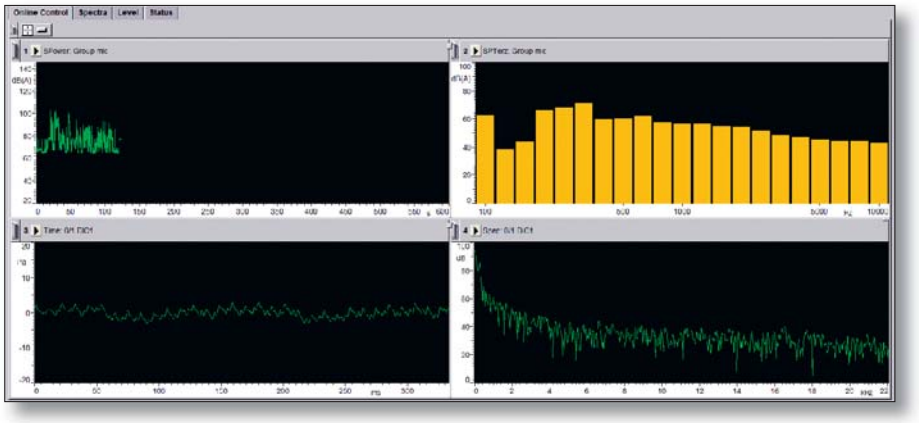
siSoundpower

Sound power measurement with the sound pressure method



Real-time sound power with 6 – 24 channels *

Precision

The multi-channel measurement system determines the standardized sound power and meets the conditions for class 1 measurements.

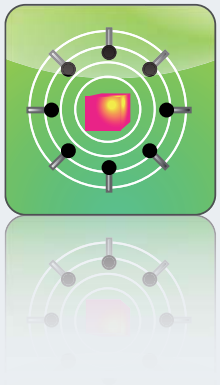
Speed

Real-time processing makes it possible to save and display the third-octaves of all channels as well as the sound power incl. room corrections. This makes the system ideally suited for measuring the sound power over a long period of time, such as e.g. with laundry machines.

Flexibility

Depending on the number of channels of the front end, further data (status variables, acceleration channels etc.) can be recorded and processed simultaneously.

** The number of channels is scaled with the computing power of the CPU and can be expanded if needed.*



Applications

- Sound pressure determination in a reverberation room and/ or an acoustically dead room, e.g. for household appliances (laundry machines, laundry dryers and dishwashing machines) and small appliances (electric razors, coffee machines).
- Sound pressure determination in a free field, e.g. for construction machines.

Relevant standards

- General standards for determining the sound power: DIN EN ISO 3740 - 3747 Sound power determination, sound pressure method
- Special standards for various devices, e.g. laundry machines: 60704-1/-3 Measurement of electrical household appliances

SOUNDTEC

siSoundpower

Real-time analysis and post-processing

All channels can be processed and saved in real time. At the same time, the channels can be divided up into groups, such as e.g. microphones, vibration transducers and various status channels. Time data can be recorded without interruption in short individual files - this makes fast post-processing possible for special analyses, even in the case of time data.

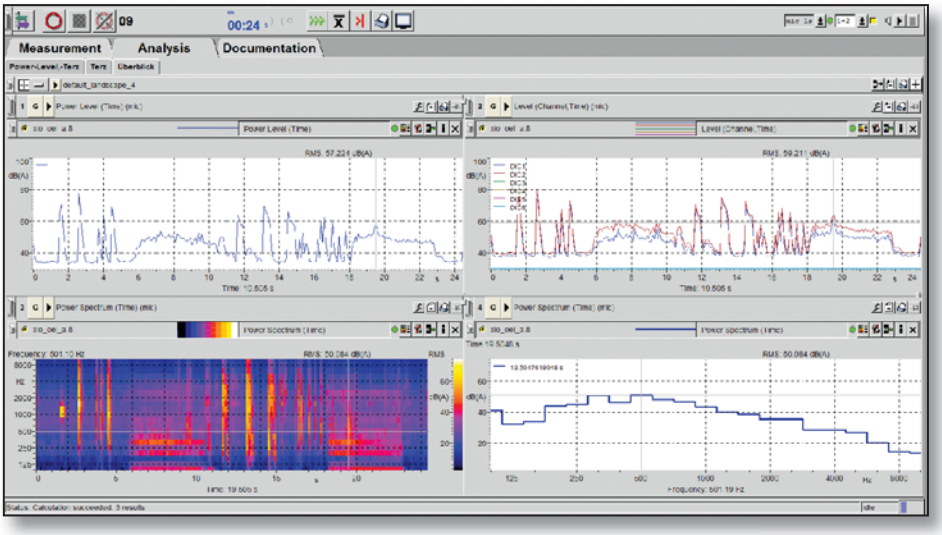
Operation

The individually configurable real-time display makes it possible to monitor the sound power and allows many other analyses during measurement as well. Since the results are already precalculated, further calculations in the post-process are very fast. The project management makes it easy to organize different measurement tasks, such as e.g. different types of devices with different set-ups.

Calibration

The system can be used to measure the room correction (K2) when a sound power source is available.

Comfortable analysis in si++Workbench



Administration, measurement, tables and results interpreted in one window for easy handling.

Presented by:

Hardware

- Standard PC
- Large selection of front ends for data recording
- Total configuration at the PC
- Support of all commercially available measurement microphones

Software

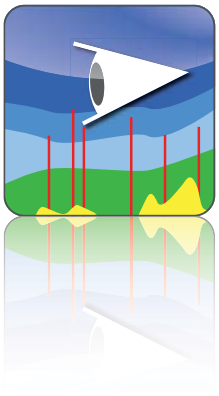
- Automatic microphone calibration for one-person operation
- Support of project management
- Integration in si++**Workbench** possible
- Recording of time data can be switched off
- Parallel calculation of all recorder groups: third octaves, FFT, single level, sound power, sound-power third octave, slow DC (status)
- Channels, RPM - all sound power results can be calculated from the precalculated third-octave data
- Consideration of all corrections for class 1 calculations
- Calculation of the room correction K2 with sound power source
- Sliding averaging with freely selectable window length for third octaves and level course
- Calculation of the sound power level from freely selectable sections
- Support of enveloping surfaces: cuboids, cuboids in front of a reflecting wall and hemispheres
- Convenient input of geometric data
- Support of measurement in a reverberation room
- Printing out of all results with siReport (incl. MS-Word®-compatible exporting)
- Network-capable, economical network licensing possible

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siVision on LivePad

The **LivePad** is an smart, intuitive, and extremely powerful system for acoustic analysis.



The **LivePad** system combines three functions in a single unit:

- Real-time acoustic analysis for analyzing noise and vibration
- Comparison and filtering of acoustic variants
- Test system for automatic noise testing

All main functions for noise testing and development are united in a single system.

The performance of all three functions is unsurpassed. The **LivePad** is impressively easy to use.

siVision on **LivePad** now analyzes sound components in real time, so you see any disturbances in machine noise straight away. Its intuitive operation and plethora of options often makes finding the cause of noise child's play.

HIGHLIGHTS

- 4 channels with ICP® supply for sound, vibrations, and RPM pulses + CAN bus interface as per ISO 11898

  Multiple channels for sound and vibrations plus RPM and parameters of the CAN bus are recorded in a calibrated manner and analyzed.

- Real-time analysis with breakdown into tones, noise, and modulations with spectral display and order display

  The display provides all of the usual technical noise parameters in a unique, highly developed display format. All noise components can be seen immediately on the distinctive siVision display.

- Verification of disturbance components by means of immediate filtering in real time during listening and during reproduction

  Unparalleled analysis and filter functions take the form of special tonality and modulation filters. The filters enable the identification of disturbance components, the elimination of disturbance noises, and the design of target noises.

