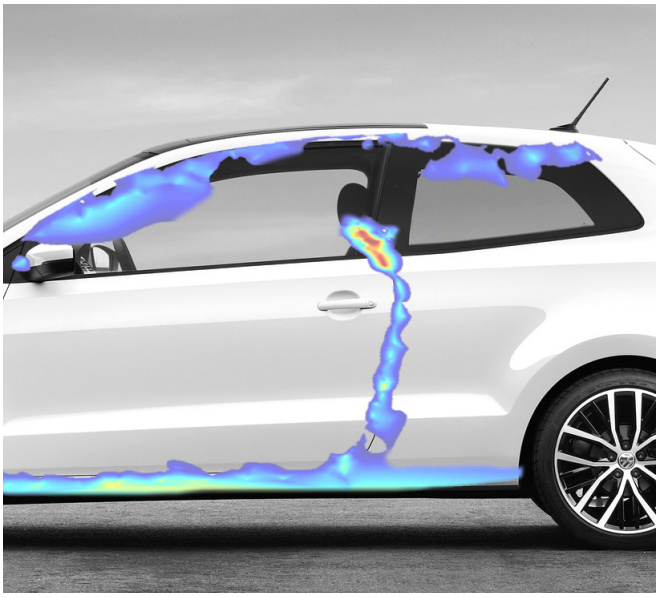
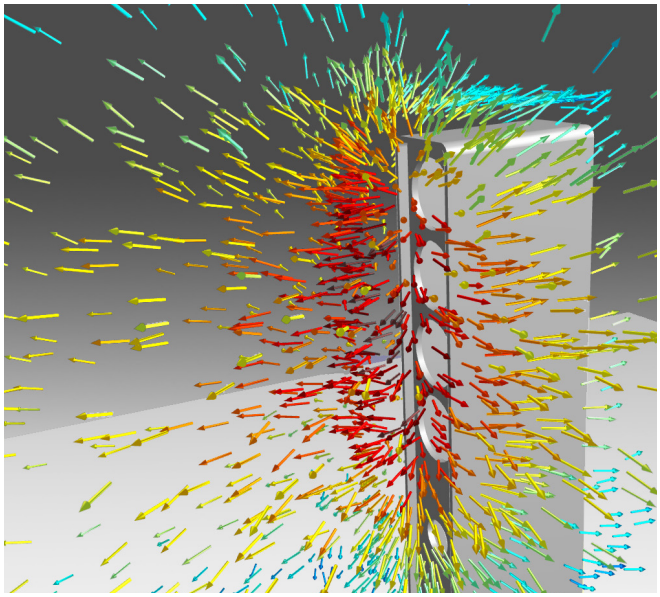
Microflown Technologies
Charting sound fields



PARTICLE VELOCITY SENSORS & SOLUTIONS



PRODUCT CATALOG

Scan & Paint 3D - Remote Handle with tracking Sphere and USP probe

LEADERS IN CHARTING SOUND FIELDS

In 1994, in the cleanroom of the University of Twente, Hans-Elias de Bree discovered that the MEMS based thermal mass flow sensor he was working with was so sensitive that it had acoustic properties. The Microflown was born. In 1998, we cofounded Microflown Technologies, in essence with no clue on who would benefit from measuring particle velocity directly. Seasoned university professors wished us good luck and told us to prepare for ten years' lead time before industry would adopt, when at all. The chances of success were estimated to be ten percent.

We sailed the oceans, exploring markets like building acoustics and bio acoustics. We tried a passage into ISO certified markets. They did not let us in. We found our anchor harbor in the global manufacturing industry, where engineers always look for better tools to do the job.

Charting sound fields is not limited to visualization techniques. Above all, it is about capturing the correct data with sufficient spatial resolution. The uniqueness of the Microflown sensor, the algorithms applied to the captured data and the user friendly tools, provide the mapping as outcome.

Today, the Microflown team, and all its international partners, built a web of highly knowledgeable professionals that travel the world helping engineers to make their products quieter and more reliable. Naming our latest product, the Voyager is a tribute to all who took, and take, the courage to make the Microflown sensor what it has become now.

Indispensable for the true professionals.

MSc. Alex Koers
Cofounder & Director

MICROFLOWN

SOLUTIONS

CATALOG

SERVICE

CHARTING SOUND FIELDS

THE PARTICLE VELOCITY SENSOR: CHANGING THE FIELD OF ACOUSTICS

Microflown Technologies

Microflown Technologies was founded in 1998 by Hans Elias de Bree and Alex Koers, following the invention of the particle velocity sensor in 1994 by de Bree. The Microflown sensor is a truly unique acoustic sensor. It is the first and only sensor in the world that allows to directly measure particle velocity as a physical quantity. Twenty years after the invention, with customers all over the world, we have proven to be an important contribution to the understanding and charting of sound fields.

Innovation

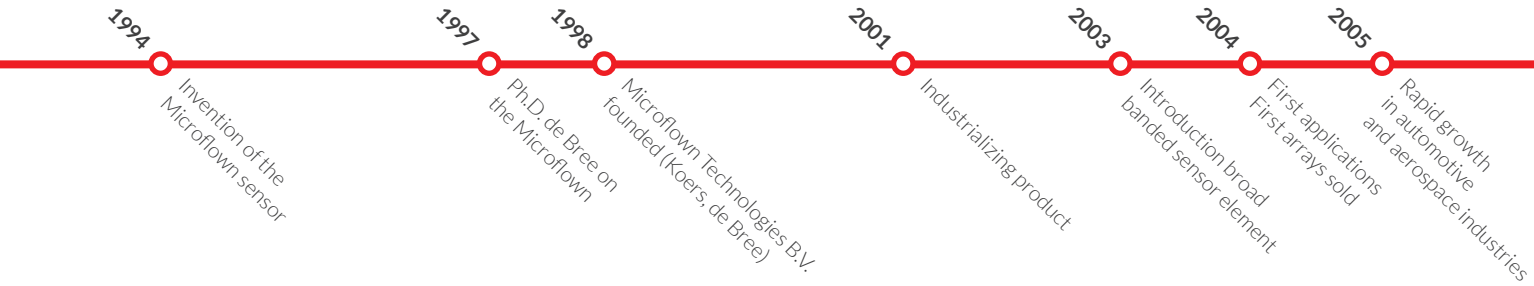
For acoustics as a science, the Microflown sensor proved to be a massive leap forward, empowering researchers and engineers to advance their understanding of complex vibro-acoustic phenomena. The innovative character of Microflown did not stop at the sensor level. New measurement techniques were researched in cooperation with the brightest minds in the world of acoustic. Starting from sensors, now innovative total solutions for comprehensive measurement needs are developped..

Foundation

Microflown was founded as an innovative start-up project at the technical University of Twente, which is located at the heart of a major Dutch technology centre. It was there that de Bree finished his PhD degree and gathered an international team of researchers and engineers. By 2003, after years of research and development, a broad banded and industrialized particle velocity sensor was finally introduced to the market. Ever since, the sensor has been known as the ´Microflown´ sensor. Since 2003, the company grew rapidly and finally relocated to its own headquarters in Arnhem.

Quality

The Microflown sensor technology along with measurement solutions built around it, come as a product of extensive research and development carried out by a small but committed team of engineers. Our engineers are constantly seeking for new opportunities to keep our technology up to date with the latest quality standards. All microflown sensing elements are manufactured under the clean room technology. Remainder of the assembly process is carried out by a team of experienced employees that adhere to strict guidelines, ensuring the highest quality products.



