

SO Analyzer

Fractional Octave Analysis and Acoustic Applications

A comprehensive range of applications from basic 1/3 octave spectrum analysis to the latest human factors analysis. Noise is increasingly the subject of new regulations for the protection of human health and safety as well as for improving the environment in general. As well as sound levels, the perceived sound quality of products from washing machines to vehicles is often an important part of the customer buying decision so must be considered during product development.

Key Features

- Measurement, analysis and reporting all within one user interface
- A wide range of hardware front-ends to suit the application
- Online measurement and post-processing of recorded data
- Multiple 2D and 3D charts as well as color maps and animation tools
- MS Windows/Office like user interface
- Intelligent measurement & analysis wizards for easy and reliable user guidance
- User configurable user interface to simplify repetitive tasks
- Copy & paste to ActiveX applications like MS Word and PowerPoint
- Automated report generator
- Free installation of the SO Viewer to actively view/analyze data like an animation display on any MS Windows/Office PC

Measurement Add-Ons

Real-Time Acoustic Analyzer for Fractional Octave Analysis

- According to ANSI S1.4 and IEC 60651 Type 1
- A/B/C weighted either internally or externally
- 1, 1/3, 1/6, 1/12 and 1/24 octave spacing
- Real-time 1/3 octave analysis 10 Hz - 20 kHz on 16 channels
- Sound level meter fast, slow, impulse settings, custom
- LEQ, peak hold by band or OASPL
- OASPL time history

Real-Time Sound Intensity Measurement

- Uses a standard dual microphone intensity probe
- Real-time pressure, intensity and pressure residual intensity index

- On-line or post-processing of recorded data
- High tolerance to background or reverberation effects
- Octave analysis option SO-2110 required

Analysis Application Add-Ons

Sound Power

- A range of standard methods to determine sound power emission levels
- According to ISO 374x for standard microphone measurements
- Measurement methods include single and multiple microphone set-ups
- User selectable geometry to suit method and location
- According to ISO 9614 when used with SO-2114 sound intensity measurement add-on

- High tolerance to background or reverberation effects for use in most on-site environments
- Analysis wizard with full qualification criteria report
- Includes sound transmission loss calculation wizard

Acoustic Intensity Mapping

- Measure and locate sound sources using intensity measurements
- Guided measurement wizard based on surface geometry model
- Uses a standard dual microphone intensity probe
- Geometry creation wizard to define 3D test object
- Wizard to create color maps displaying the distribution of the acoustic intensity

Sound Quality

- A range of functions to assess perceived sound quality
- Zwicker loudness according to ISO-532 and DIN-45631

- Specific loudness and transient loudness
- Loudness and percentile loudness time history
- Articulation index and extended articulation index time history
- Sharpness time history
- Pitch and warble analysis wizards for squeak and rattle analysis
- Statistical analysis of any function, eg LSF, L(10), L(50), L(90)
- Time/freq color maps of loudness
- Customisation service to help develop your own metrics

Human Vibration

- Evaluation of hand-arm vibration from the use of power tools as per ISO and BS
- Evaluation of whole body vibration from riding in vehicles or being in vibrating buildings as per ISO and BS
- Weighting C/D/H/K included plus user defined
- Vibration Dose Value (VDV) time history

Applications

- Sound engineering
- Product refinement
- Comparative product ranking
- Occupational health and safety
- Rugged portable, mobile and stationary systems
- 4-32 channel VibPilot for fan-less, noise-free operation requiring a quiet environment

Overview

The Windows based Acoustics software uses intelligent wizards that guide the user step by step through the process of data analysis. Alternatively, the user can access any set-up menu for faster operation.

Data management is done with the central e-Reporter. For displaying data it uses 2D and 3D/Waterfall viewers. The viewers are the same for both the acquisition and the analysis process. A 2D viewer can show single or multiple data records. The 3D viewer can display any XY data pair against amplitude and switches in and out of color map mode in one click. Both viewers offer a multitude of analysis functions like cursors, mathematical operations and data cuts. Data can also be copied from the viewers and pasted directly into Excel or as ActiveX charts into applications like MS Word or PowerPoint, providing the same chart functionality in those applications.

- Display calculator functions (Acoustics specific): acoustic weighting and un-weighting, 1/1 and 1/3 octave from time or narrowband spectrum

Please refer to the "SO Analyzer Dynamic Signal Acquisition and Analysis" product information for detailed information on analysis with the 2/3D viewers.