- Parallel display of structure-borne sound spectrum to localize the source in the machine

  This enables the immediate visualization and investigation of the correlation with the structure-borne sound signal.

- Recording and comparative playback of different variants with seamless switchover

  Up to 240 sounds can be directly compared.

- Comparison and testing of noises with freely definable limit curves

  Individual noises and complete lists can be tested against limit curves. Thanks to separate limit curves for tonal components, noises, and modulation components, complex tests can also be carried out easily by any user. Scripts can be used to enhance testing opportunities in line with special requirements. This means that the system can also be used to configure sound tests for production usage.

SOUNDTEC



siVision on LivePad

Hardware:

- Stylish tablet PC with dual-core i5, Windows®7, and 64 GB SSD
- The USB front end is tailored to match the design and forms a unit with the tablet PC.
- 4 channels with ICP® supply for sound and vibration recorder or as pulse input
- CAN bus interface for RPM and other parameters (ISO 11898)
- Dimensions of 205 x 310 x 45 mm
- 3 hours of runtime with a single battery charge

Filtering:

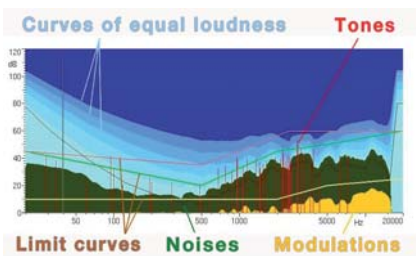
- Multiple filter groups for total sound, tonal components, noise components, and modulations
- Filters with different characteristics such as narrow band, bandwidth, high-pass, and low-pass
- Each sound has its own filter set that can also be stored and loaded to other sounds
- Each filter can be defined by means of time configurations so that only certain extracts are filtered
- Additional limiter for tonal components to restrict the loudness of tonal components to the defined limit

Real-time analysis:

- Real-time spectral display and filtering
- Automatic breakdown of sound spectra into acoustically relevant components
- Display of noise parameters such as frequency, noise level, modulation depth, evaluation of tonal components etc.
- Structure-borne sound spectra can also be displayed
- Frequency and order display with RPM from CAN bus or pulse input
- Displayable limit curves

Recording:

- Up to 4 channels for sound and vibrations with 48 kHz sampling rate
- CAN bus parameter channels can also be configured via .dbc files
- Recording of all analysis parameters in calibrated format
- More than 24 hours recording with SSD (can be extended with additional memory cards)
- Configuration and additional online analysis possibilities with the tried-and-trusted siRecord interface
- FFT, third-octave, and level display can also be shown for all four channels



Listening:

- Seamless switchover for playing back recordings you just made
- Playback modes: Single/circular/list
- Selection of individual and multiple extracts for playback
- Time or speed-synchronous switchover between recordings
- Direct, seamless comparison from matrix of up to 240 recordings with keys 0-9 and A-Z
- Loading of .wav files and other formats for comparing existing sound recordings

Testing:

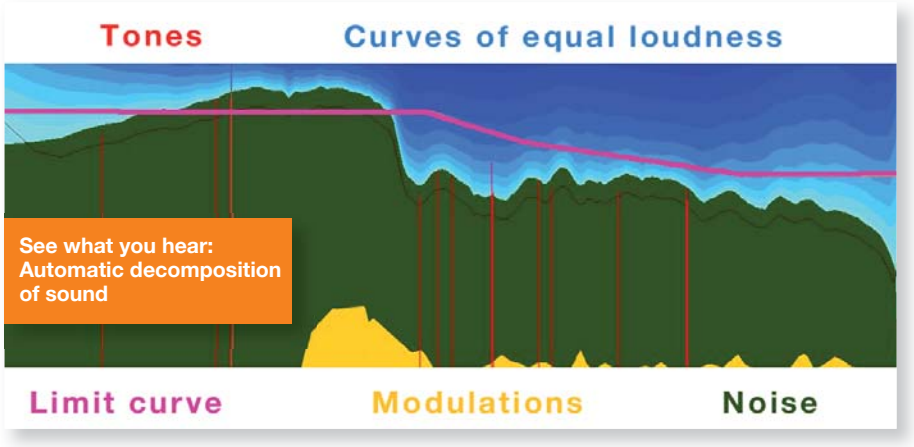
- Each sound can be compared with the limit curves using a selectable tolerance
- Three different limit curves can be defined for tonal, noise, and modulation sound components
- Limit curves can be freely edited by users or loaded from existing spectra
- The list mode test compares all loaded noises with the limit curve and creates a table with "OK"/"Not OK" results
- The test function can be extended as required using scripts to add functions from the analysis kit of the si++ system
- Configured test functions can be transferred to test systems in production if required

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siVision

Integrated analysis, filtering and noise rating



siVision optically displays all sound components perceived by the human ear and provides filters to reduce, eliminate, or enhance individual sound components. This sound simulation presents the user with specific objectives (in dB) for optimizing the noise characteristics of a real component, machine, or vehicle.

With the **Testing Mode** extension, **siVision** is the ideal software tool for automated tests in a production environment.

siVision on **LivePad** is a compact complete system (measuring instrument, computer hardware and software) with 4 ICP® inputs and a CAN bus interface, which can be operated intuitively via an integrated tablet PC. The system is ideal for mobile work, and can be used directly as a test system for applications involving automatic sound testing.

What can you visualize with siVision?

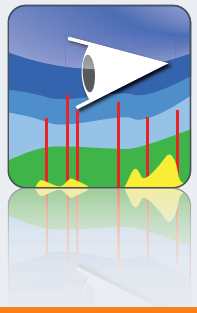
Tones:
Narrow-band tonal components (red vertical lines).

Modulations:
Rattling, squeaking, or singing components, which can often give the particular sound its unique signature (yellow area).

Noise/background:
Stochastic component of the sound over the entire frequency range and lacking any salient features (green background).

Curves of equal loudness:
Blue horizons over the sound components which are perceived as equally loud along the course of the individual blue line. With these curves, it is possible to map the different sensitivities of the human ear.

Limit curves (Testing Mode):
Target curves to be individually defined by the user, for tones, modulations and noise, and which provide the results 'OK' or 'not OK' during automatic acoustic testing in a production environment.



Applications

- Real time analysis of sound and vibration
- Troubleshooting components and machines
- Sound optimization
- Interactive and intuitive simulation of target sounds
- Objective and subjective rating of sounds and target sounds
- Acoustic source identification on the object
- End of line testing in production environment (**Testing Mode** and **LivePad**)

Operating Modes

- Software tool for sound analysis and sound optimization tasks
- Extension **Testing Mode** available for comparison and test of acoustic variants with user defined limits for critical sound components
- **siVision** on **LivePad**: Complete system for **siVision** + **Testing Mode** consiting of software, tablet PC and USB frontend (4 channels, ICP® supply, CAN bus interface) - optimal for automatic sound testing



siVision on **LivePad**

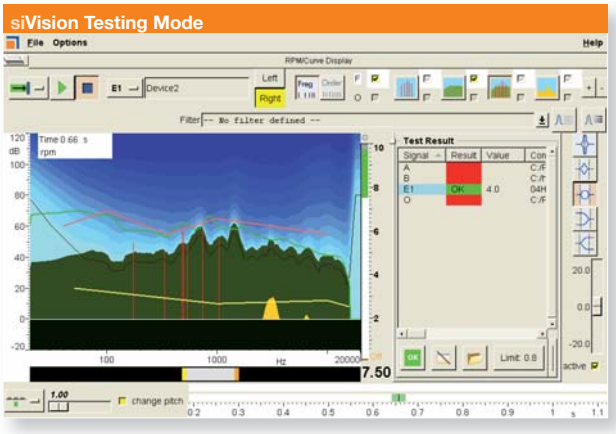
SOUNDTEC

siVision

siVision for troubleshooting and sound optimization

Monotonous tones (e.g. persistent beeping) as well as prominent modulations (e.g. rattling) are easily perceptible and irritating to the human ear. Even an otherwise inconspicuous noise can be too loud or too soft (noise can mask other features, for example). In particular, however, these sound characteristics can point to faults or errors in the manufacture of a machine. **siVision** visualizes these sound characteristics and can thus plays an important role in the identification of faults.

