HEAD acoustics

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

ArtemiS SUITE
ASM 08

ArtemiS SUITE RPM Generator Module (Code 5008)

Extension module for generating RPM curves, e.g. for measurements of small engines or turbochargers for which the mechanical acquisition of the revolution speed is difficult or impossible.

Generate single RPM curve; configure result as templates for batch mode.

Generate RPM curves of whole series in batch mode.

Overview

For generating missing RPM curves, the RPM Generator Module provides the RPM Generator as well as the Batch RPM Generator. In addition, users are given the option of using RPM generation in batch processing with an Automation Project (ASM 01 is required).

The algorithm developed by HEAD acoustics allows users to generate missing RPM signals from order curves with only little effort and to add them as new channels automatically.

Using the Batch RPM Generator, this process is applied to a larger number of measurements simultaneously. This allows users to generate RPM curves for many similar measurements at the touch of a button. The algorithm even detects the correct revolution speed for measurements of different lengths, keeping manual adjustments to a minimum.

In addition, ASM 08 permits the use of the Batch RPM Generator embedded in an Automation Project. Integrating the RPM generation task into the measurement, analysis and processing tasks of an automation project, which are performed without user interaction, offers further opportunities for process optimization.
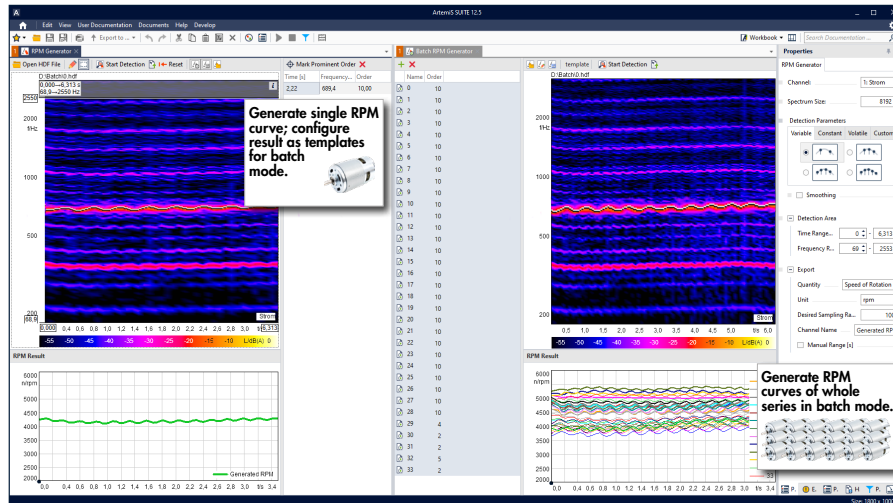
Features

RPM Generator

- Intuitive generation of RPM curves from significant order curves for measurements with corrupted or missing RPM information

- High accuracy thanks to a sophisticated algorithm developed from HEAD acoustics

- Preview window for immediate verification of results

- Wide range of applications:
  - run-ups and run-downs,
  - strongly varying RPM curves across a wide frequency range, e.g. in case of turbochargers,
  - almost constant RPM curves, etc.

- Various settings for determining RPM values for different noise classes (e.g. variable or constant revolution speed)

- Optimization of results by using multiple reference points or smoothing

- Manual drawing of curves with the pen tool

Batch RPM Generator

- RPM Generator extension for batch processing

- Use of individual templates based on a reference measurements

- Applying the template to a complete data set

- Post-processing of the speed curves

The templates must meet various requirements (see page 4) and must have produced a reasonable result without manual corrections.

Batch RPM Generator embedded in an Automation Project (ASM 01 is required)

- Automation Project for embedding RPM generation into automated processes
  - Measuring, RPM generation, analysis and processing up to a completed report in one step, for example

RPM Generator

When measuring rotating objects, such as small motors or turbochargers, it is often not possible to measure the revolution speed. In such cases, the RPM Generator allows users to generate RPM signals, e.g. from structure-borne noise signals, and to embed them in the recording as new channels, with simple means and a short investment of time.
This tool can also be used in cases where RPM recordings turn out to be corrupted.

It is sufficient to select a visible order curve in the diagram with a single mouse click and to specify the corresponding order number.

By selecting a suitable parameter preset with more or less reference points or by limiting the frequency or the time range in the diagram, the accuracy of the generated RPM curve can be optimized.

Several parameter presets are available:

- Variable: for run-ups, run-downs, and combined run-ups/downs of combustion engines
- Constant: for all constant revolution speeds where the focus is not on occurring physical variations
- Volatile: for RPM curves with very strong variations across a wide frequency range
- Custom: for custom parameter configurations

The RPM Generator displays the estimated RPM curve in the spectrogram. In addition, RPM vs. time analysis is displayed in a separate diagram, providing the user with immediate visual quality control.