PU Match 0 & 90 degrees

2008 Exploration of defence and military markets

2010 Introduction of Scan&Paint 2D

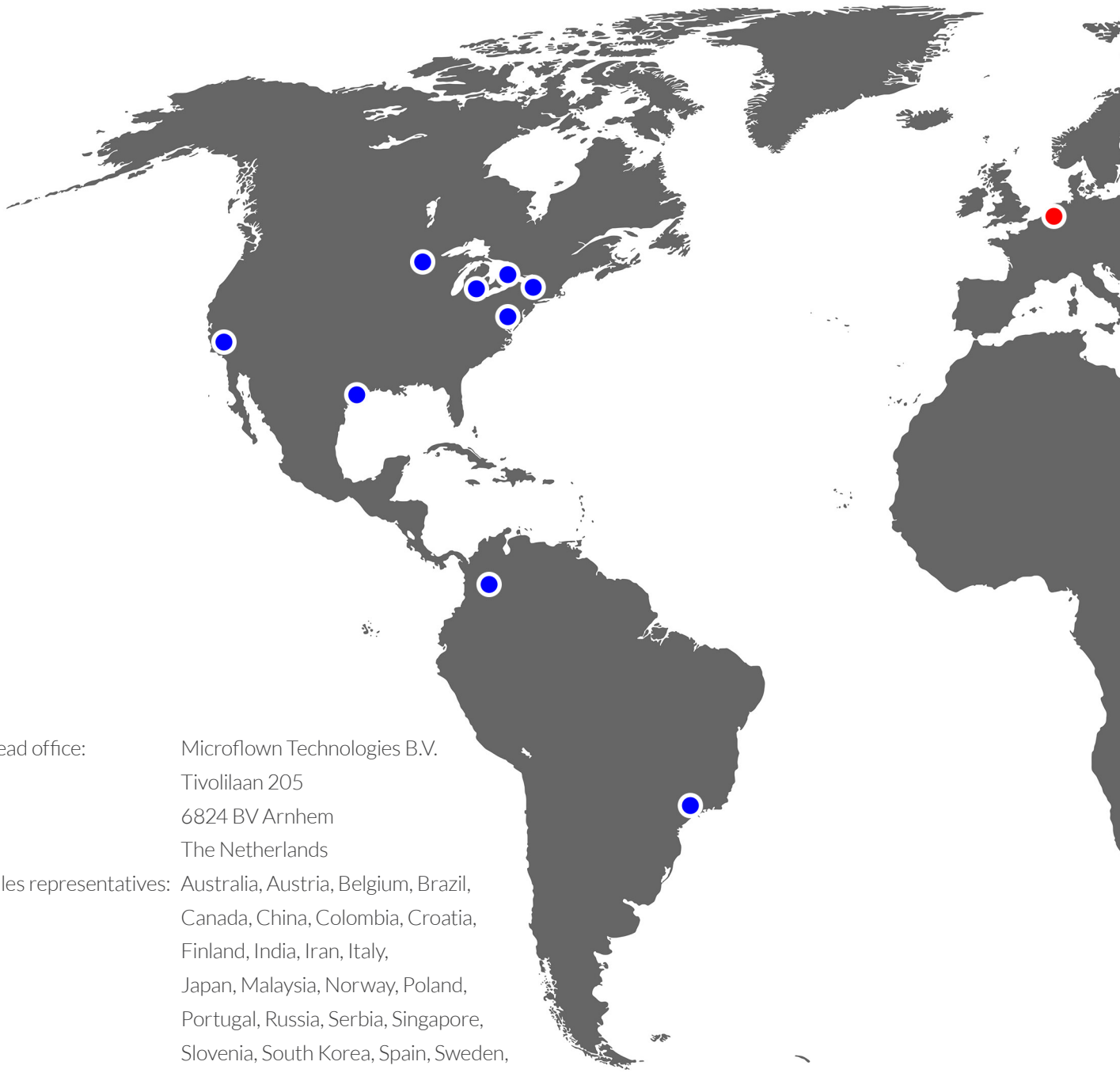
2011 Microflown Avisa fouded

2013 Microflown Maritime founded

2014 Introduction of Scan&Paint 3D

2019 Introduction of Voyager
Microflown Holding:
Microflown Technologies
Microflown Avisa
Microflown Maritime
Total 45 FTE

SALES REPRESENTATIVES



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6824 BV Arnhem
The Netherlands

● Sales representatives: Australia, Austria, Belgium, Brazil, Canada, China, Colombia, Croatia, Finland, India, Iran, Italy, Japan, Malaysia, Norway, Poland, Portugal, Russia, Serbia, Singapore, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirats, United Kingdom, United States.

Visit our website for detailed and up to date contact information

WE PROUDLY WORK WITH THE BEST

AUTOMOTIVE

The adoption life time cycle of cars has decreased over the decades. More models are offered in the markets for shorter period of time. However the expectation of the customers regarding comfort, fuel consuming and design are higher than before.

Next to that regulation regarding the environment such as lower fuel consumption are also have to be taken in mind by designing nowadays cars. This all makes the testing of noise, vibration and harshness (NVH) playing a more important role in nowadays engineering and designing. Manufacturers of trucks, buses, motorcycles, rail vehicles, tractors and other off-highway vehicles face similar challenges as the automotive manufacturers. Microflown Technologies offer technically innovative testing applications for the NVH markets, based on the patented MEMS based Microflown sensor. The only sensor that really measures physically the acoustic particle velocity. Diverse applications in the field of mapping and analyzing noise and vibration for the automotive branche are offered. Application such as Panel Noise Contribution Analysis, Near Field Acoustic Camera, In-situ Absorption setup, Acoustic end of line control give you the opportunity to increase the comfort by making the car more silent and improve product quality. Applications based on the Microflown are ideal to test, as for example trouble shooting on a powertrain or acoustic end of line control of car components, in-situ, without the need to create anechoic conditions.

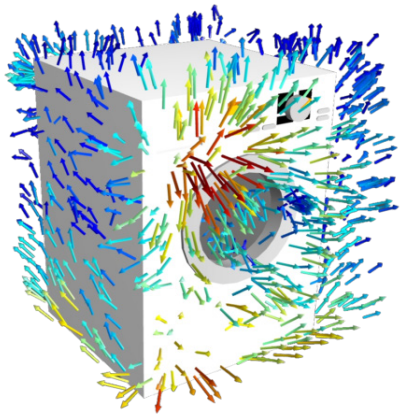
AUTOMOTIVE / OEM

AUTOMOTIVE / SUPPLIERS

GROUND VEHICLES

APPLIANCES & ELECTRONICS

Over the years technology innovations had a big impact on our life, driving an increased standard of living. Computers, washing machines, vacuum cleaners and many more devices are used on daily bases. Quality standards, regulations and off course customers expectations creates the need to analyze and evaluate products in details. The perceived sound is a differentation factor for a supplier compared to its competitors. Microflown Technologies is offering technically innovative testing solutions in the field of noise, vibration and harshness such as sound mapping and localization, noise quantification and ranking to increase quality and reduce time, cost and risk. The solutions provide engineers time effective tools for in-situ measurements on their devices. The unique sensor enables that measurements can be taken in-situ with no need for anechoic conditions. The small size of the sensor allow for taking measurements with a very high spatial resolution even on very small product such as a computer motherboard or a mobile phone.



AEROSPACE & AVIATION

Microflown Technologies offers a large number of interesting vibro acoustic testing methods for the aerospace industry for a variety of airborne vehicles such as fixed wing aircraft, helicopters and UAV's. Both the reduction of cabin interior noise (as perceived by passengers and crew) and the reduction of exterior noise as perceived on the ground are topics of intensive research at Microflown Technologies. The company is proactively participating in a large number of national and international R&D projects, mostly the EU 7 th framework.

HEAVY INDUSTRY & MACHINERY

Currently, there are very few in-situ measurement procedures available to evaluate the noise emissions of large machinery. Pressure based techniques often encounter difficulties adapting to industrial scenarios from controlled laboratory experiments. The presence of high background noise levels generated by surrounding equipment, along with the reverberant characteristics of most industrial sites, prevents the application of standard sound characterization techniques. In contrast, particle velocity measurements performed near a rigid radiating surface are less affected by background noise and can potentially be used to address noise problems even in such conditions. The vector nature of particle velocity, an intrinsic dependency upon surface displacement and sensor directivity are the main advantages over sound pressure based solutions. These key features enable identifying and quantifying noise emissions of problematic elements, despite high levels of background noise.

THE PARTICLE VELOCITY SENSOR

PARTICLE VELOCITY MEASURED DIRECTLY

Microflown: MEMS based sensor technology

The Microflown sensor element is a MEMS based sensor. The very small sized elements are created on silicon wafers by a clean room technology.