All the sound components are automatically displayed separately and rated for perceptibility of tones. The perceptibility is visualized by means of equal-loudness curves. The loudness levels shown can be adjusted according to the required quality, and enable a quantitative assessment of the felt disturbance.



siVision makes it possible to analyze sound characteristics in real time or in playback in a very simple manner, and allows their individual manipulation with the help of filters. With the modification of the sound it is possible to acoustically generate a target sound, e.g. without tonal and modulating components, which can subsequently be used as the basis for potential constructive adaptations or corrections. Each development status, however, can be compared objectively as well as subjectively.

Psychoacoustic know-how at the press of a button

With classic methods, analyzing disturbing components and configuring the sound characteristics of a machine is a time-consuming task for experts. **siVision** separates disturbing components without any user interaction or special prior knowledge of psychoacoustics.

Comparability to standard analyses

The values calculated in **siVision** are computed on an aurally-equivalent frequency scale and normalized according to classic third-octave analysis. The ratio of the tonal component level to the residual noise is given directly in dB. This makes it possible to determine the strength of a disturbing component in a quantitatively meaningful way.

Filter groups for tones, noise, modulation, and total sound

The sound components can be influenced through separate filter groups; this sound simulation provides the user with specific objectives (in dB) for optimizing sound on a real component. Tonal components and modulations can be analyzed and filtered either as orders via the RPM or in the frequency range. Automatic sound separation makes it possible to filter orders without RPM information for the first time. The direct filtering even of modulations is another unique feature.

Evaluation of the tonal quality using an objective grading scale

Sound quality is usually graded by experienced listeners. This method is time-consuming and involves a certain degree of uncertainty due to the individual evaluation criteria. **siVision** now provides an objective grading of tonal components in a sound through comparison with curves of equal loudness. Conversely, it is also possible to specify a grade for the desired sound quality in order to achieve an objective through automatic filtering.

Real-Time Analysis

- Real-Time spectral display and filtering
- Automatic breakdown of sound spectra into acoustically relevant components
- Display of noise parameters such as frequency, noise level, modulation depth, evaluation of tonal components etc.
- Structure-borne sound spectra can also be displayed
- Frequency and order display with RPM from CAN bus or pulse input
- **Testing Mode**: Displayable limit curves for tonal, noise, and modulation sound components

Filtering

- Separate filter groups for total sound, tonal components, noise components, and modulations
- Filters with different characteristics such as narrow band, bandwidth, high-pass, and low-pass
- **Testing Mode**: Each sound has its own filter set that can also be stored and loaded to other sounds

Evaluation

- Curves of the equal loudness indicating the percieved loudness of the human ear
- Loudness curves adjustable according to subjective rating scale
- Display of the overall rating for tonal components
- **Testing Mode**: user defined limit curves for tonal, noise, and modulation sound components
- **Testing Mode**: automatic rating of various sounds through comparison with limit curves, display of OK / NOT OK for the tested object

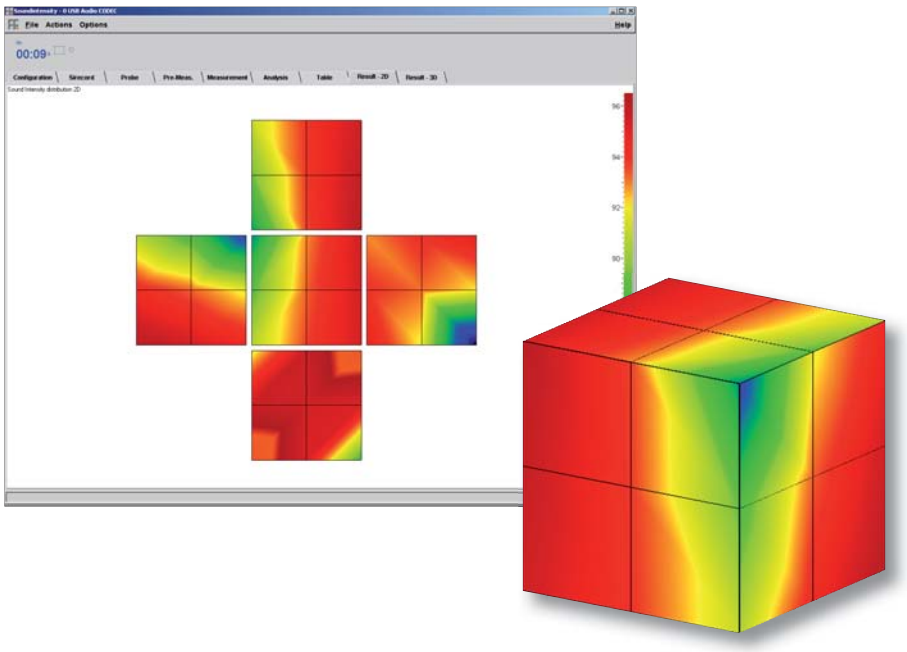
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siIntense

Integrated measurement of the sound intensity with the classic p-p and the new p-u probe



siIntense is a sound power measuring tool in accordance with DIN/ISO standards, with 3D scanning and visualization of the sound intensity distribution of machines and electrical and household appliances.

The sound power of a device can be determined even under difficult circumstances (e.g. sources of interference) with the aid of a sound intensity sensor such as our **SoundFlow** Sensor. The enveloping surface of the measurement object is scanned at discrete locations or continually. In addition, particularly loud positions can be pinpointed - such as gaps in the sound insulation. **siIntense** will guide you through the entire process.

From measurement to result in one application

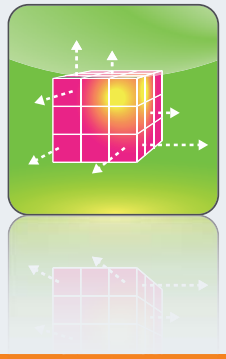
Configuration of the measuring surface, probe selection/calibration, data recording with real-time display, analysis in 2D and 3D charts - **siIntense** offers a structured interface for all tasks.

Hardware-independent

siIntense offers great flexibility in terms of data recording and the sound intensity probe. Extremely compact total solutions are available.

Easy calibration

siIntense allows easy (re)calibration and management of various probes with different microphone distances. In the case of the pressure/velocity sensors (PU probe or **SoundFlow Sensor**), the exact frequency and phase response correction is taken from the calibration data.



Applications

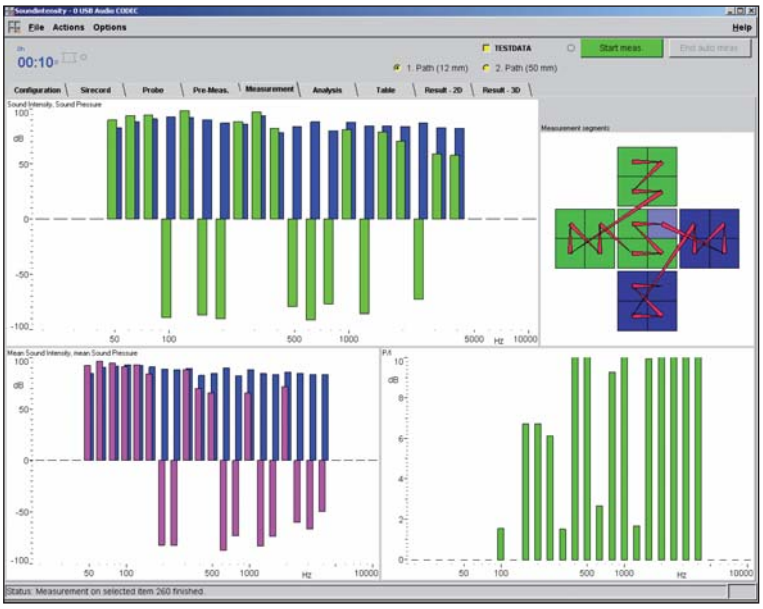
- Sound power determination on stationary machines (e.g. electrical and household appliances)
- Sound power measurement with background noise level
- Sound power determination in non-standardized rooms
- Partial sound source measurement
- Search for sound sources or gaps in sound insulation

Relevant standards

- DIN EN ISO 9614 – 1 measurement at discrete points
- DIN EN ISO 9614 – 2 scanning method
- Support for all 3 accuracy class

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siIntense



All accuracy classes

Class 1, 2 and also Class 3 measurements are supported by **siIntense**.