In addition, the revolution speed determination can be carried out manually. Via the pen tool users may draw the curve step-by-step or complete in the FFT vs. Time representation as well as in the RPM vs. Time diagram.
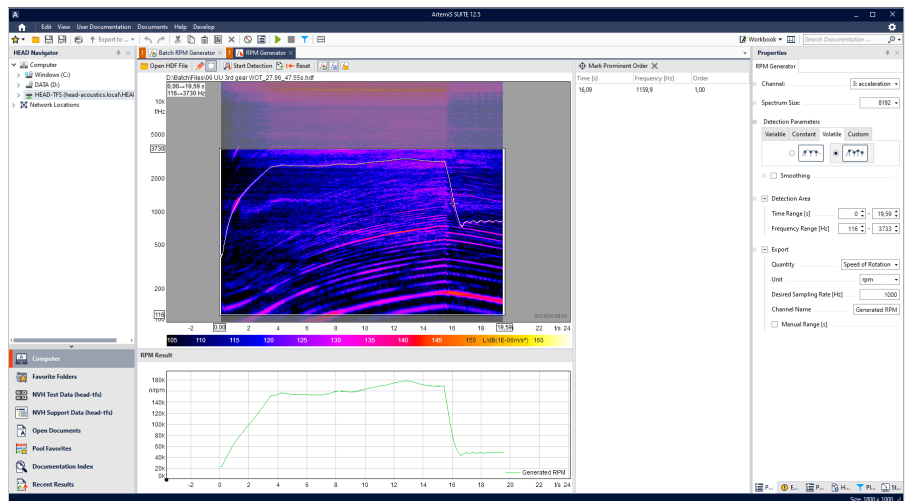
For the measurement of rotating objects such as small engines or turbochargers, the mechanical acquisition of the revolution speed often turns out to be tricky or it is not possible at all. The RPM Generator allows it to extract this information from the normal measurement signals.
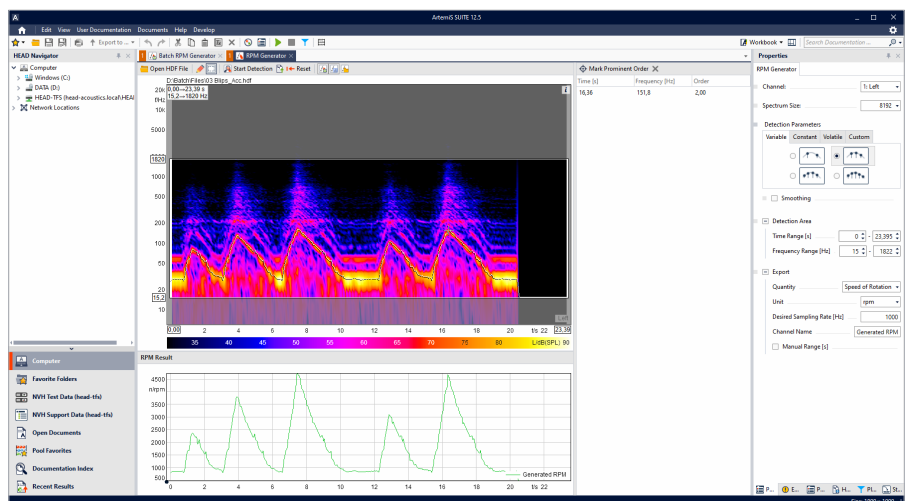
Depending on the measurement, the settings can be selected variable, constant or volatile. Variable is suited for run-ups, coast downs, and combined run-ups/coast downs of combustion engines, as well as for the determination of frequency fluctuations of electrical auxiliary drives.
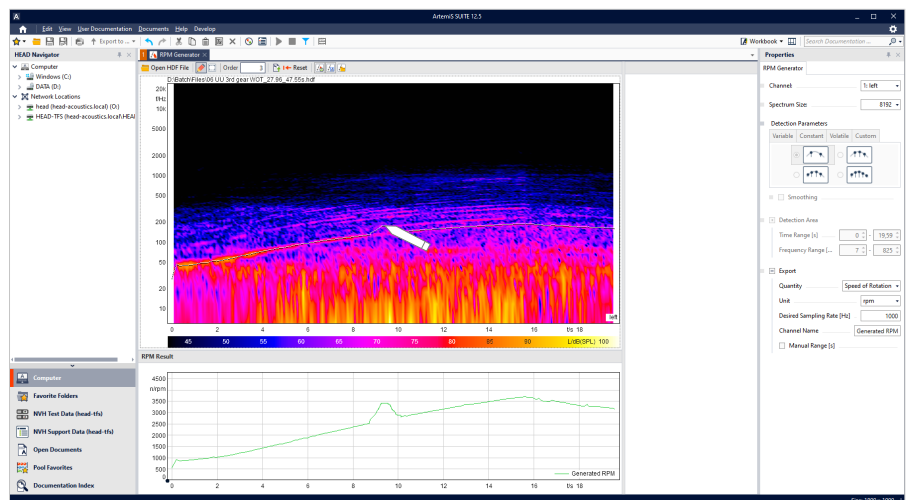
In addition to the methods of automatic RPM determination, manual drawing with the pen tool is available. Users can completely draw a new curve and save the result as a new RPM curve.