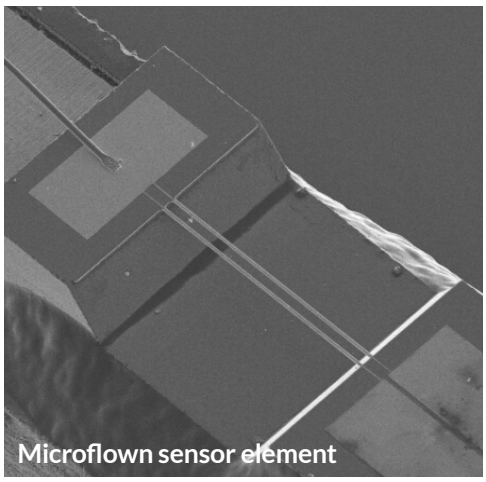
The sensing element consists of two ultra-thin wires (thinner than a strand of human hair). These wires are platinum resistors that act as temperature sensors. They are powered by an electrical current which causes them to heat up. An increase of the temperature of the wires leads to an increase of the resistance as well. When particle velocity (sound) propagates orthogonally across the wires, it asymmetrically alters the temperature distribution around the resistors (wires). The resulting resistance difference provides a broad band (20 Hz up to at least 10 kHz) signal with a figure of eight directivity that is proportional to the particle velocity up to sound levels of 150dB.

Due to the unique measurement principle, the Microflowns require a dedicated pre-amplifier. Therefore all sensors are always equipped with a dedicated signal conditioner.

Production of Microflown sensor elements on silicon wafers

LESS SUSCEPTIBLE TO BACKGROUND NOISE

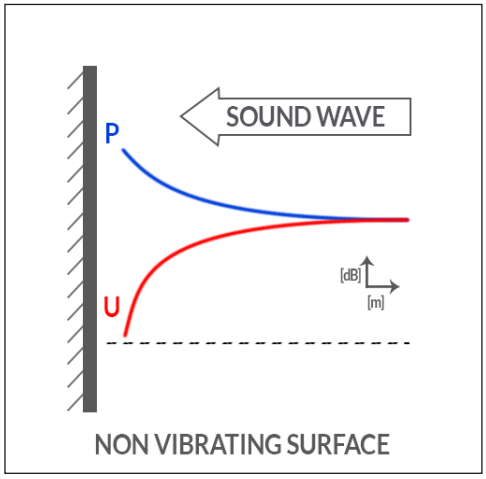
Until the invention of the Microflown sensor, acousticians were limited to the use of microphones to quantify sound. Being a scalar value, sound pressure provides information about the magnitude and phase of the sound field at the measurement location. Unlike sound pressure, the particle velocity is a vector quantity, and is thus described by magnitude and phase, as well as direction. Measuring three-dimensional particle velocity at one single spot in the sound field, would provide a better description of a sound wave's physical behaviour, as compared to the same measurement based only on sound pressure. Moreover, the physical behaviour of particle velocity coupled with the unique features of the Microflown sensor, allow for accurate measurements under non-anechoic conditions, such as office spaces, test facilities or even manufacturing environments. The two most important benefits are explained below.


Microflown sensor element

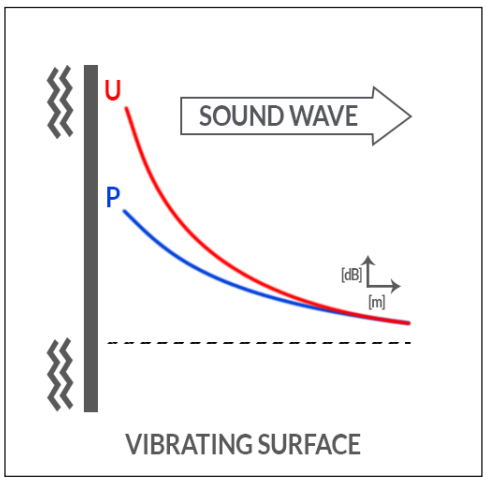
Near Field Effect

Measurement of normal particle velocity close to a surface of a sound source is less affected by background noise then a sound pressure measurement would be. This effect is caused by near-field properties of a sound source. Such phenomena is referred to as the near field effect. In order to understand the implications of the near field effect we will study two scenarios:

1. First, consider a non-vibrating surface in an environment where background noise is present. Measuring sound pressure under such conditions, while gradually decreasing the distance between the measurement point and the rigid surface, would result in continues increase of the amplitude of sound pressure – sound will reflect off the rigid surface and cause an increase of sound pressure at the boundary. In contrast, normal particle velocity would behave in an exactly opposite fashion. Its amplitude would decrease in proximity of a rigid surface.
2. Second, consider a vibrating surface (a sound source) in an environment where background noise is not present. Measuring sound pressure in such conditions, while gradually decreasing the distance between the measurement point and the surface of the sound source, would result in a linear increase of the sound pressure level. In case of the same experiment carried out with particle velocity, we would notice an exponential increase of the velocity near the source surface. This increase of amplitude is so significant, that it becomes the dominant source of excitation, largely suppressing external sound sources.



NON VIBRATING SURFACE



VIBRATING SURFACE

Figure-of-eight Directivity

Whereas most sound pressure microphones have a omni-directional sensitivity pattern, the Microflown particle velocity sensor has a broad banded figure-of-eight sensitivity pattern. Thanks to its directivity pattern, the Microflown sensor disregards 1/3 of the total sound field.

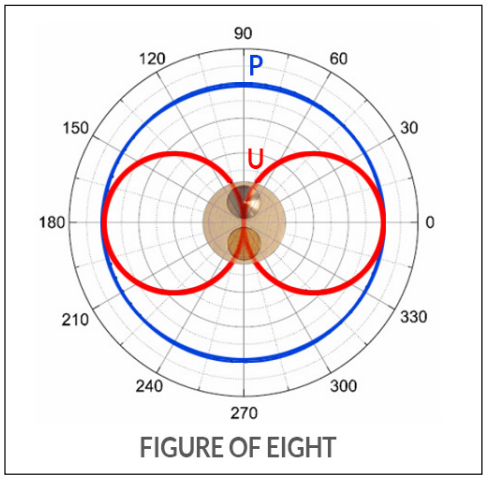


FIGURE OF EIGHT

MEET THE FAMILY

U

REGULAR
0° & 90°

1x Particle velocity sensor

USP

REGULAR

3x Particle velocity sensor
1x Sound pressure microphone

PU

REGULAR

MINI

MATCH
0° & 90°

VOYAGER

1x Particle velocity sensor
1x Sound pressure microphone

VELO SOFTWARE PLATFORM

INTUITIVE, EASY AND FAST

Microflown Velo is an integrated software platform that offers a complete software portfolio. Thanks to the tools embedded within the platform you will be able to perform virtually any task within the area of sound field analysis and visualization. Enjoy the efficient and intuitive Velo workflow from set-up to results analysis and reporting.

Velo is a software platform in which Microflown's main measurement solutions are implemented. All solutions share the same resources such as your probe calibration database and follow a similar, efficient workflow. Thus with minimal time and investments, our users are able to upgrade to other Microflown solutions. Moreover, Velo allows users to open measurement files in other software modules. For example, the Analyzer module can be used to load Scan & Paint 3D measurement files. This feature will allow users to process their data without any limitations imposed by the interface of a particular application.

Velo updates are released regularly including new features, improved algorithms and better performance. Microflown Software Service Contract holders are guaranteed to always run the latest version of Velo, as well as benefit from a range of other attractive services. For more information see the Service section at page 62.

Velo

Microflown Software Platform

Analyser
Time and frequency domain analysis
Order tracking & RPM analysis
Sound Ranking, TL & PNC

Scan&Paint 2D
2D sound field visualization
Single sensor solution
Acoustic near field measurement
TPA & TL

Scan&Paint 3D
3D sound field visualization
Single sensor solution
Time-stationary noise

Acoustic Camera
2D sound field visualization
Non-stationary noise
Order tracking & RPM analysis

In-Situ Absorption
In-situ acoustic material testing
Sound absorption and reflection coefficient measurement
Acoustic impedance

Acoustic Shape
Enabling sound visualistion for PU array applications into 3D. Display data on a 3D geometry over time or RPM.

