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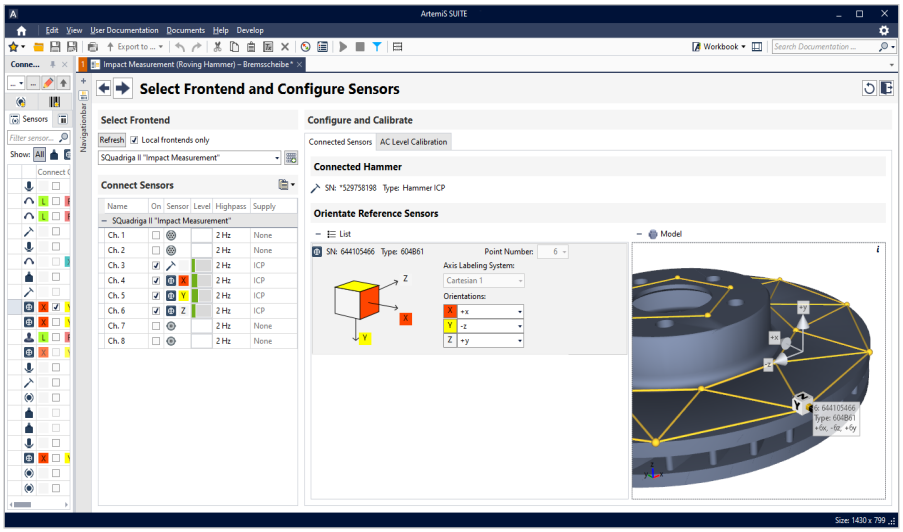
ArtemiS SUITE
ASM 43

DATA SHEET

ArtemiS SUITE Impact Measurement (Code 5043)

Extension module for impact measurements to perform structural analysis examinations



Overview

Impact Measurement ASM 43 allows impact hammer measurements (Roving Hammer / Roving Accelerometer) with an automatic hammer for example, to perform structural analysis examinations.

Software assistants 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.

Results can be further processed with the Modal Analysis Project and with the Shape Comparison Project.

HEAD acoustics offers suitable hardware for performing both functions. Frontend configurations can be easily carried out with the Offline Frontend and later transferred to the hardware, supported by HEAD acoustics.

Features

- Impact measurement methods:
  - "Roving hammer" method with fixed reference points
  - „Roving accelerometer" method with fixed excitation points
- Coordinate systems:
  - Cartesian system
  - Cylindrical system for round, axially symmetric test objects
  - Spherical system for spherical test objects
- Easy-to-use frontend and sensor configuration
- Automatic configuration of the desired measurement parameters with a few test strikes
- Assistant-guided procedures during impulse hammer measurement
- Acoustic and visual feedback to control the individual hammer strikes, to detect incorrect hammer strikes immediately
- Optional reciprocity check / linearity check
- Checking of coherence between the averaged strikes
- Representation of the results, each in a separate diagram
  - Time domain signal of the impact hammer
  - Time domain signals of the reference points
  - Coherence
  - Transfer functions averaged over the individual hammer strikes
- Monitoring and modal analysis using the Modal Analysis Project (ASM 42)
- Analyzing the deflection shapes using the Shape Comparison Project (ASM 41)
- Display of the results in the Data Viewer and as a report (with the Basic Report Module ASM 02)
- Various frontends from HEAD acoustics available
  - The powerful, lightweight, battery-powered SQuadriga or SQobold frontends are recommended, if the hardware is to be used for mobile applications

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.

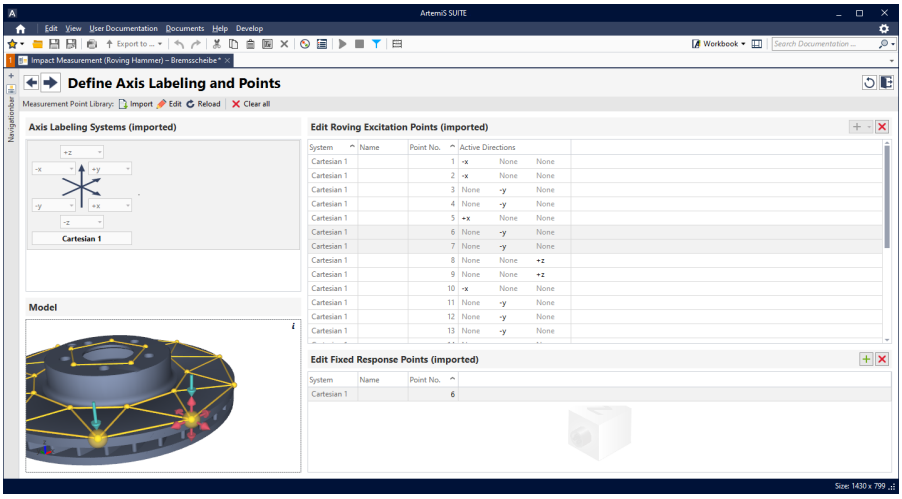
As an alternative to the manual procedure, a 3D model created with the Measurement Point Library (included in ASM 00) can be imported. Using the 3D model, sensors can be automatically orientated to the surface of the model for minimizing the error rate.