Real-Time Acoustic Analyzer (Octave Analysis)

The Real-Time Acoustic Analyzer is part of the SO Analyzer data acquisition software and supports real-time octave analysis.

Acquisition Setup

- Time domain based fractional octave analysis
- According to ANSI S1.4 and IEC 60651 Type 1 standards
- Internal and external A, B, C weighting filters
- 1, 1/3, 1/6, 1/12, 1/24 octave analysis
- Response types: fast, slow, impulse, custom, linear average, LEQ
- Selectable measurement interval and measurement storage

- Measurement processing: peak OASPL, peak band, overall linear average (LEQ)
- 1 and 1/3 octave function within the 2D display, based on time or spectral data

Post-Processing¹⁾

- Same functionality as Acquisition except data source is a throughput time history file with a predefined length and sample rate

Sound Power

Sound power is an absolute measure of the noise emissions of a product. It depends only on the noise source itself and is not influenced by the acoustic environment in which the product under test operates. Traditionally sound power is based on the measurement of sound pressure levels at microphones positioned around the test specimen and must be done in a quiet open field site or an anechoic chamber for best results.

Alternatively real-time acoustic intensity measurements using an acoustic intensity probe is able to cancel out background noise and reverberation effects so can be used in almost any environment. Intensity and pressure measurements are made typically by scanning over segments enclosing the source and a wizard then computes the sound power result and the qualification criteria defined in the ISO standard. This method also requires the real-time sound intensity option.

Sound Transmission Loss is a technique using the real-time sound intensity measurements to measure an enclosed sound source followed by the same source shielded for example by an acoustic treatment enclosure. The result is the attenuation achieved by the enclosure.

- Sound power analysis according to ISO3744
- Sound power analysis according to ISO 9614 when coupled with SO-2114 sound intensity measurement
- Sound transmission loss analysis when coupled with SO-2114 sound intensity measurement

Acoustic Intensity Mapping

A measurement and analysis wizard using a 3D model and guided sound intensity measurements to quickly develop a 3D color contour map for source localisation. Because the intensity technique is tolerant of background noise and reverberation then this is ideal for use in most environments and can be used for single product testing as well as multiple source ranking etc.

Sound Quality

When assessing the total quality of a product, not only the level but also the quality of the sound plays an increasingly important role. Designers and developers face a challenging task: They not only have to reduce the noise level, but also have to find the "right" sound that attracts the customer.

The complexity of the human senses means that our perceived loudness and quality of a noise source does not map well to conventional FFT or third octave analysis. Classic A and C weighting go some way to improving evaluation but these do not take the non-linear effects of the human ear into account.

¹⁾ DSA Pro only

The basis of the SO Analyzer Sound Quality Analysis is Zwicker loudness that provides standardised methods for this type of analysis. The following functions are available both as online and post-processing analysis and can be computed from either narrowband or octave band spectra.

Pitch and warble analysis provides metrics for squeak and rattle applications.

- Loudness according to ISO 226, ISO 532/R, DIN 45631 (Zwicker and Fastl method), based on spectrum or 1/3 octave data
- Specific loudness: a sones/bark spectrum
- Transient loudness: spectrum taking the ears temporal masking into account
- Percentile calculation L(10), L(50), L(90)
- Sharpness
- Articulation index and extended articulation index for quieter environments; often known as intelligibility
- Spectrum and time history computation
- Flexible 2D charts, 3D charts and 2D color maps to view data sets
- Pitch wizard to create plots of frequency and relative pitch against time from 3D PSD spectrograms; also provides limit analysis for assessment criteria
- Warble wizard to detect rapid and periodic amplitude variations from specific loudness time histories

Human Vibration

As well as noise we are, in daily life at work, at home or during leisure time, exposed to a wide range of vibrations from our environment. For protection from mechanical vibration, exposure limit values have been defined for hand-arm and whole-body vibration. Hand-arm vibration comes typically from the use of hand-held power tools, while whole-body vibration is transmitted through the seat or feet of people in cars, busses, trains, tractors, fork lift trucks, even vibrating buildings etc. Standard methods are available to assess these overall levels and to provide cumulative exposure data over time.

In conjunction with sound quality metrics these vibration results can form a comprehensive set of metrics for vehicle comfort assessment and refinement engineering.

- Vibration weighting filters for human body vibration measurements according to ISO 5349, ISO 2631, BS 6841
- Hand-arm-body vibration levels
- Cumulative Vibration Dose Value (VDV) analysis

Operating System

- Microsoft Windows XP/Vista

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