In order to achieve better results in case of insufficient order curves, additional orders can be identified. The algorithm then examines them together with the dominant order. In case of complex order curves (e.g. of turbochargers), the revolution speed can be determined separately for individual signal sections. The RPM Generator automatically combines the individual sections into the resulting RPM curve.

The generated RPM curve can be saved along with the (unchanged) input data as an additional channel in the HDF file. Alternatively, users can save only a specific part by entering the start and end positions manually or by moving the limits displayed in the bottom diagram with the mouse.

Batch RPM Generator

The Batch RPM Generator is used to process similar measurements or entire measurement series in one step.

The handling is simple. Users select a reference measurement, generate the RPM curve by means of the RPM generator, and use the result as a template for further measurements. The RPM detection algorithm utilizes the template and the parameters it contains and applies them to any number of measurements in batch mode.

Templates can be saved, edited and used at any time.

The Batch RPM Generator displays all results for each channel in an FFT vs. Time diagram. The order determined for each channel is displayed in a table. The RPM curve converted from the frequency is displayed in the RPM vs. Time diagram. To combine several results multi selection is supported.

Manual adjustments, for example a correction of the order number, can also be performed manually later on.
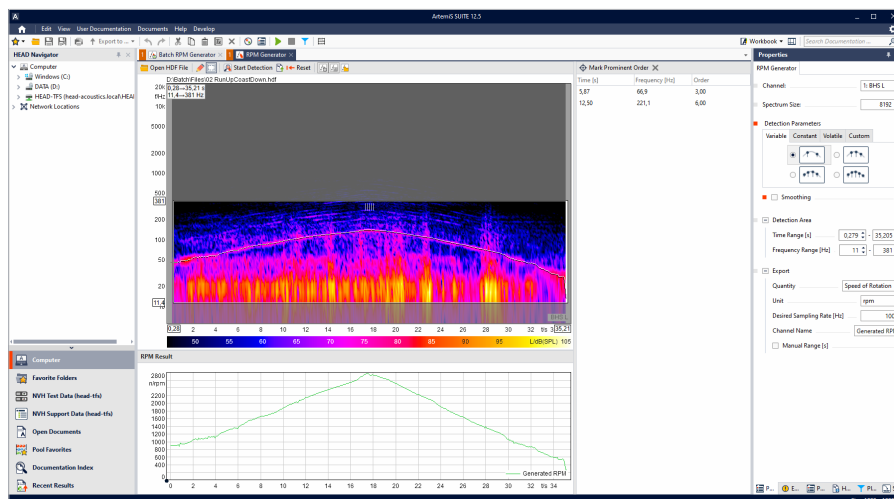
On each of these tabs (variable, constant, or volatile), users can choose variants, have proved themselves in extensive test series to be especially effective and they should cover the majority of use cases.
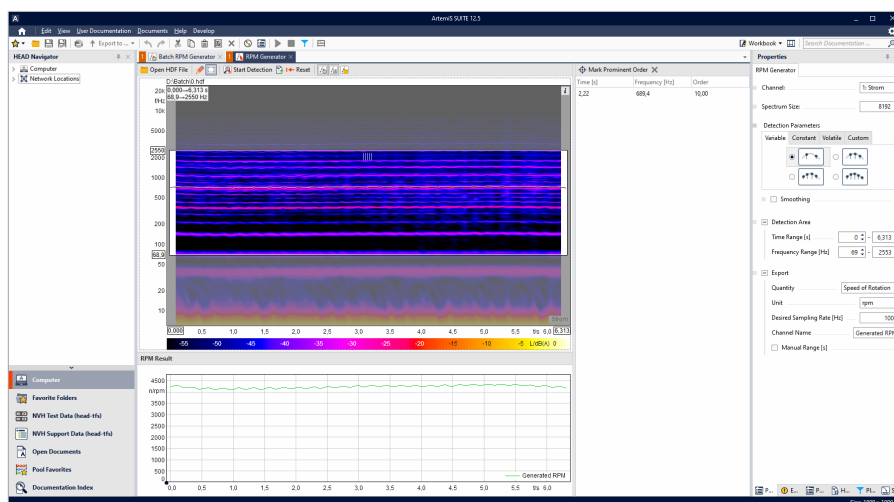
To make it easier for users to process a large number of similar measurements, the RPM Generator can be used to create a corresponding template, which can then be applied to the complete data set using the Batch RPM Generator.