Parameter acquisition

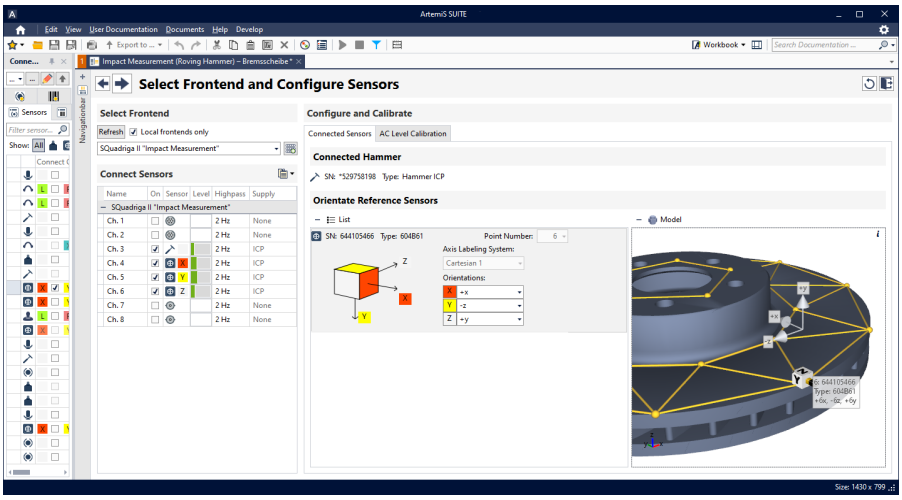
All that is needed to determine the required measurement parameters are some test strikes, from which the desired sampling rate, the window size and windowing function, the pre-triggers for the hammer, the threshold values for triggering the hammer and the appropriate measurement range will be determined. 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.

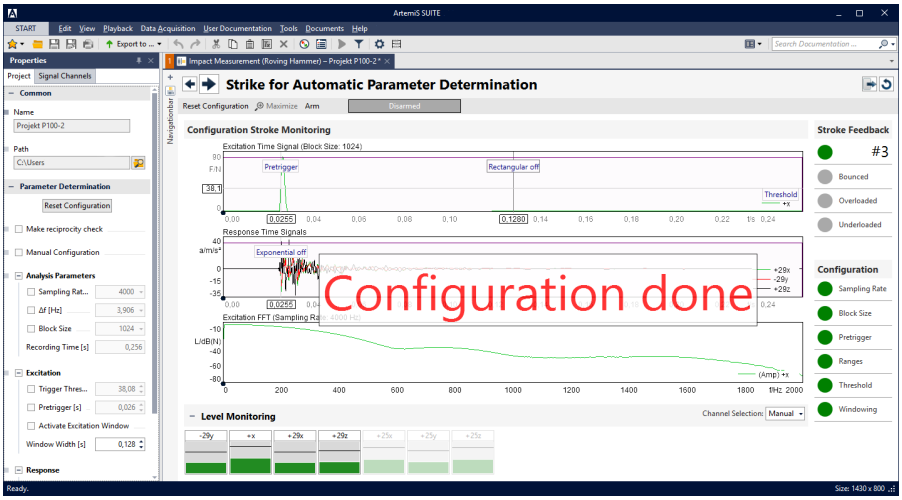
Users can turn off the automatic functions and do the configuration manually.



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 frontend, 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.

Linearity Check

Using the optional linearity check, users can compare between two sets of transfer functions with different excitation strength visually, in order to detect possible problems during the excitation.

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.