Optimum user guidance

The user is guided through the entire measurement process, depending on the selected standard. Both segment control and starting/stopping of the measurement can be performed with only a single button on the probe. The contribution to the total sound power can be immediately evaluated by simply selecting and deselecting sub-surfaces and third octave bands. Partial results can be evaluated during a measurement sequence. The measurement circuit for the probe can be freely selected by the user.

Clear presentation of results

Depiction of criteria and measurement quality indicators using color coding (depending on the class selected). The results can be presented in 2-dimensional or 3-dimensional form, and as a table.

Background image and simple positioning of the probe

Optionally, an image can be stored to visualize the intensity distribution in front of the object image.

Presented by:

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Hardware

- P-u probes for genuine **SoundFlow** sensors or PU probes for real sound pressure and sound particle velocity measurements
- Optimum PP probes: G.R.A.S. 50AI
- All commercial PP probes can be adapted as needed.
- Large selection of suitable front ends, see **si++Voyager** range of products
- Standard PC and Notebook

Software

- Sound intensity in third octaves (real time)
- All data can be exported as a text file - Excel-compatible
- Resumption of measurement after interruption (including after hardware or operating system failures)
- Simple project management because all configuration, measurement and analytical data are saved in one file
- Management of multiple sensors with 2 microphone distances including phase and residual intensity calibration

Features

- PP and PU probes can be used
- Data recording can be controlled using the buttons on the sound intensity probe.
- Signals already overloaded in the front end are detected and are automatically not used for evaluation
- Clear feedback regarding compliance with the accuracy criteria according to standard
- Measuring range selection can be modified with a mouse click

siTracer

Innovative Acoustic Camera for Sound Source Localization



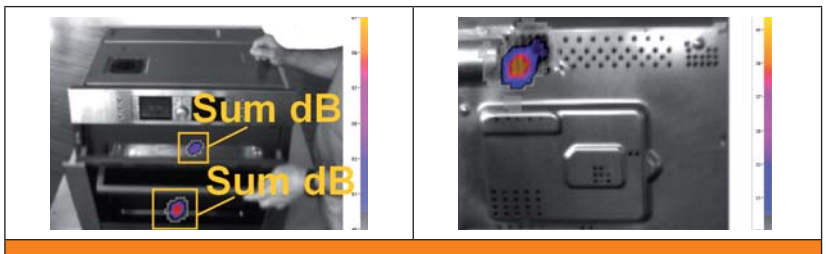
siTracer is an innovative acoustiv camera. It works with the Sound-Identification-Algorithm (SIA) that reaches a full 20 dB(A) dynamic range with only 24 microphones in optimized arrangement.

Standard cameras require many (e.g. 60) microphones for displaying a dynamic range of 8-13 dB. They only deliver a rough locating where a loud sound source is, but they can not provide any further information about the differences between several loud sound sources, due to the small dynamic range and the unsharpness. In addition, extra effort is necessary for focussing on the sound source.

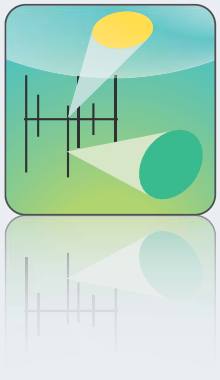
This is different with siTracer:

Through the innovative technique of **siTracer** not only sound sources are automatically localized and displayed in greater detail, but also the sound emission of the localized sound sources is precisely accurately measured.

- **Acoustic autofocus**
- **Area Level Summation**
- **Optimized microphone setting**
- **Measuring accuracy**
- **Slow motion playback**



Left: Area Level Summation on the snap noise of an oven door, a very useful function when you find multiple sound sources.



Applications

Sound source mapping with:

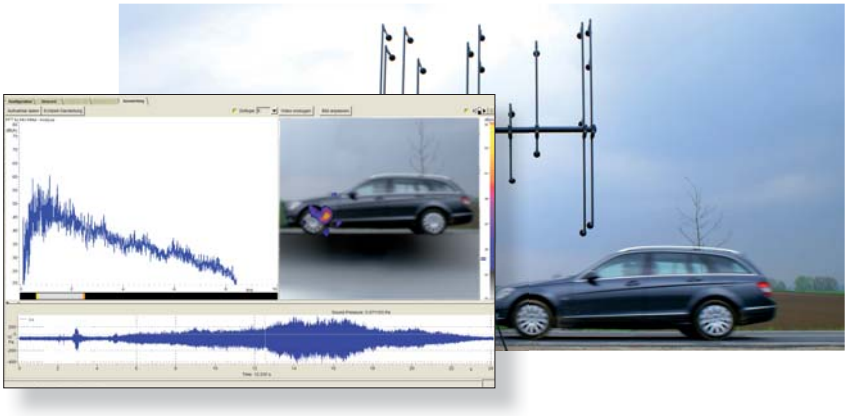
- Vehicles
- Devices
- Aircraft
- Ships
- Buildings

Display

- Multiband sound source analysis in an integrated presentation
- Easy readout of the levels from marked picture areas
- Multiple acoustic autofocus
- Ofline slow motion playbaack up to factor 1025
- Easy generation of videos

SOUNDTEC

siTracer



Acoustic Autofocus:

As opposed to common acoustic cameras **siTracer** needs no extra focus on the distance to the sound source. The focussing works automatically without any auxiliaries. Additionally siTracer can focus on multiple sound sources at the same time.

Area Level Summation:

Sound levels can be summed up over multiple areas. This is possible because of the unique Sound Identification Algorithm.

Optimized Microphone Setting:

The setting of the microphones in the array of **siTracer** derives from a deliberate pattern of economy and the exact knowledge of the required microphone distances for full coverage of the audible range. Apart from higher dynamics and reduced unsharpness, this allows working with only 24 microphones.

Measuring Accuracy:

Not only does **siTracer** distinctly highlight a loud sound source, it also shows the level of a sound source precisely accurate at the same time. This is possible owing to the applied algorithm and the optimized microphone setting. This option is available by using quater-inch microphones that are calibrated with a standard calibrator.

Slow Motion Playback:

Along with recordings in real time **siTracer** can play recordings in slow motion. A time-streching by a factor of 1024 is possible. The frequency band of interest can be selected subsequently. The slow motion playback reveals especially impulsive or fast moving sounds and their spreading.

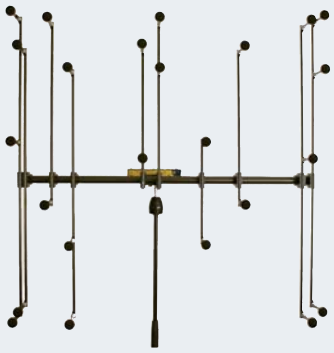
Presented by:

Hardware

- Lightweight frame thanks to carbon fibre and aluminum
- Integrated data acquisition: 24 channel frontend
- Integrated video camera
- 24 standard microphones
- Runs on laptop

Handling

- Easy and fast mounting through plug connections
- Safe transport and storage through aluminium case
- Mobile and stationary application
- Suitable for indoor and outdoor use





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siBuilding

Measuring system for determining the sound insulation for airborne and impact sound



siBuilding is an application for determining the sound insulation according to DIN/ISO 140. Measurement, analysis and reporting are integrated in a single interface.

