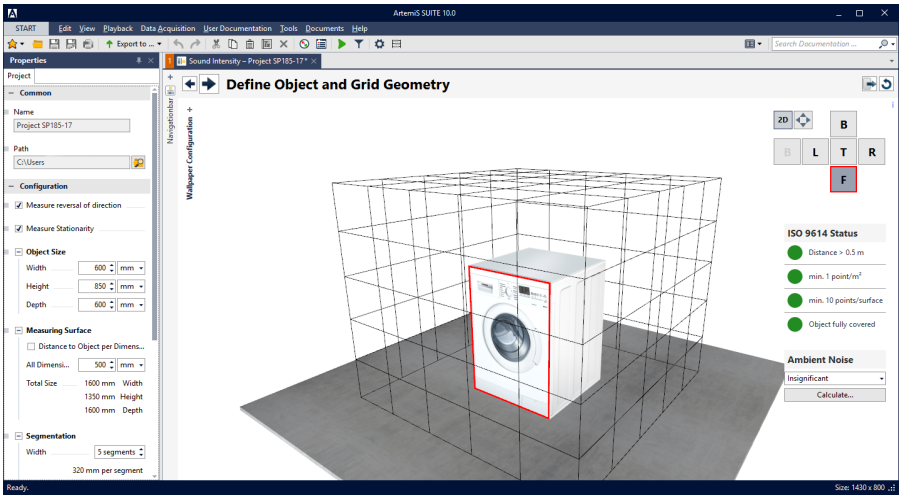
After a measurement, the 3D sound intensity map automatically displays the performed averaging with colors and as additional single values. The color-coding of the individual frequency bands immediately indicates whether the measurement was successful and complies with the standard.

- Real-time test diagrams

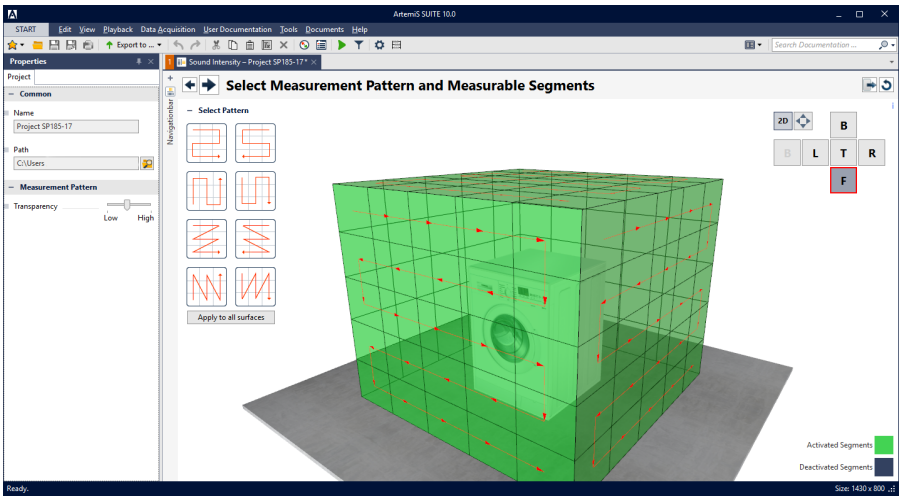
Status indicators indicate whether the results are compliant with the ISO 9614 requirements and suggest how identified problems can be solved.

Multiple diagrams immediately inform about the status of the field indicators F2, F3, and F4.

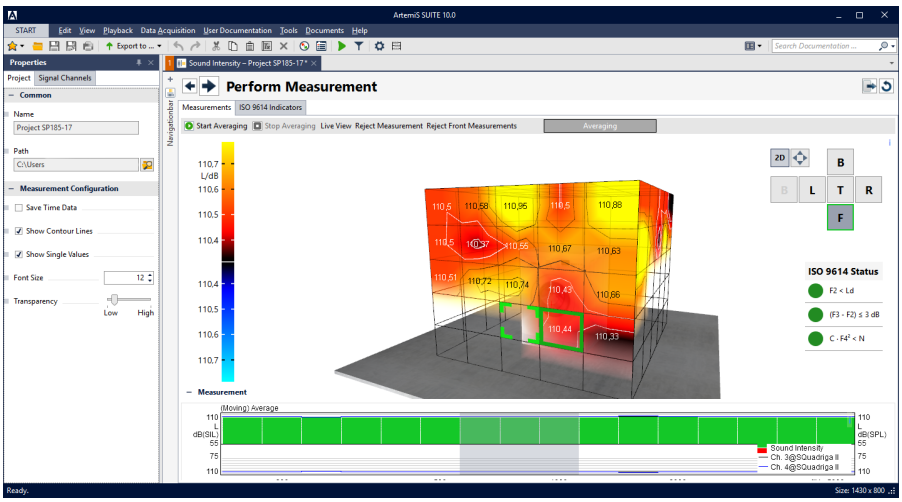
The moving average values of sound intensities and signal levels are displayed in butterfly diagrams as columns (sound intensity) or curves (levels). If a measurement violates ISO criteria, this is indicated immediately.