CHOOSE YOUR SOLUTION

MICROFLOWN ACOUSTIC TESTING SOLUTIONS

Over the years Microflown developed numerous acoustic testing solutions for a wide range of applications and industries. Microflown Technologies has established itself as a game changer with novel sound field visualization techniques.

Each of our solutions is an all-inclusive portable system. Everything from sensor to software is ready to use. We offer fast, easy and accurate methods for sound field visualization and material testing. All our solutions are based on one or more particle velocity sensors and sound pressure microphones, thus allowing you to obtain a thorough understanding of acoustic phenomena present in the sound field.

Furthermore, thanks to the properties of the Microflown sensor, it is possible to perform accurate measurements in non-anechoic conditions and in the presence of background noise.

Choose your solution based on the characteristics of your sound field: for time stationary noise sources, scanning techniques are recommended, since they relay on just one sensor, thus making them a cost efficient option.

For non-stationary sound fields, where noises like squeaks, rattles and clicks are present, a simultaneous multipoint measurement is necessary. In such case, the Near Field Acoustic Camera equipped with near field acoustic holography and direct sound field visualization capabilities would be a perfect choice.

MATERIAL TESTING

- In-Situ Absorption
- Scan&Paint 2D + Transmission Loss
- Analyser + Transmission loss

STRUCTURE BORNE NOISE

- Scan & Listen
- Voyager
- Scan & Paint 2D
- Array systems

AIR BORNE NOISE

Time-Stationary:

- Scan & Listen
- Voyager
- Scan & Paint 2D
- Scan & Paint 3D
- Scan & Paint TPA
- Analyser
- Acoustic Shape

Non-stationary:

- Scan & Listen
- Voyager
- Acoustic Camera
- Analyser
- Acoustic Shape

PU Match array for consumer electronics and actuators

ADD-ONS

MAKE THE MOST OUT OF YOUR SENSOR

Microflown developed multiple solutions for a diverse range of applications. At the heart of each and every one of them, is the Microflown sensor. If you already own a Microflown probe or one of our measurement solutions, we offer you the possibility to choose from a variety of software and hardware ‚add-ons'. An Add-on is a low cost option to expand the measurement capabilities of your sensor by adding new processing capabilities and additional hardware. Most popular add-on combinations are listed here. Please contact us to find out how we can help you with other combinations.

POPULAR ADD-ONS AND UPGRADES

I own a PU probe and Microflown front-end:

- Voyager Standard+ // VYR-S+
- Scan & Paint 2D add-on // SP-ADD
- In-Situ Absorption add-on // IMP-ADD

I own a USP probe and Microflown front-end:

- Scan & Paint 3D // SP3D-ADD

I own Scan & Paint 2D:

- Voyager Standard+ // VYR-S+
- Advanced Tracking System // SP-ADD-TR
- Scan & Paint TPA // SW-S&P-TP
- Scan & Paint TL // SW-S&P-TL

SCAN & **LISTEN**

PARTICLE VELOCITY MADE AUDIBLE

Human ears are only sensitive to changes of sound pressure. With Scan & Listen, particle velocity is now audible as well.

Experience sound in a way you never could before. Identify noise sources even in situations where high levels of background noise are present. Locating sound sources in practical environments can be difficult.

Especially in situations with non-stationary sources which produce squeak & rattle noises. The Scan & Listen is typically used perfroming short quick scans, instead of time consuming series of point-by-point measurements. Often just by listening to particle velocity, you can obtain a good understanding of the main noise emission areas, without having to perform a long and cumbersome measurement campaign.

HOW DOES IT WORK?

Scan & Listen offers an intuitive method for sound source localization. It is an engineering tool designed to detect noise emission hotspots and acoustic leakage. Quick, intuitive, mobile, simple and robust, are the keywords describing the Scan & Listen and its usage.

The system allows to route the signal produced through the particle velocity sensor, or sound pressure microphone, directly to a headset. Furthermore, the device is capable of sending all acquired signals to a line out port, thus allowing for their recording. The listening and the recording can be done simultaneously.

TYPICAL APPLICATIONS

- Noise source identification
- Sound source dynamic behavior determination
- Squeak & Ratlle noise localization
- End of line quality control

FEATURES

- **Direct listening to particle velocity and sound pressure**
- **Quick, intuitive, mobile, simple and robust**
- **In the near field, particle velocity is less susceptible to background noises and reflections**
- **Applicable in operating environments e.g. non-anechoic conditions**
- **Portable single sensor solution**
- **Compatible with multiple frontends**

SOLUTIONS

Volume adjuster
Set the headphones volume output for particle velocity or sound pressure.

Channel selection
Choose the channel, particle velocity (U) or sound pressure (P), that you would like to listen to.

Headphone connection
Connect the included headphones.

Line out
Record output for both P and U channels.

Sensor input
Input connector to connect the PU probe.

SCAN & **PAINT 2D**

HIGH SPATIAL RESOLUTION SOUND MAPPING

Sound source localization is an important topic in the field of sound & vibration, from product development stage to the end of line quality control.

Scan & Paint 2D is a fast, easy and accurate tool to visualize stationary sound fields with an unmatched spatial resolution and in a broad acoustic bandwidth (20 Hz - 10 kHz).

The system is a superb engineering tool for troubleshooting or benchmarking all kinds of objects on the spot. It only takes a few minutes to complete and entire measurement campaign. Results of the scan are translated by the software into a color map, superimposed on a photograph of the measured object, allowing to find the origin of noise. Measurements with Scan & Paint 2D do not require anechoic conditions. In practice, there are many cases where placing a measured object inside of an anechoic chamber is not possible, for instance some large industrial machinery or a car interior. Scan & Paint 2D allows for direct measurement and visualization of particle velocity, which is not highly affected by background noise, or reflections. Moreover, sound intensity measurements can be taken even in situations with a high sound pressure to sound intensity ratio.

HOW DOES IT WORK?

The Scan & Paint 2D measurement technique is a very simple and fast method. From system setup through data processing until data analysis, it only takes a few minutes to complete an entire measurement campaign.

During a test, the surface of the sound source is scanned with one PU probe, while meantime a camera positioned towards the surface is filming the scanning process. The recorded video and audio data are automatically synchronized by the software. The measurements are directly available for further processing. In the post-processing the position of the probe is extracted for each frame of the video. The auto-tracking function in the software enables to automatically recognize the probe along with its position by a color tracking algorithm. The particle velocity, sound intensity and sound pressure are calculated from the relative time block of audio data (relative to a particular location). A high resolution sound color map is produced as a result. With Scan & Paint 2D size doesn't matter, measuring anything from small hearing aids to large gas compressors is possible.

Moreover a reference sensor can be added to preserve the relative phase for the measured particle velocity distribution. This feature enables to plot and study the dynamic behavior of the measured surfaces.

TYPICAL APPLICATIONS

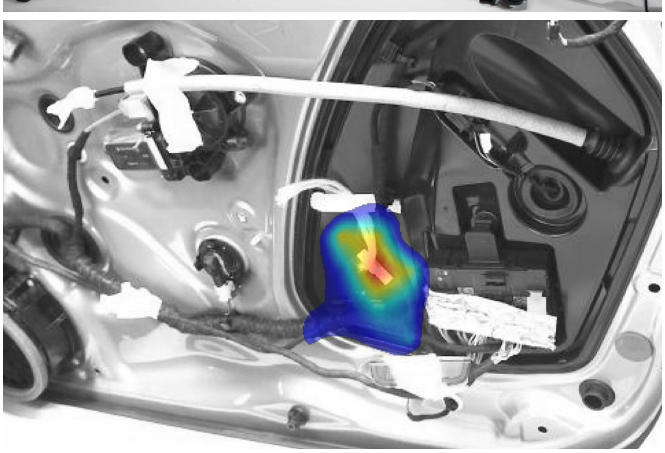
- Sound field visualization
- Sound source localization
- Leak detection
- Troubleshooting
- Benchmarking