Especially high measuring dynamics

The use of special filter techniques produces standardized measurements with better dynamics than other systems. Disturbing noises are measured at the same time that the sound insulation is determined. Loudspeaker overdriving is uncritical. All of this results in a maximum signal/disturbing noise ratio with optimum control, thereby ensuring measurability under all operating conditions.

Optimum user guidance

siBuilding is equally suitable for simple use by assistants and demanding analysis by professionals. The user is optimally guided, from entering the room parameters and specifying the measured transmission paths to printing out data.

Selectable system configuration

1 to 12 channels can be measured simultaneously by combining standard laptops with different front ends. This makes it possible to use lightweight systems economically and portably in the field as well as to measure four channels in a minimum amount of time in the laboratory.



Applications

- Measurement of the impact sound insulation
- Measurement of the airborne sound insulation
- Measurement of the reverberation time

Additional options

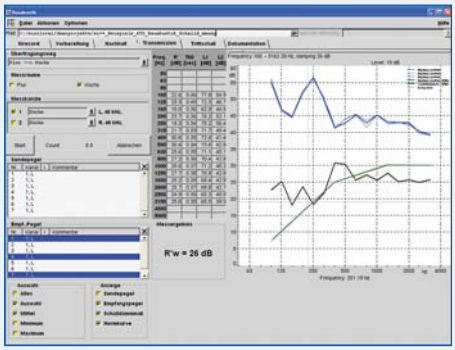
- Determination of the pulse response
- Determination of the speech intelligibility
- Analysis of architectural acoustic parameters

Relevant standards

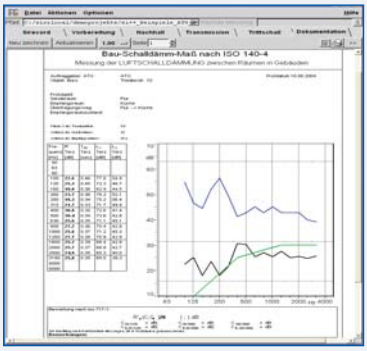
- DIN EN ISO 140-(x)
- DIN EN ISO 16283-1 airborne and sound insulation
- DIN EN ISO 16283-2 impact sound insulation
- DIN EN ISO 16283-3 façade sound insulation
- DIN EN ISO ISO 717-1 rating of airborne and sound insulation
- DIN EN ISO ISO 717-2 rating of impact sound insulation

SOUNDTEC

siBuilding



Administration, measurement, tables and results interpreted in one window for easy handling.



Print-out of the sound insulation in buildings according to ISO 140-4 with measurement data and further individual descriptions.

Immediately measurable

A typical measurement can be performed immediately after the microphones have been calibrated. The preparation time for the user is therefore minimal.

Optimized measurement of several transmission paths

After several rooms and transmission paths have been specified for measurement, the desired measurement can be selected from the list of tasks. The measurements can be performed in any order, and pending measurements are displayed by the software as suggestions. In this way, nothing is overlooked and the measurements are worked through without additional planning effort.

Flexibility for users

All names and parameters can also be edited at a later time. As soon as the measurements and room parameters are complete, the finished analysis and print-out are available. In this way, the measurement system adapts to the way you work.

Combination of precision and speed

To measure the reverberation time, impulse excitation analyses (with a gun) are also supported for fast overview measurements.

Additional options for analyzing architectural acoustic parameters

The recorded data can be post-processed for special tasks with the complete range of modules in the sound and vibration analysis system.

Presented by:

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Measurements

- Parallel measurement of several channels
- Send and receive level are simultaneously and serially measurable
- Output of the excitation signal via PC. Alternatively, playback from CD when no connection exists between source and receiving room
- Measurement length can be selected to improve the signal-to-noise ratio and to measure longer reverberation times

Operation

- Calibration values for microphone sensitivities can be entered directly or determined with a sound-pressure calibrator
- Overdriving information from hardware and software immediately visible and marked on the measurements if necessary
- Output of the complete, standardized print-outs

Hardware Configuration

- Can run on standard PC/laptop under Windows®

Hardware plattforms:

- LivePad-X
- 4/6 channel hardware with additional channels und CAN bus optionally
- LiveRec24+
- 24 / 12 chanels with X-Range und additional channels (CAN bus)
- Zodiac-Aerospace (formely HEIM) single modules or as multichannel solution series
- USB microphone

Software

Signal processing:

- High signal/noise ratio due to special measuring method
- Calculation and display of the disturbance level from the time period of the transmission / decay measurement
- Selectable frequency range 125-3150 Hz or 50-5000 Hz
- Calculation based on measurements in third-octave bands
- Online display of the current third-octave spectrum

User guidance:

- Management of the source / receive rooms and transmission paths
- Resumption of measurement after interruption/restart
- Integration of room parameters even after the measurement and subsequent discarding of individual measurements
- Automatic averaging of several measurements

Additional option of architectural acoustics:

- STI/RASTI
- Determination of speech intelligibility
- Pulse response, reverberation times: EDT, RT10, RT20, RT30
- Distinctness, clarity (C50, C80)
- Cross correlation functions IACC_A, IACC_E, IACC_L

siTest

Using siVision Testing Mode: Quality testing through acoustic and vibration measurement in a production environment



siTest optimally monitors the quality of your products with respect to acoustics and vibration. The applications range from 100% testing in production to the determination of complex performance characteristics using samples.

Our proven system for industrial testing has now been further enhanced by the incorporation of our analysis software **siVision**. **siVision** visually displays all sound components perceived by the human ear. The testing system comprises an industrial PC, our **LivePad** USB front-end with 4 channels, ICP® supply, CAN bus interface and the **siVision** software

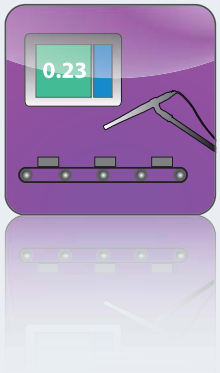
Sound analysis

To define and limit the critical sound which is to be tested, the system employs the **siVision** sound analysis. This sound analysis shows all the relevant sound components:

- Rattling, squeaking or singing sounds are displayed as modulation components in yellow.
- Narrow-band tonal components are shown as red vertical lines.
- The stochastic sound components over the entire frequency range, which lack any salient features, are shown as a green area.

Testing Mode: testing settings

- Thanks to separate filters for each sound component, the critical sound characteristic can be identified exactly.
- Each sound component (tones, modulations, noise) has its own limit curve. It can be created interactively and easily by the user.
- Every setting can easily be exported to the production system via USB flash drive.