When defining the object and grid geometries, the dimensions and the subdivision of the measurement area surrounding the test object can be specified very easily. Images of the test object can be mapped onto the faces of the 3D box representing the object.



When specifying the pattern based on which the individual segments are to be processed during the measurement, partial areas can be excluded from the measurement.



Easily identifiable for the user during the measurement, the next points to be measured and the corresponding face of the measurement area are highlighted with a green frame. Below that, a butterfly diagram shows the moving averages of the sound intensity as columns and the signal levels of all active, connected channels as curves.

- Sound intensity analysis

After the measurement, the test object is displayed with the overlaid sound intensity map in an unfolded 2D representation for determining the sound power. By means of graphical selection elements, users can select which pages or segments are to be used for calculating the sound power.

Export and reporting

The resulting data can be exported to Excel, as images, or as a report (requires an ASM 02 license).

Various options are available for creating a report. An ISO-compliant report is generated automatically containing the information required by ISO 9614, which can then be edited by the user.

A created report can be saved as a template and re-used later.

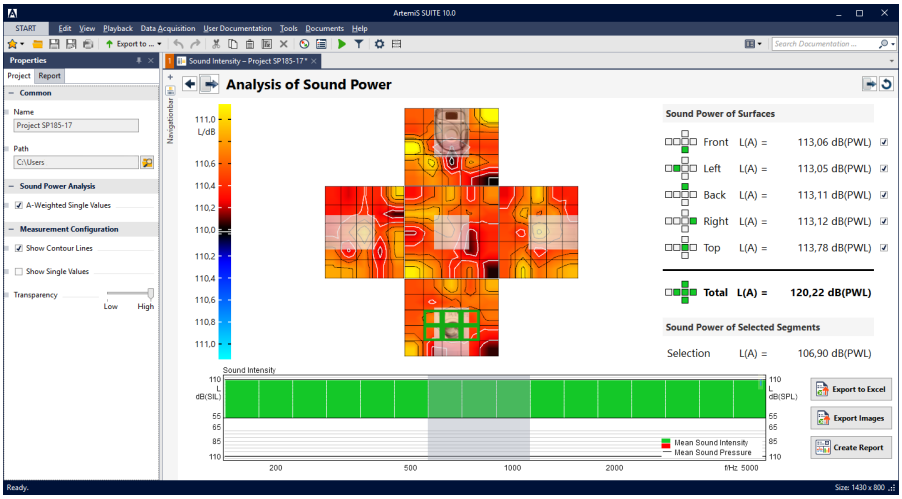
Quick diagnostics (troubleshooting)

As an alternative to the ISO 9614 measurement, a quick diagnostics mode for troubleshooting is available.

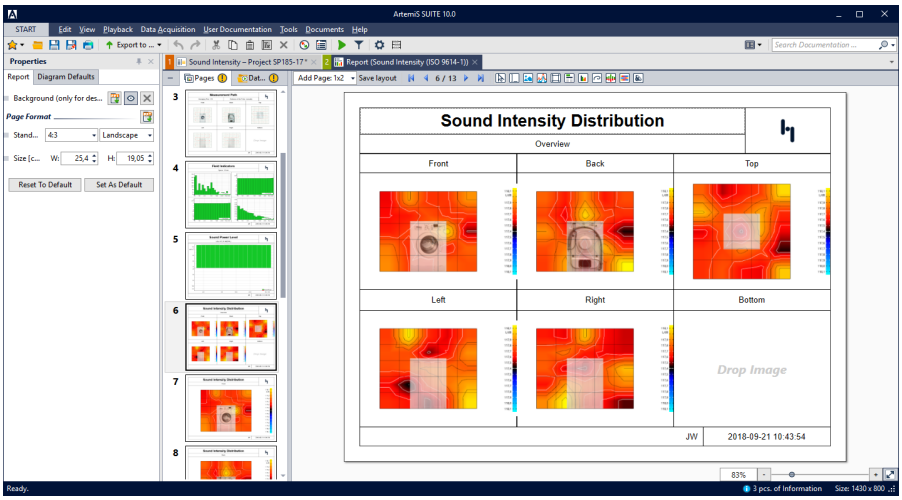
This is a very versatile method, where any position on a test object can be measured. With little effort, sound sources can be located and multiple measurement objects or surface materials can be compared with each other.

For measurements of test objects with very stationary sound emissions, a single scan with the measurement probe is usually sufficient to locate the sound source by means of the peaks in the “(Moving) Average” butterfly diagram.