Analyzing the measurements with the Modal Analysis Project

During the measurement (or also afterwards) the Modal Analysis Project can be used for monitoring or the modal analysis. This allows users to view animations of the oscillation modes.

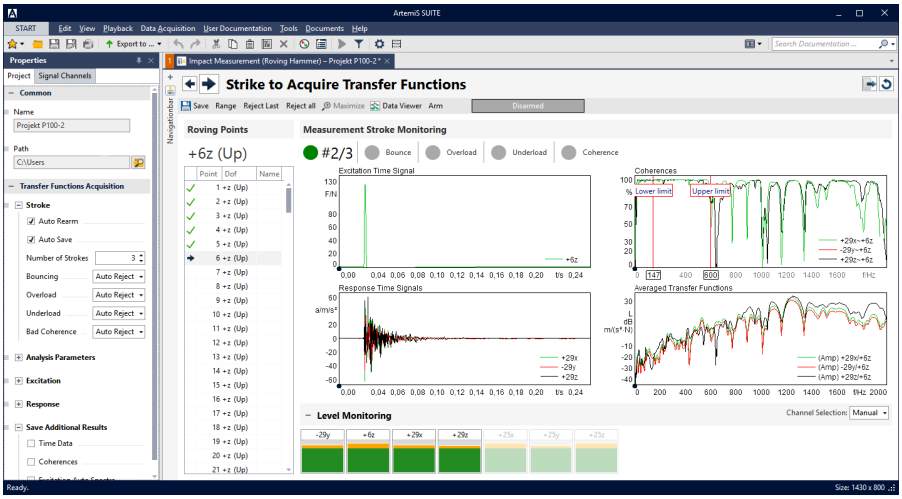
Comparing the deflection shapes with the Shape Comparison Project

Using the Shape Comparison Project, users can compare simulations with real measurements or assess components changes, for example.

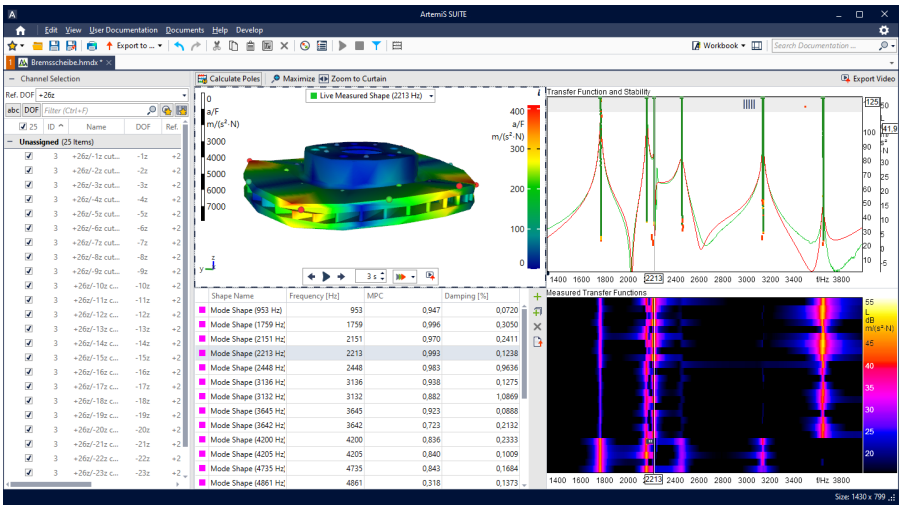
Report and Export

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

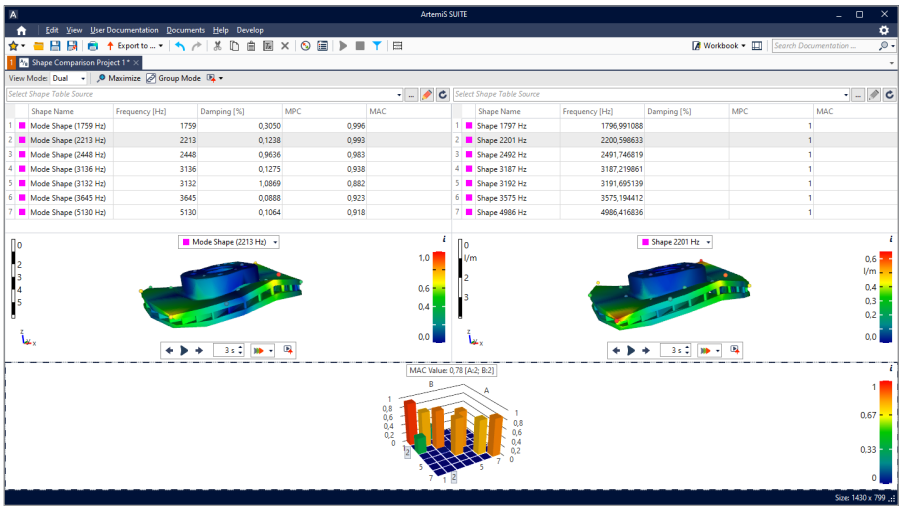
Furthermore, the results can be exported to Excel and to other licensed third-party formats, such as ME'scopeVES™ und UFF (e.g. for activating the export to UFF, the Advanced Import & Export Module, ASM 23 is required).