Applications

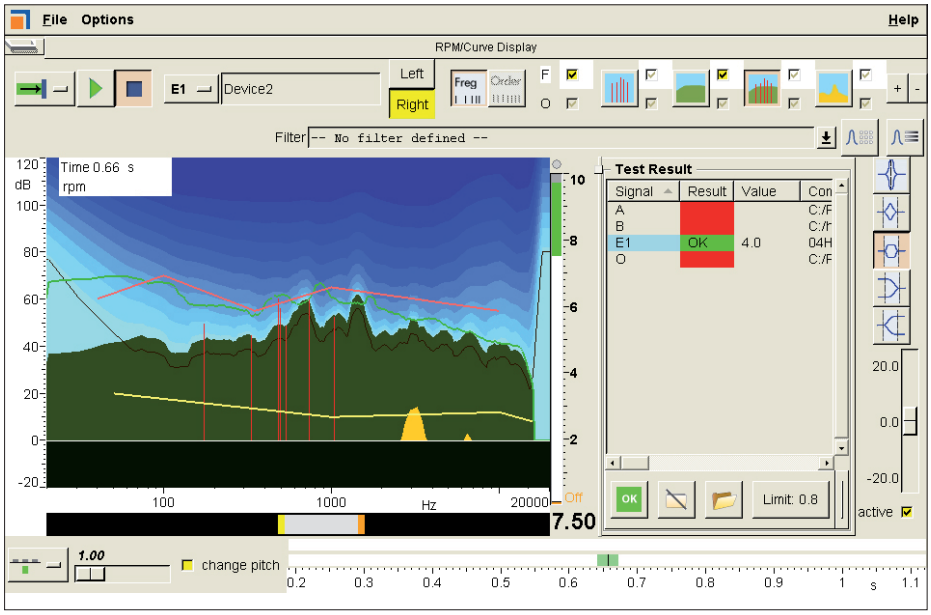
- Trobleshooting components and machines
- End of line testing in production environement
- Comparison and test of acoustic variants

Filters and Evaluation

- Each sound has its own filter set that can also be stored and loaded to other sounds
- 3 limit curves for can be defined by the user for tonal components, noise and modulations
- Automatic rating of various sounds through comparison with limit curves

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Display

- If a visible aspect of the sound reaches its limit curve the sound is defined and marked as critical
- An additional Display shows OK or NOT OK for the tested object
- For each sound the judgment is stored and can be shown as just the actual result or as a list of all tested sounds so far

Reliable detection

siTest listens with an expert's ear. The detection rates therefore attain the level of trained staff in the assembly shop, without the fluctuations and drift in criteria which a subjective evaluation always entails.

Easy adaption of limit curves

When the tested object or sound changes, the limit curves for critical sound components can be easily adjusted at any time by the user.

Realistic noise identification

Compared to standard acoustic methods, **siTest** achieves considerably better differentiation in production testing. This is due to a realistic reproduction of the detection processes required in human hearing. **siVision**'s unique and realistic analysis is used for this purpose. This makes it possible to automate acoustic quality control in many areas of production control, where well-trained human ears were previously required.

Easy self-administration

siTest can be configured and serviced by the user via the **siVision** Testing Mode's intuitive interface. As a result, adjustments and extensions can be implemented in a very short time.

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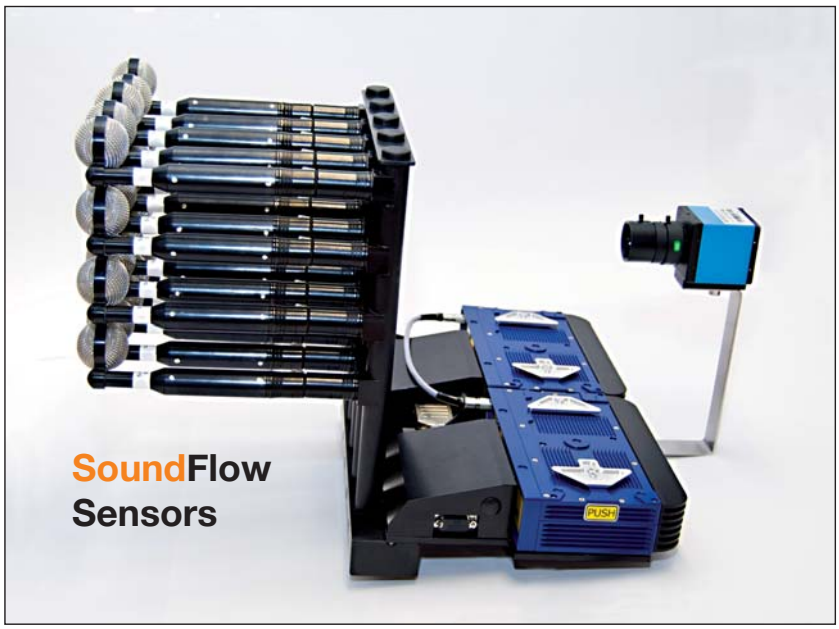
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siCamera

Film camera for sound intensity distribution with a probe array (sound intensity camera)



siCamera allows you to directly observe and film the sound flow through a surface. The fast, wide-band camera has a large dynamic range, since the sound field is directly measured and not calculated. As a result, for the first time highly accurate direct observations of the sound emission are possible under various operating conditions.

Large dynamic range

The sound flow is directly determined by the sensor surface with a sensor array, which allows a dynamic signal range of more than 40 dB even with low frequencies. This is considerably more than any other acoustic imaging process has provided so far.

Large frequency range

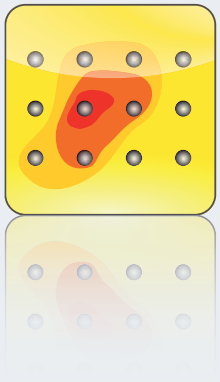
The use of actual sound velocity and sound pressure sensors allows a direct, wide-band measurement of the sound intensity over the entire audio range. The typical accuracy limitations and frequency measuring ranges of conventional sound intensity probes (pressure difference) are no longer a problem.

Documentation of object image and sound flow

The object image is displayed via an optical camera. The sound intensity is shown as a semitransparent colored surface in front of it. This way, the acoustic events can be directly seen and documented on the object structure.

Selectable frequency range

The frequency range that is displayed and replayed can be freely selected for online monitoring and audio replay of the recording, which makes it possible to focus on problem regions.



Applications

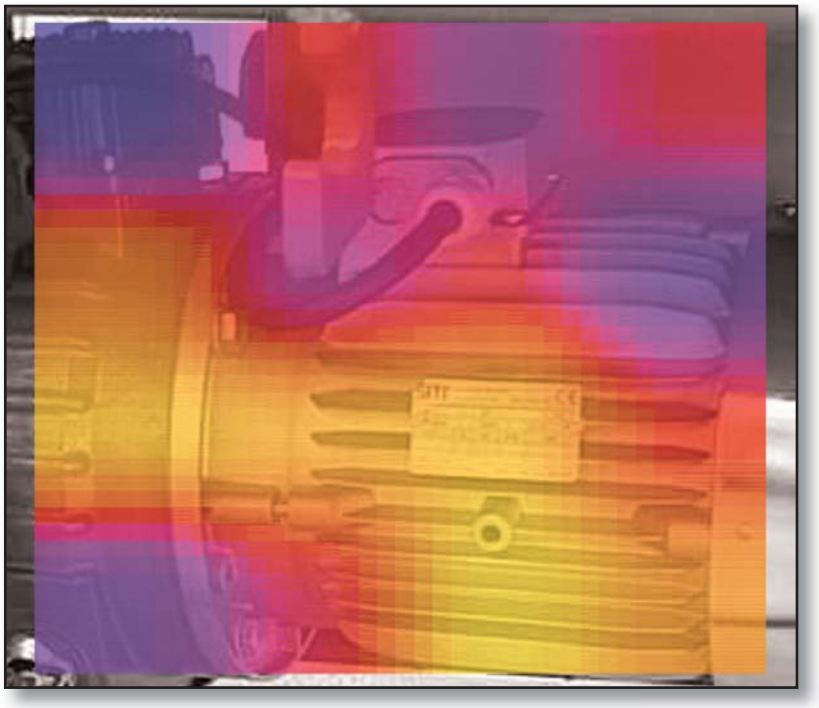
- Acoustic source localization on the object
- Recording and audio replay of the sound emission under varying operating conditions (e.g. run-up)
- Visualization and contact-free measurement of the surface oscillation (sound velocity mode)
- Recording and audio replay of the acoustic signal

Operating conditions

- Direct measurement of the sound flow on a plane in space or on the object
- Alternatively measurement of the sound velocity near the object surface
- Wide frequency range and great dynamic range without switchover or conversion
- Online visualization and recording of even fairly long-term processes possible (machine cycles, traversing movements etc.)