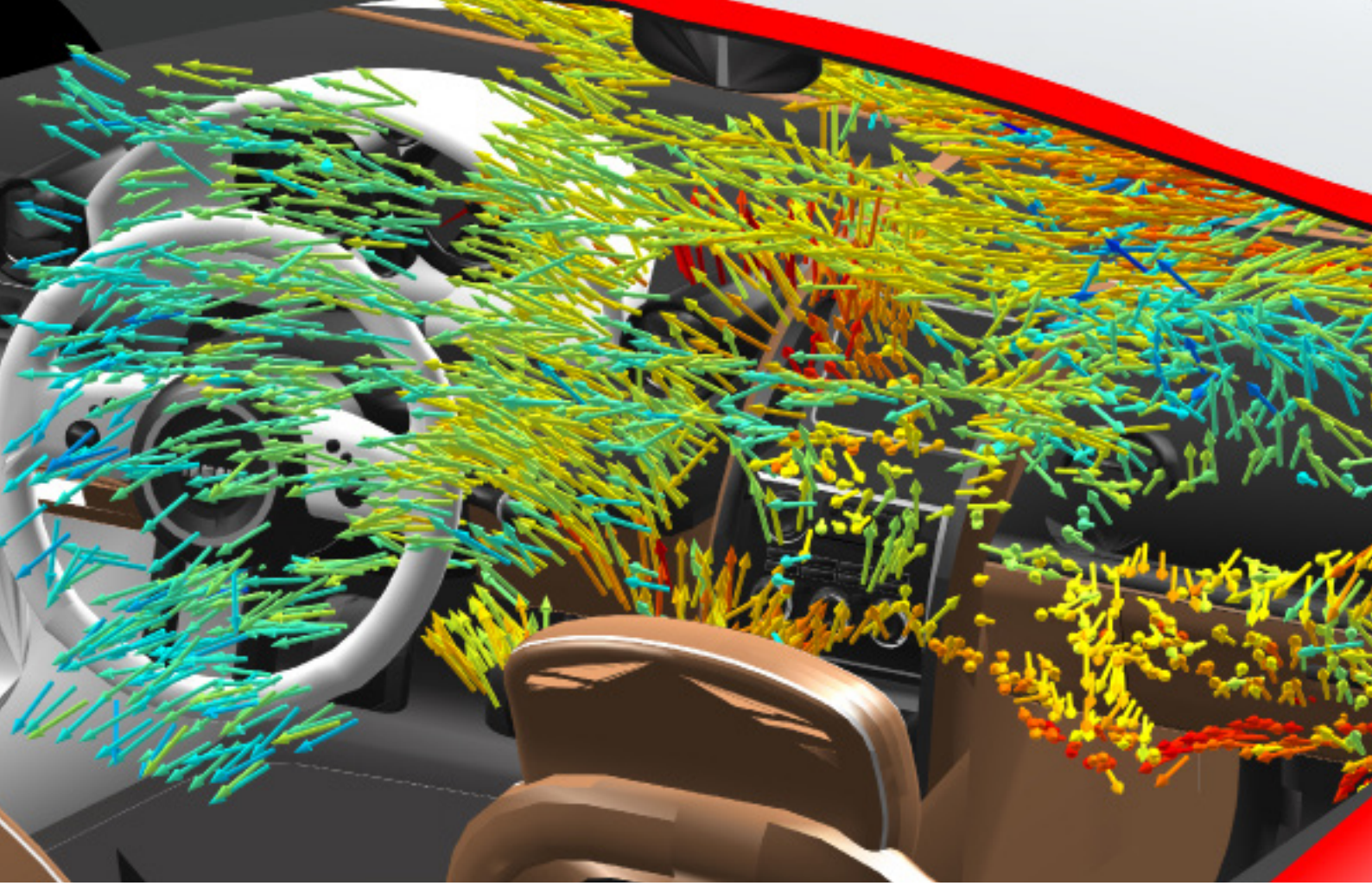
OPTIONAL EXTENSIONS

- Remote Handle // RH-01
- Advanced Tracking System // SP-TR-ADD
- Scan & Listen add-on // SL-ADD
- Voyager Standard+ // VYR-S+
- In-Situ Absorption add-on // IMP-ADD
- Scan & Paint TPA // SW-S&P-TPA
- Scan & Paint TL (Transmission Loss) // SW-S&P-TL

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Time-stationary conditions**
- **High resolution mapping of:**
  - **Particle velocity**
  - **Sound intensity**
  - **Sound pressure**
  - **TPA (Optional extension)**
  - **TL (Optional extension)**
  - **Absorption (Optional extension)**
- **Applicable in operating environments**
- **Sound Power calculation**
- **Reference sensor option for phase referencing**
- **Easy to operate**
- **Fast: setup, measurement and processing time within a few minutes**
- **Single sensor solution**





SCAN & **PAINT 3D**

3D SOUND VECTORS OVERLAID ON A 3D MODEL, IN JUST A FEW MINUTES

Scan & Paint 3D, a unique tool for acoustic troubleshooting and sound source localization, allowing to visualize what you hear. It makes complex problems simple and easy to understand. Localize your sound sources and visualize the sound propagation in full 3D.

Sound source localization is an important topic in the working field of sound & vibration, from product development stage to product quality control. With Scan & Paint 3D it is now possible to localize your sound sources and visualize sound propagation in full 3D. In a matter of minutes the complete sound field, as 3D sound intensity or particle velocity vectors, is displayed on a 3D model.

A broad frequency range (20 Hz – 10 kHz) and an unparalleled dynamic range make Scan & Paint 3D a unique and powerful solution. The very small 3D sensor and the accurate real time 3D tracking of the sensor position, makes it possible to obtain results with a very high spatial resolution (up to 3mm). Allowing measurements on even very small objects.

Additionally, an intuitive sound power feature easily calculates the overall radiated sound power from the sound intensity data around your test object. Sound power measurements have never been easier.

HOW DOES IT WORK?

Scan & Paint 3D is equipped with a USP probe. This probe consists of three orthogonally positioned particle velocity sensors and one omni-directional microphone. Sound intensity can be obtained by taking the time averaged cross spectrum between the corresponding particle velocity sensor and the microphone. This enables to carry out measurements in a broad frequency from 20 Hz till 10 kHz.

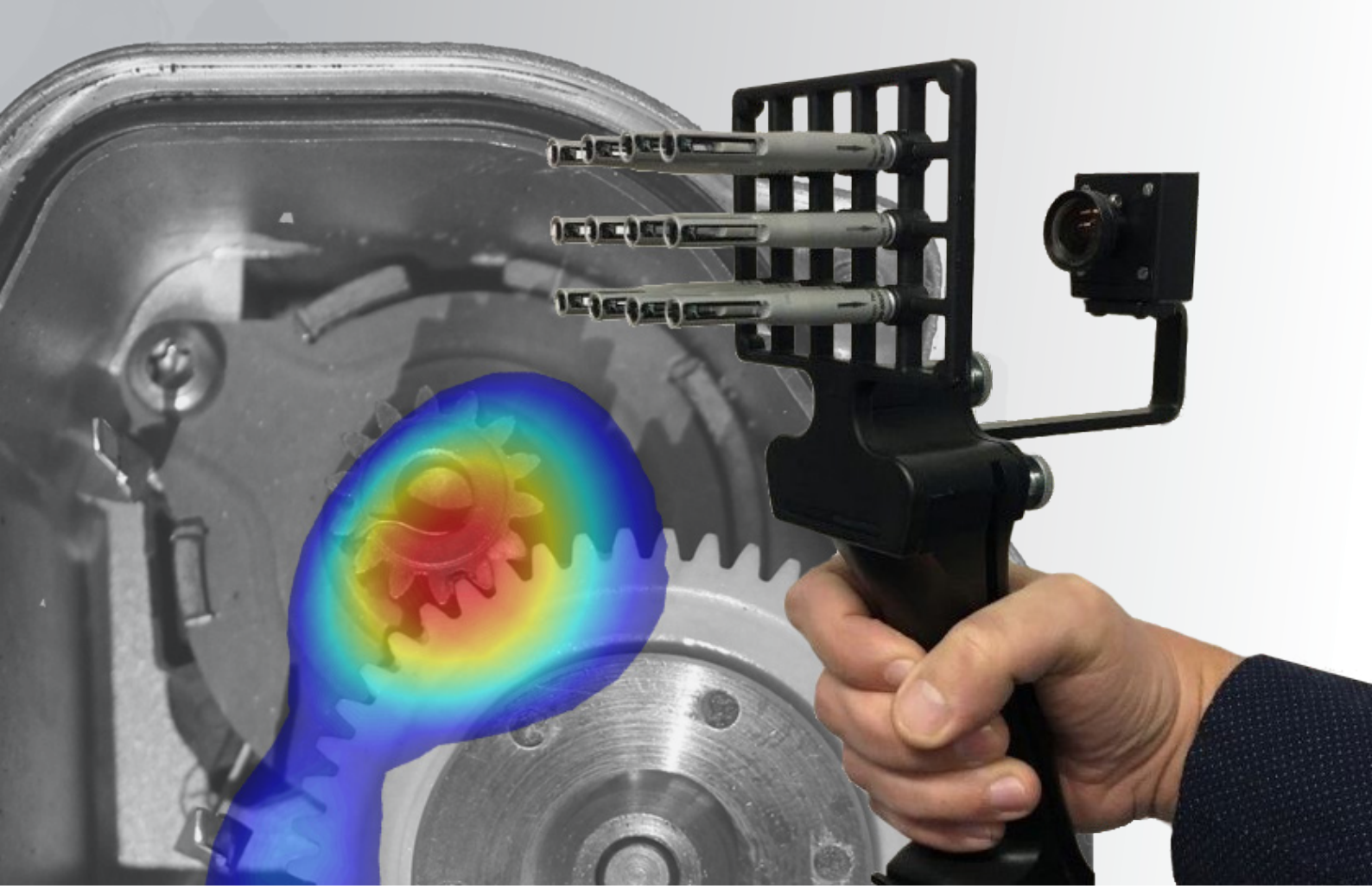
Moreover, Microflown sensors enable to measure sound intensity measurements in environments with a high sound pressure over intensity ratio (P/I index). This unique feature makes the system a superb engineering tool for troubleshooting or benchmaking of all types of objects directly in-situ. The Scan & Paint 3D will allow you to locate sound sources even in acoustically challenging environments. The task of determining the position and orientation of the probe in space, is tackled with a stereo infra-red camera and a sphere with an asymetric pattern of retro reflectors. Multiple measurements from different camera views can be merged into one full 3D project, providing you with maximum flexibility.