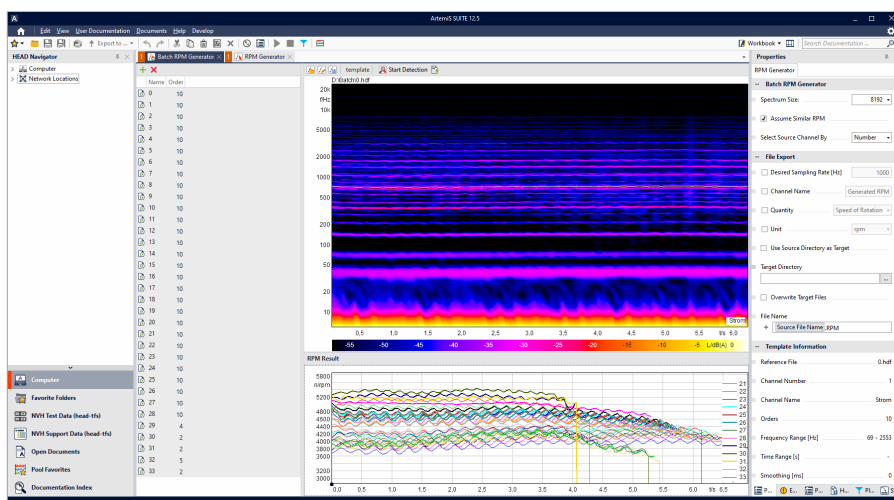
The order determined in each case is displayed in the corresponding column of the table. In the FFT vs. time diagram, the estimated model curve is displayed for control purposes. The result converted out of the frequency is available as RPM vs. Time in the lower diagram.
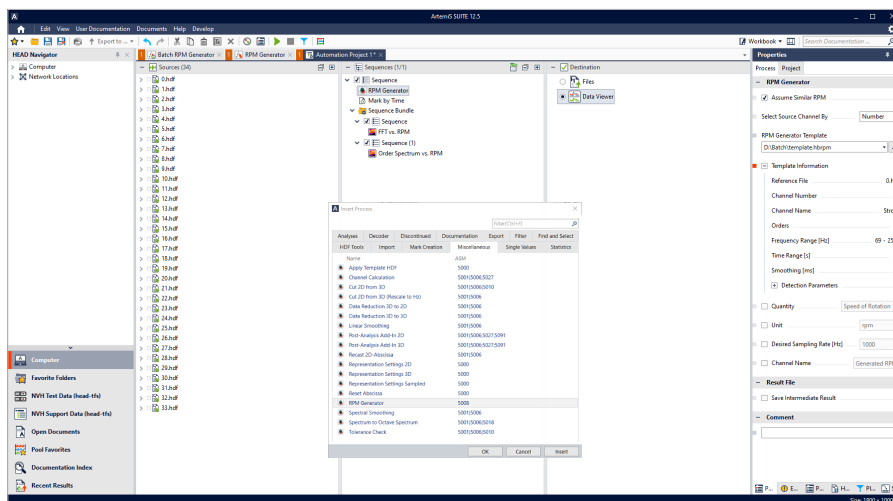
Batch RPM Generator embedded in an Automation Project

The Automation Project (ASM 01 is required) is a perfect solution for integrating RPM generation in batch processing mode into their automated processes.

In an Automation Project, various functions such as selecting, cutting, filtering, analyzing, calculating single values, importing/exporting can be executed without user action. The automated output of the results as a file, in the Data Viewer or in a report (with ASM 02) is also possible.

To integrate the Batch RPM Generator into an Automation Project, users simply need to create a template, save it, and insert it as a RPM Generator element into a suitable processing sequence.

The Automation Project allows manual adjustments of various RPM Generator parameters, too.

RPM Generator templates can be embedded into an Automation Project as a normal processing step. Via HEAD Navigator, Automation Projects with RPM generation can also be applied to entire folders with a large number of similar files.

Scope of supply

- License file
  - ArtemiS SUITE RPM Generator Module (Code 5008)

Required

- ArtemiS SUITE Basic Framework (Code 5000)

Not included

- The Basic Analysis Module (ASM 01) is required for using the Batch RPM Generator with an Automation Project.
- The Basic Report Module (ASM 02) is required for performing a report.

Requirements for using the Batch RPM Generator

- The template created with the RPM Generator and the files for the batch process must contain
  - the same channel names or numbers and
  - similar dominant orders.
- The template must have provided a reasonable result without manual corrections.
- RPM generation is only possible for a coherent area.
- In the template, the order courses should be clearly marked with only one point each.