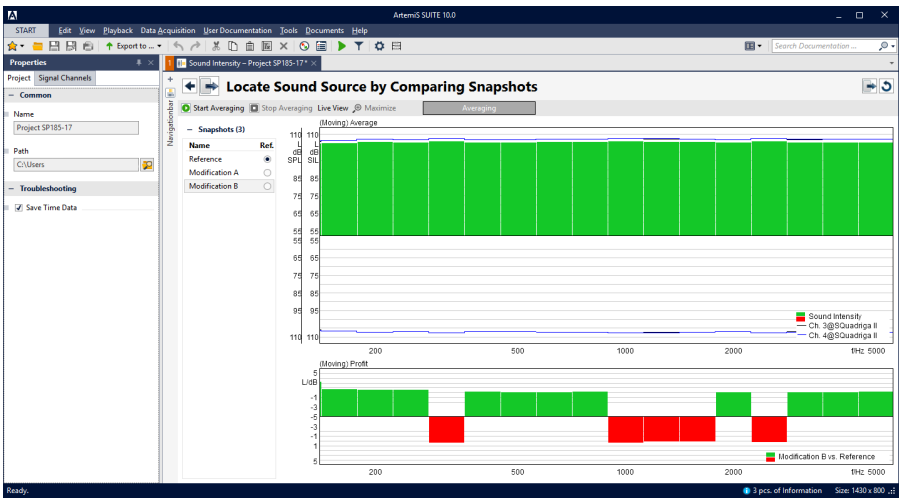
For a comparison, e.g. of different surface materials, different averaged measurement results can be saved as “snapshots” and compared with each other. The differences are displayed in the “(Moving) Profit” butterfly diagram.



To calculate the sound power, users can select the pages that should contribute to the overall result. The butterfly diagram shows the averaged sound intensities of all selected segments in the 2D view.



A report summarizes the results, images, diagrams, and so on. The report can be made ISO-compliant so that it contains information required by ISO 9614.



Using the quick diagnostics method, butterfly diagrams allow users to perform and save real-time comparison measurements or localization measurements. In addition to the sound intensity and level data, the underlying time signals can also be saved.

Scope of Supply

- License file: ASM 18 ArtemiS SUITE Online Analysis Module (Code 5018)

  The sound intensity measurement is available as of ArtemiS SUITE version 10

Requirement

- ASM 00 ArtemiS SUITE Basic Framework (Code 5000)

Required hardware

Front ends

(Impact measurements and sound intensity measurements)

- Mobile front ends with built-in battery
  - SQuadriga II (Code 3320)
    Mobile recording and playback system - suitable as stand-alone system or USB front end (max. 6 Line/ICP channels)
  - SQobold (Code 3302)
    Mobile, 4-channel recording and playback system with sound level measurement function, GPS, and much more
  - SQuadriga (Code 1369)
    Mobile four-channel front end with internal flash memory (using SQuadriga, only the channels 1+2 or 3+4 are available)
- Front end systems
  - HEAD*lab* systems (Code 3700ff.)

    Sample configuration:
    - *lab*CTRL I.2 (Code 3702)
      Controller LAN / USB
    - *lab*V6 (Code 3721)
      6-channel Line /ICP input module
    - *lab*PWR I.1 (Code 3711)
      Power box for HEAD*lab* systems (up to 40 W max.)
    - Mains adapter for *lab*PWR I.1
      15 V / 60 W / LEMO 2-pin
      90 to 275 V AC, 50 to 60 Hz
  - DATaRec 4 (Code 3600ff.)
    Modular 24 bit data acquisition system with signal conditioning
    Required:
    ASM 28 (Code 5028)
    Data Acquisition Support for DATaRec 4 Module
- Single-module systems
  - *lab*COMPACT12 (Code 3708) / *lab*COMPACT24 (Code 3709)
    HEAD*lab* compact modules
    Single module systems for 12 / 24 analog/ICP sensors

Supported probe types

(Sound intensity measurements)

- One-dimensional PP probes with two microphones
- One-dimensional PU probes (Microflown) (not compliant with ISO 9614)

Remote control

(Sound intensity measurements)

- For remote control, one remote control from G.R.A.S. and Microtech Gefell is supported as well as the combination of RC X.1 and RC X.2 from HEAD acoustics
  - RC X.2 (Code 9851)
    Wireless module for controlling the RC X.1
  - RC X.1 (Code 9850)
    Remote control for connection to a PC and SQobold (USB)

Additional hardware

- Impact hammer
- Accelerometers
- PC / notebook / tablet (Windows)

Required software

(Impact measurements)

- ArtemiS SUITE
  - ASM 02 (Code 5002)
    ArtemiS SUITE Basic Report Module
  - ASM 23 (Code 5023)
    ArtemiS SUITE Advanced Import & Export Module
- ME'scope
  - ME'scopeVES™ (Code 4980ff)
    Analysis software from Vibrant Technology

(Sound intensity measurements)

- ArtemiS SUITE
  - ASM 02 (Code 5002)
    ArtemiS SUITE Basic Report Module
- Excel