TYPICAL APPLICATIONS

- Noise source identification and ranking
- Vehicle acoustics
- Powertrain
- Component testing
- Radiation patterns

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **3D visualisation of:**
  - **Sound intensity vector**
  - **Particle velocity vector**
  - **Sound pressure distribution**
- **Sound power calculation**
- **Automatic 3D tracking of the sensor position**
- **3D modeling tools embedded. Supported file extensions for CAD import:**
  - **obj** - **3ds** - **dae** - **stl**
- **2D visualisation available for all angles of the 3D model**
- **Applicable in (real) operating environments**
- **Easy to operate**
- **Fast: setup, measurement and processing time within a few minutes**
- **Single sensor solution**



NF ACOUSTIC **CAMERA**

REAL-TIME SOUND MAPPING OF TRANSIENT NOISES

The Microflown Acoustic Camera is a flexible and versatile all-in-one box solution, which allows for real-time localization and analysis of non-stationary noises such as squeaks, rattles and clicks. All that, can be done either by a direct sound field visualization technique, or by employing acoustic holography algorithms for near-field sound reconstruction.

Sound source localization of transient and other non-stationary noises requires a simultaneous measurement with multiple sensors. The Acoustic Camera is a tool for real-time sound field visualization.

It is a perfect tool for diagnostics and localization of non-stationary noise sources from product development stage till end of line quality control. Thanks to the unique properties of the Microflown sensor, the localization task can be performed not only in real-time, but also in any measurement environment, and in a broad frequency range (20 Hz -10 kHz). Making the Microflown Acoustic Camera the only system capable of accurate real-time sound source localization below the barrier of 200 Hz. Furthermore, to maximize the potential of a Microflown sensor array, the acoustic camera software can be equipped with acoustic holography algorithms.

HOW DOES IT WORK?

The provided PU probes enable direct measurement of both sound pressure & particle velocity, as a result, the sound intensity can be obtained by taking the time averaged product of both signals. This allows for sound intensity measurements across a broad frequency range (20 Hz to 10 kHz – no spacers required). Additionally, when the size of the measured area is known, the sound power of the object under test can easily be calculated within the Acoustic Camera software.

There is no need to preserve a defined spacing between the probes in the array. Thus the Acoustic Camera can also be configured as a scattered array, allowing to accurately measure curved surfaces and complex geometries.

The physical properties of particle velocity and the design of the sensors make our systems less susceptible to background noise. Therefore accurate sound intensity and sound power results can be obtained in situations with a high sound pressure over sound intensity ratio (P/I index). This unique feature makes this system a superb engineering tool for troubleshooting, benchmarking, or quality control of all kinds of objects in-situ. In practice, there are many cases where anechoic conditions are not applicable, for instance in an industrial manufacturing environment, or a car interior. The Acoustic Camera is a solution which does not require any compromise when taking measurements even in acoustically challenging environments.

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Transient noise**
- **Large dynamic range of visualization**
- **Sound field reconstruction capabilities: near field acoustic holography**
- **High, frequency independent, spatial resolution**
- **Flexible geometry and size of the array**
- **Real-time sound field visualization:**
  - **Sound pressure**
  - **Particle velocity**
  - **Sound intensity**
  - **Sound power**
- **Order analysis tools**
- **Applicable in (real) operating environments**