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siCamera



Various probe configurations

Probe dimension and number of sensors can be easily configured. Bandwidth and number of probes can be adapted to the requirements and increase with the available computing power.

Easy adjustment and reliable documentation of the operating states

The measuring ranges of all sensor channels are set at the same time using a few central parameters. The data recording format allows memory-saving recording and the selection of an interesting frequency range at a later time. The parameters for the analysis do not have to be taken into account during the measurement.

Sound intensity mapping of harmonic orders

The coupling with RPM pulses allows orders to be displayed in an RPM-synchronous way as a sound intensity map over the RPM.

Presented by:

Special features

- Great dynamic signal range over the entire frequency range
- Recording of superimposed object image and sound intensity distribution
- Display, recording and reproduction of sound pressure, line spectra and third-octave spectra
- Selectable frequency range for audio replay and the sound intensity map
- No secondary maxima in the sound distribution

Hardware-configuration

- Array with our **SoundFlow** sensors (sound intensity and sound pressure sensors) or sensors from Microflown
- Data recording via multi-channel front ends from the **si++Voyager** range
- Analysis and recording on a laptop for mobile use or a Desktop-PC in the lab

Operation

- Probe with handle, CCD camera and sensor array is held directly over the surface to be tested
- Online sound intensity map for direct observation of the sound emission
- Very easy recording and replay of sound, image and sound intensity distribution
- Replay ranges can be defined and time events marked

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siPass-by

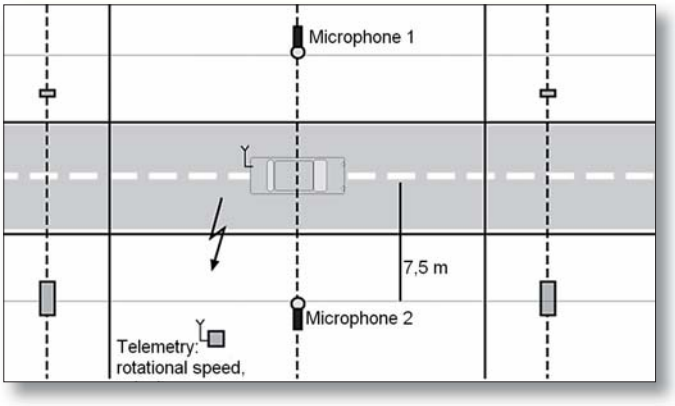
Pass-by measurement system according to ISO 362 and ECE R 51

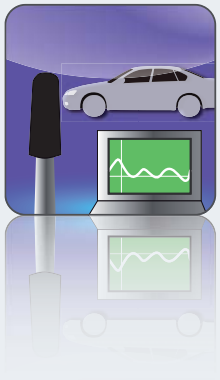


siPass-by is a proven pass-by measurment system with numerous analysis options like high-resolution order analysis, tire rolling noise measurement and noise source separation.

The measurment method according to the common ISO 362 is supported as well as the measurement method according to ECE R 51.

- **Flexible and easy handling**
- **Fast measurement / analysis**
- **freely adaptable configuration**
- **Digital telemetry up to audio bandwidth**
- **Convenient data management in a network**
- **Numerous analysis options**





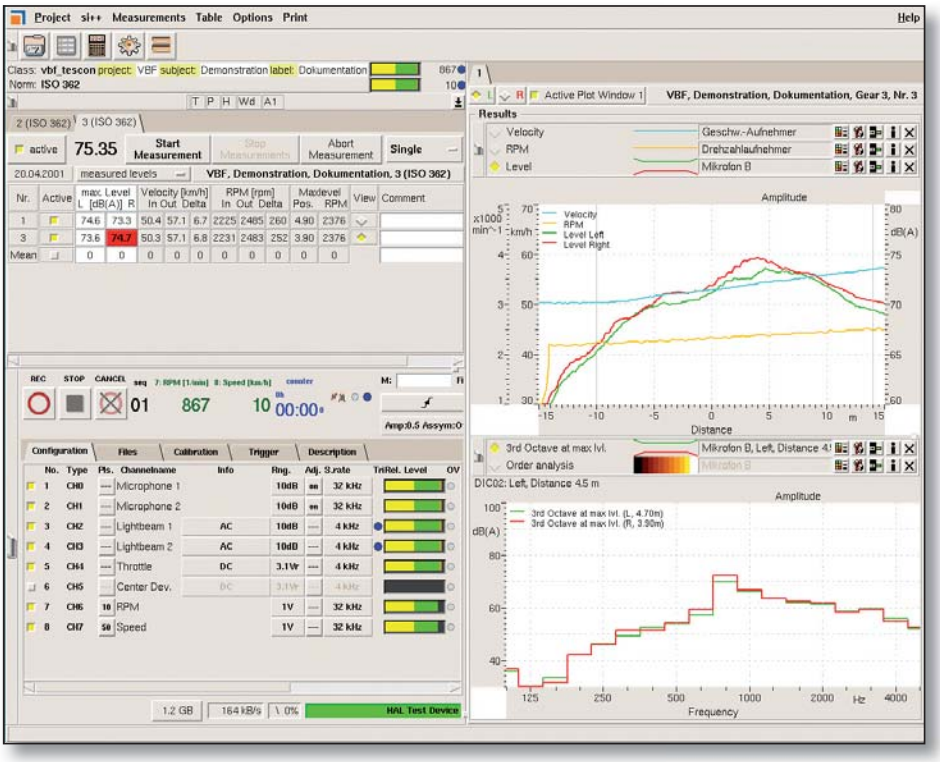
Applications

- Exterior noise testing
- Development: tires, motors, exhaust systems
- Conformity testing / COP control of serial produktion

Relevant Standarts

- ISO 362
- ECE R 51

siPass-by



■ Support for new measuring method ECE R 51

The main differences between ECE R 51 and the older ISO 362 are the acceleration method and the calculation of the end result.

Acceleration in ISO 362 is defined as approach with 50 km/h and then full throttle after passing the -10m line. In contrast ECE R 51 requires 50 km/h at microphone position. This usually requires pre-tests where the drivers accellerates at various positions and determines the speed at microphone position. This has to be repeated for each vehicle with different power.

siPass-by supports the driver in displaying the point where 50 km/h was reached. So the driver knows how much acceleration has to be displaced in order to reach 50 km/h at microphone position.

ECE R 51 also calculates the end result by taking the actual acceleration and the so-called power-to-mass-ration of the vehicle into account. Both determine which gears have to be tested. siPass-by also supports the driver by calculating the required gears and listing the detailed decision parameters.

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- Optional for ECE R 51
- Intuitive display for the driver
- 50 km/h feedback
- Recommendation to choose gear

Hardware / Software

Complete system with:

- Telemetry
- Radar
- Photoelectric barrier
- Microphones
- Software
- Measurement PC
- Optional: weather station
- Optional: minicomputer for the driver support, WLAN

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SoundFlow

Sound Pressure- and Sound Velocity Sensor
The robust solution for near field measurements

The new **SoundFlow** Sensor from Soundtec is the ideal solution for determining sound power or sound emission in the near field. It can also be applied when no special testing room is available. The usage of proven technology makes the **SoundFlow** Sensor sturdy, versatile and good value for money.



Advantageous features

Direct measurement of velocity and pressure enables the determination of sound intensity with only one measurement for a frequency range of 40 Hz to 15 kHz. Even with high frequencies the inherent noise stays low. With its diameter of head of 4 cm the sensor is considerably smaller than usual intensity probes.

Examples for the application

In connection with the software **siIntense** our **SoundFlow** Sensors are applicable for sound power measurements through mapping of the sound emissions from a surface. **SoundFlow** Sensors have already been working successfully in our sound intensity camera **siCamera**.