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



Using the Modal Analysis Project, the analysis of the recorded data can be performed by means of live coupling already during the measurement. Alternatively, impact measurements that have already been performed can also be analyzed offline there. Within the analysis, all necessary information are clearly displayed via various diagrams and animations.



The Shape Comparison Project determines the MAC (Modal Assurance Criterion) value and provides information about the similarity of deflection shapes. This information can be used, for example, to assess the quality of a simulation.

Recommended hardware

Frontends

- Mobile frontends with built-in battery
  - SQuadriga III (3324)
    Mobile recording and playback system – as a stand-alone system or USB frontend
  - SQuadriga II (Code 3320)
    Mobile recording and playback system - suitable as stand-alone system or USB frontend
    (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 frontend with internal flash memory (using SQuadriga, only the channels 1+2 or 3+4 are available)
- Frontend 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

Additional hardware

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

Recommended software

- ArtemiS SUITE
  - ASM 02 (Code 5002)
    ArtemiS SUITE Basic Report Module
  - ASM 23 (Code 5023)
    ArtemiS SUITE Advanced Import & Export Module

Requirement

- ASM 00 ArtemiS SUITE Basic Framework (Code 5000)

Structural Analysis Package

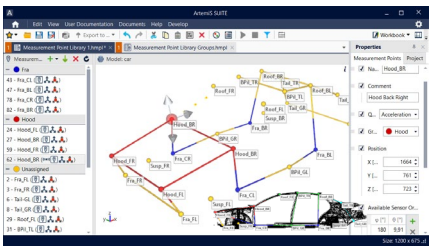
In combination with the Measurement Point Library (ASM 00), the Operating Deflection Shape Analysis Module (ASM 40), the Shape Comparison Module (ASM 41), and the Modal Analysis Module (ASM 42) Impact Measurement forms the ArtemiS SUITE Structural Analysis Package.

Measurement Point Library

(Basic Framework - ASM 00)

The Measurement Point Library can be used to create the 3D grid models very easy. Users select measurement points, enter the coordinates, and connect the points with lines to a model. For visual control, users can zoom, turn, tilt etc. the model with the mouse at any time.

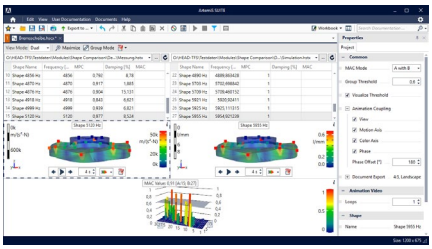
A corresponding CAD model can be imported and merged with the grid model of the Measurement Point Library.



Comparing shapes

(Shape Comparison Module - ASM 41)

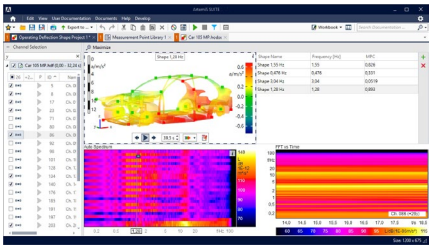
The Shape Comparison Module is used for analyzing and comparing deflection shapes.



Analyzing shapes

Operating Deflection Shape Analysis Module - ASM 40)

The module includes the Operating Deflection Shape Project (ODS) and the Time Domain Animation Project (TDA). The projects can be used to animate and analyze structures in a defined stationary operating status as well as time-variant motions.



Modal Analysis

(Modal Analysis Module - ASM 42)

The Modal Analysis Project enables quick and interactive examinations of natural modes of test objects, e.g. on the basis of an Impact Measurement.