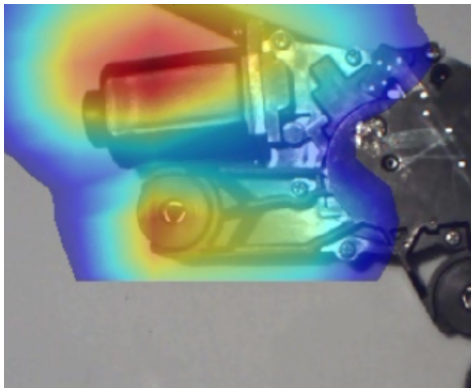
SOLUTIONS

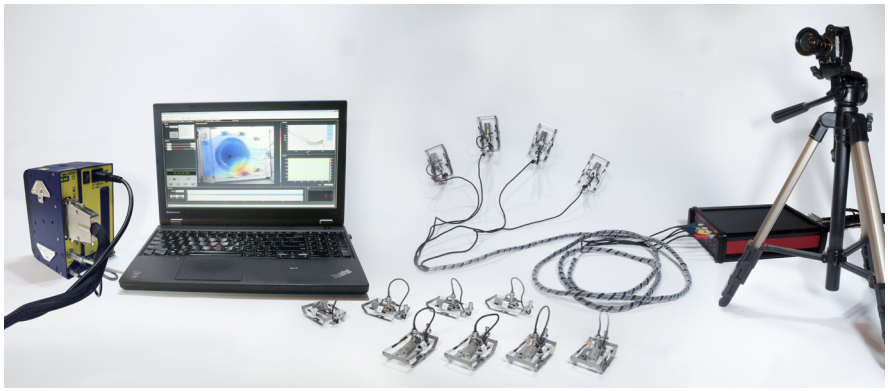
TYPICAL APPLICATIONS

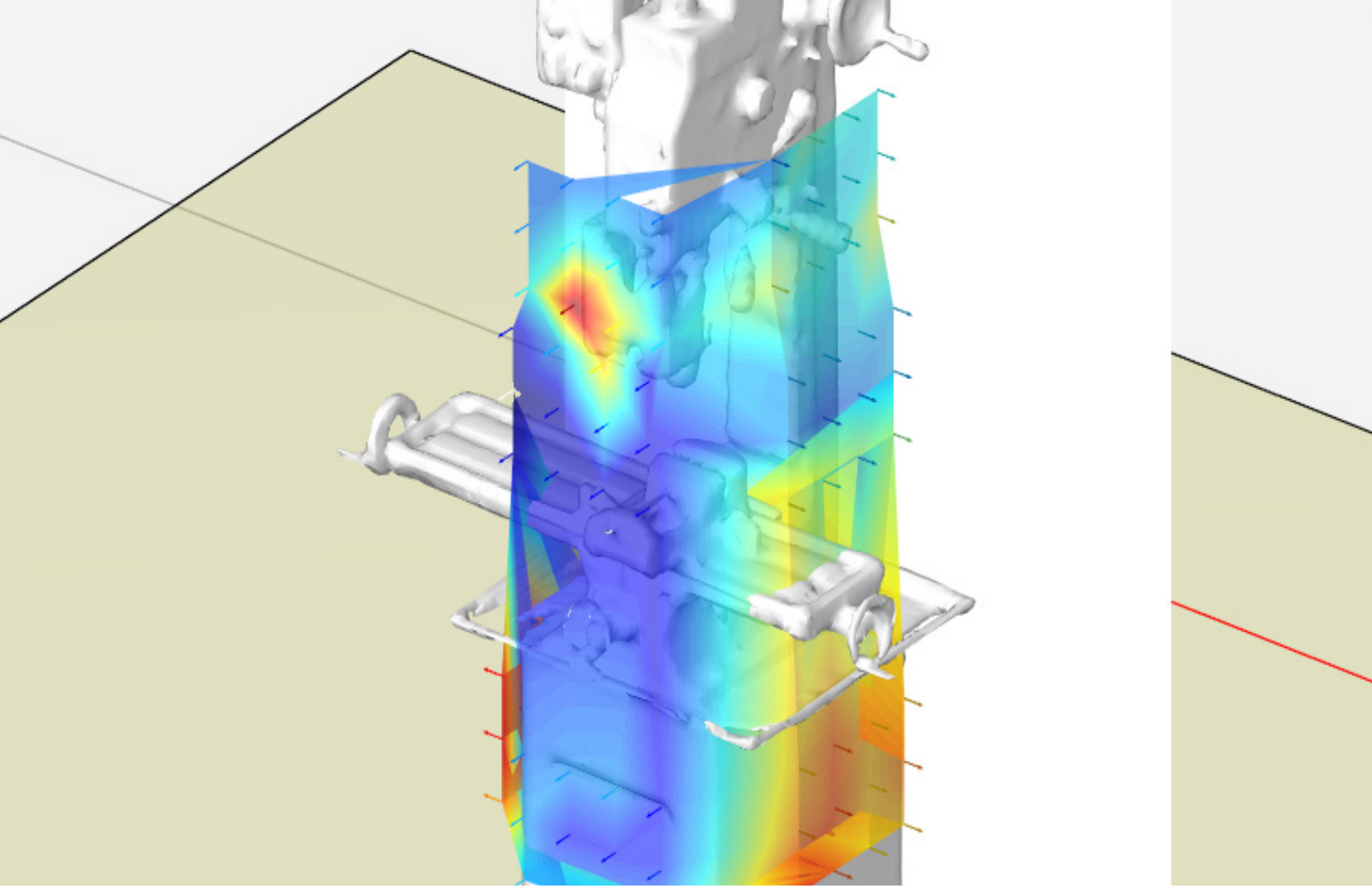
- Noise source identification and ranking
- Squeak & Rattle noise
- Vehicle acoustics
- Powertrain
- Component testing

OPTIONAL EXTENSIONS

- Order Analysis // SW-AC-OA
- Acoustic Holography module // SW-AC-NAH







ACOUSTIC **SHAPE**

TRANSIENT NOISES AND NON-STATIONARY MEASUREMENTS

Acoustic Shape has joined the Velo platform, moving your array applications from 2D to 3D. As with Scan&Paint 3D the fundament of your measurement campaign is a 3D model. Enabling an intuitive workflow to combine multiple measurements, even from different perspectives, into one project.

With Acoustic Shape arriving, we can for non-stationary situations, when arrays have to be applied to localize transients or see changes over time and rpm, serve this need. The Acoustic Shape base will create a strong fundament too many applications and processing methods to be added and offered in the future.

The system requires a 3D model of the object to be analyzed and allows positioning and orientation of the sensors around its structure. This can be done by means of single sensor positioning or default array configuration. This last feature allows loading a predefined array structure, very useful for repetitive test situations. The setup offers real time process control and noise visualization together with a broad range of analysis possibilities.

HOW DOES IT WORK?

Base Module (SW-AS)

- ***Power spectrum:*** Combines multiple captures into a 3D colormap based on power spectral calculations. This method provides a sound map adjustable along the whole usable frequency range.
- ***Power spectrum movie:*** Provides a video output of a single capture with the evolution in time of the frequency components.

Enabled with sub-module Order Tracking (SW-AS-RPM)

- ***Order spectrum:*** Combines multiple captures into a 3D colormap based on order analysis. This method provides a sound map adjustable along the order range of interest.
- ***Order spectrogram over time:*** Provides a video output of a single capture representing the evolution in time of the order components.
- ***Order spectrogram over RPM:*** Provides a video output of a single capture representing the evolution in RPM of the order components.

Depending on the analysis method used one or more captures can be combined to
1) cover a large area with a sufficient spatial resolution
2) average several measurements for a better phenomenon analysis.

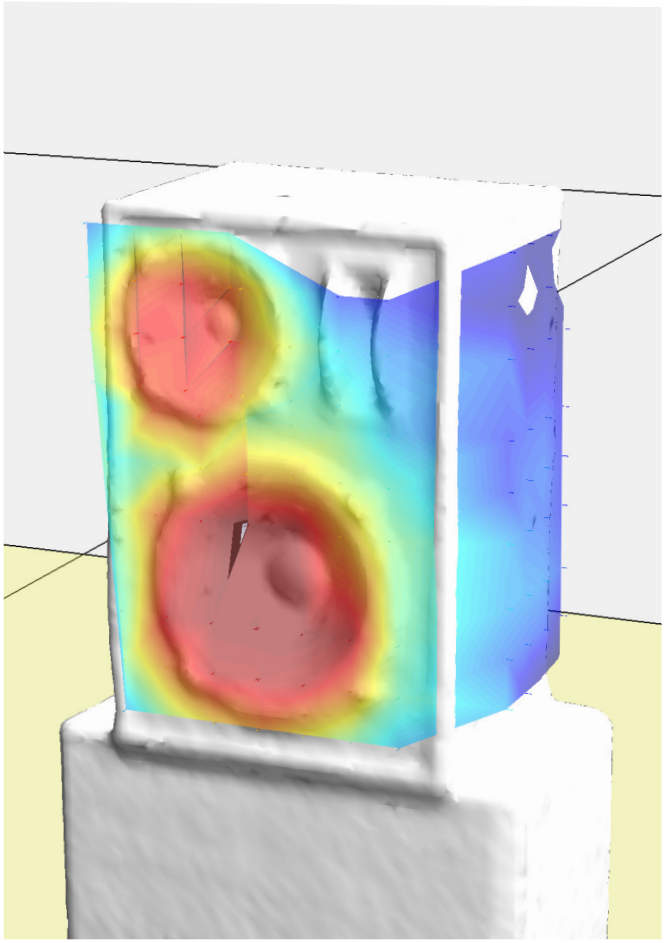
3D data representation and the synchronization (in time and RPM) of several captures at once creates a very powerful tool for noise localization and mapping uitable for complex structures. E.g. obtaining high spatial resolution for large surfaces, relate interior and exterior noise radiation and sound power calculation of a total structure.

TYPICAL APPLICATIONS

- Noise source identification and ranking
- Squeak & Rattle noise
- Vehicle acoustics
- Powertrain
- Component testing

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Large dynamic range: up to 45 dB**
- **3D sound maps**
- **Spatial resolution does not depend on the frequency**
- **Independent of geometry and size of the array**
- **Order Tracking Module and extensive order analysis tools**
- **Basic Signal Processing Matrix**
- **Flexible: free configuration of a measurement grid**
- **Applicable in (real) operating environments**



IN-SITU ABSORPTION

NON DESTRUCTIVE IN-SITU MATERIAL TESTING

A truly in-situ method to accurately measure the acoustic properties of your materials. It only takes minutes to get the sound absorption or reflection for a sample.