Areas of Application:

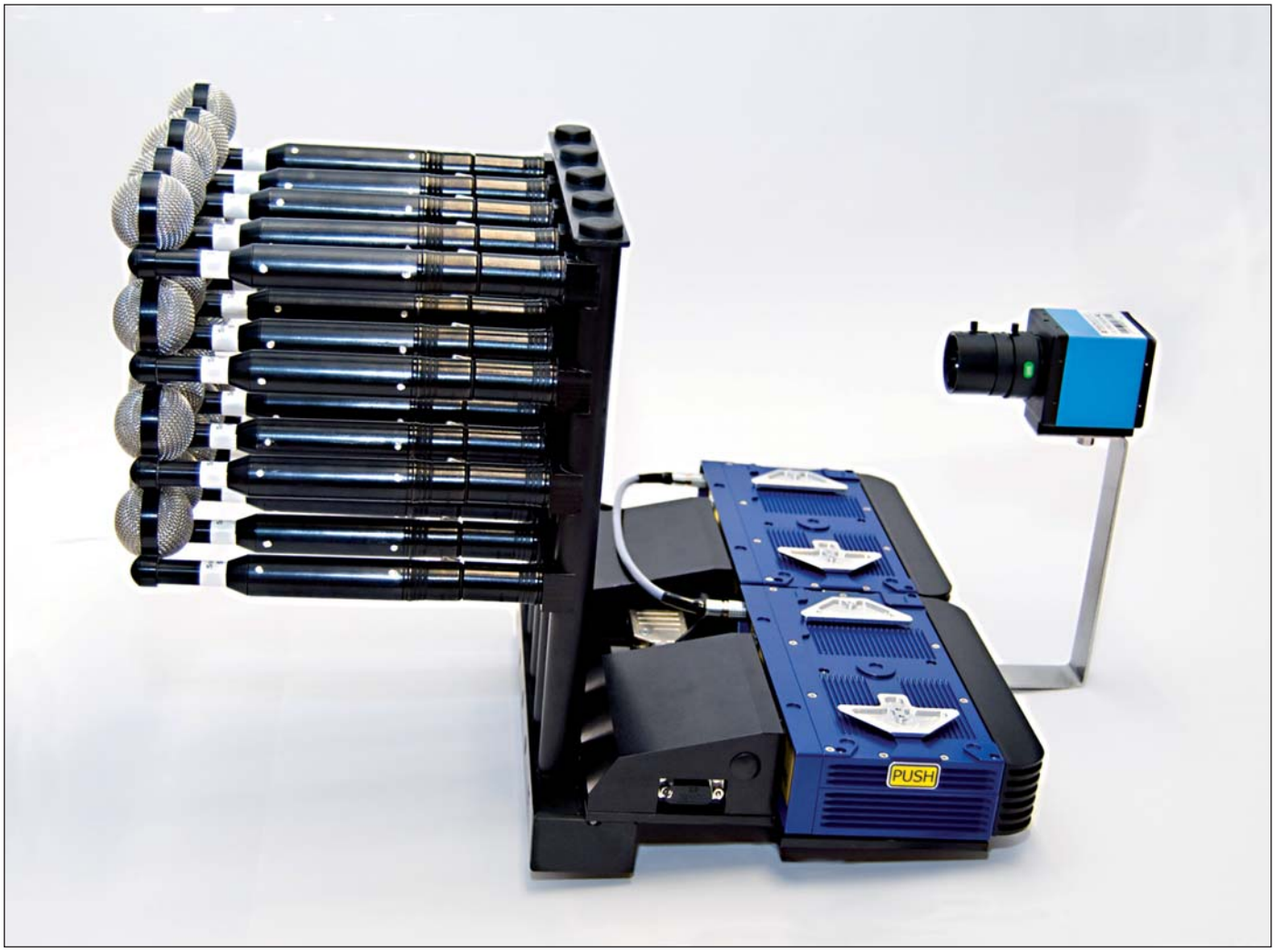
- Determination of sound power or sound emission in the near field.
- Also applicable without a special testing room.
- Seeking for acoustical isolation leaks.
- Together with the software **siIntense** applicable for sound power measurements through mapping of sound emission from a surface.
- Application in our sound intensity camera **siCamera**.

Features

- Dynamic range: 25 dB(A) – 130 dB.
- Frequency range: 40 Hz -15 kHz (-15 dB to 20 kHz).
- Low inherent noise: 25 dB(A).
- Sturdiness.
- Very good cost-benefit ratio.

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SoundFlow Sensor-Array in our **siCamera**



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LiveRec24+

The **LiveRec24+** is a data acquisition solution for up to 24 dynamic signals with an analogue bandwidth of **30 kHz/channel** and very high precision. All channels are equipped with **24 bit high end AD-converters** with a **dynamic range of more than 110 dB**. The noise floor is lower than any ICP® sensor. The **1 V range with only 3 µV noise** covers the range down to lowest input signals which provides an almost carefree dynamic range.

The **X-Range** covers 12 channels in 135 dB range by combination of two 24 Bit AD-converters to one channel. Therefore range selection is not needed any more. **The dynamic range in the FFT is higher than 160 dB**.

The module works with a very low **power consumption of typ. 6.5 W**. With the **4mA ICP® / IEPE supply** it is perfectly suitable for any kind of ICP®/IEPE sensor. All 24 channels support AC and DC coupling. Two additional **pulse inputs with 512 kHz sampling rate and 4 slow DC inputs** complete the 24 dynamic inputs. A **galvanic isolated CAN-Bus adapter** is available as an option. Despite all these features the **LiveRec24+** is even **25% smaller** than comparable frontends.

The modules are powered by **8-36 V** and are connected to the **PC via Ethernet**. A single module can be connected and powered by an USB-C interface.

The **Soundtec LiveHub** provides galvanically isolated power supply and data connection for up to 4 modules. The LiveHub ethernet outputs can be connected to each other with standard Gigabit Hubs to increase the number of channels to some 100 channels easily.

Technical Features

- 24 dynamic channels with reference ADCs
- Input -10 V to +20 V and +/1 V, or alternatively -10 V to +20 V in X-range mode
- Dynamic range (SFDR) 110 and 107 dB(A) or 135 dB(A) in X-range mode
- DC and AC (0,3 Hz) coupling
- ICP® supply with 4 mA (+/10%)
- TEDS support
- AC precision 0.015 dB
- DC precision 0.0015 dB, 1mV (20 V range)
- Input impedance > 1MOhm
- Input noise 3 µV (A weighted) in 1 V input range
- Sampling rate 64 kHz, 30 kHz analogue bandwidth (-3 dB)
- Sampling rate analogue 1,024 MHz with precise digital filtering to 64 kHz
- Max. input without damage -20/+30 V

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LiveRec24+



Additional inputs

- 2 pulse inputs for RPM measurements with 512 kHz
- 4 slow DC inputs with 1–15 V range and 0.5% precision
- CAN-Bus input with galvanic isolation (option)
- Digital AES/EBU input with galvanic isolation (option)

Connections

- 50 pin D-Sub for 24 channels resp. 12 channels with X-range
- 15 pin D-Sub for 2 pulse channels and 4 slow DC channels
- 2 x RJ45 Ethernet and Soundtec X-Bus (incl. Power supply, sync and data to Live-Hub)
- USB-C power supply 5 V / 2 A and USB data transfer
- 9 pin D-SUB CAN-Bus
- Banana plug for ground connector

Environmental Conditions and Dimensions

- Temp. range for operating mode -10°C to 55°C (to 50°C in multi-module usage)
- Temp. range for storage -40°C to +85°C
- Humidity 0-93% not condensing
- Dimension 176 mm x 148 mm x 30 mm
- Weight 820 gr
- Connection between modules: magnetic, with M5 screw fitting



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