There are many unwanted noise sources in our industrialised society. Acoustic noise pollution can be reduced by absorbing sound energy. Absorbing material packages are used in many applications to attenuate sound. Knowing exactly the acoustic properties of your materials and the effectiveness of the applied material packages is a requirement to successfully reduce noise levels. The In-Situ Absorption setup is a hand-held system which will allow you to determine the acoustic properties of virtually any surface, even curved and irregular surfaces. Moreover thanks to the properties of the particle velocity sensor, sound absorption and reflection coefficients can be measured in-situ, in almost any environment and for any material size.

Now you're able to perform in-situ absorption measurements, allowing the characterization of already installed structures.

When combined with the Scan & Paint system, the In-Situ Absorption setup can also be used to visualize the spatial disruption of the absorption or refection coefficients.

HOW DOES IT WORK?

The setup is based on a spherical loudspeaker and a PU sensor, with which two measurements are performed to characterize the acoustic properties of a surface. The first measurement is taken with the PU probe pointing away from any reflective surface. This step is meant to calibrate the probe within the systems operating frequency range (300 Hz – 10 kHz). The second measurement is taken very close to the samples surface, in order to acquire the incident and reflected energy. Both datasets are then post-processed to:

1. Remove room effects: signal smoothing is applied to minimise the impact of reflections.
2. Model the results: the three available calculation methods are meant to translate the measured acoustic impedance into the sound absorption and reflection coefficients. Main differences between the calculation techniques lay in their degree of complexity and assumptions taken about the sound field. Choose a method which best fits your scenario.

Post-processing of measurements taken with the In-Situ Absorption system takes only a few of seconds.

FEATURES

- **Frequency range 300 Hz - 10 kHz**
- **In-situ method of:**
  - **Impedance**
  - **Sound refection coefficient**
  - **Sound absorbtion coefficent**
- **Non destructive method**
- **Portable solution**
- **Normal & oblique angles of incidence**
- **Flat & curved surfaces**
- **Homogeneous & inhomogeneous materials**
- **Easy to operate**
- **Mapping absorption coefficients using Scan & Paint add-on**

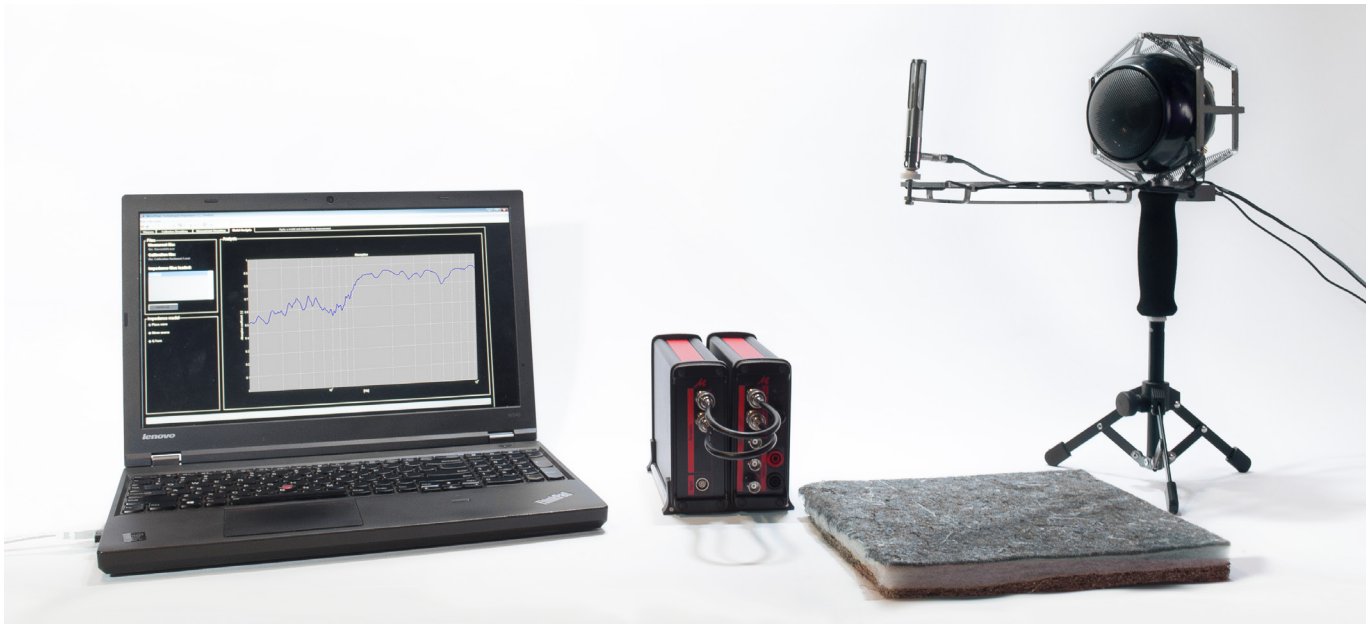
SOLUTIONS

TYPICAL APPLICATIONS

- Material sample testing
- EOL Quality Control
- Component testing
- Trim package validation

OPTIONAL EXTENSIONS

- Scan & Paint add-on // SP-ADD
- Analyser // SW-SA
- Analyser Transmission Loss // SW-SA -TL



VOYAGER

MOBILE DATA ACQUISITION & VIBRO-ACOUSTIC ANALYSIS

The Voyager is a portable NVH testing device that merges multiple functional units like data acquisition, signal conditioning and storage into a powerful tablet device for vibro-acoustic data recording, visualization and analysis.

This Voyager device is set to transform the NVH testing industry as the front-runner in on-site measurements. The success of the Scan & Listen device, that allows one to gain understanding about the sound field by listening, led to the development of Voyager. mbedded software with touchscreen response allows a more intuitive and user friendly operation for real-time audio playback and comprehensive analysis of the acquired data. Besides conventional FFT and octave frequency analyses, the implementation of spectrogram analysis allows the user to also study non-stationary or transient noises. Targeted analysis with the help of real-time filters on a data channel optimizes the workflow and efficiency of the Voyager. The possibility of extension up to 6 channels allows autonomous measurement with reference microphones or accelerometers to correlate and compare data measurements. Compatibility with the Microflown range of sensors ensures utilising the superior advantages of the Microflown, in terms of background noise cancellation and signal-to-noise ratio. This allows using it directly at the test location in presence of environmental sounds.

Visualize, analyze and record data by means of just a single handheld device, making the Voyager an indispensable portable NVH testing tool.

HOW DOES IT WORK?

The device interface is intuitive to operate and the modular applications enable easy usage by NVH experts and technicians alike. Inspired by the workflow operation, as daily used on mobile devises such as smartphones and tablets, a target was set to bring a similar approach and experience to the Voyager.

The touch controlled interactive icons provides ready access to different modes & settings: you can listen to the signal in real-time, switch to playback or analysis mode with just a single touch operation icon. All settings and options are directly accessible and visible, leading to easy and fast operation. Intuitive toggles provide single touch activation or deactivation of many features. The icon based menus leave a clear & large space open to display all your analysis data, offering the perfect balance between intuitive usage and visual display. Real-time listening & filtering, spectrum visualization, alongside post-processing capabilities. A conventional go-to measurement tool for wide range of vibro-acoustic analysis capabilities. Transform your Voyager in to a powerful portable measuring station with embedded processing and signal conditioning units with the Voyager Advanced. Use the device autonomously or as a portable frontend for our PC based VELO software platform.

FEATURES

- **Quad-core powered compact touchscreen NVH testing tool**
- **Real-time listening & audio filtering along with signal playback and recording options**
- **Integrated data analysis software modules**
- **Applicable in operating environments**
- **Built-in battery and storage capacity for autonomous operation**
- **Compatibility with all Microflown probes and other (IEPE) sensors**
- **Integrated camera for comprehensive project management**
- **Two modes: autonomous or portable front-end**

SOLUTIONS

TYPICAL APPLICATIONS

- Noise source identification
- Buzz, Squeak & Ratlle noise localization
- Quality and End-of-Line Control
- Acoustic leakage detection
- Acoustic analysis

OPTIONAL EXTENSIONS

- PU Voyager // PV
- Upgrade to Advanced // FW-VYR-A

SCAN & PAINT 2D TPA

SOUND PRESSURE CONTRIBUTION BASED ON SCANNING MEASUREMENTS

A high velocity at the surface does not necessary mean a high pressure contribution in a certain position further away from the surface. An advanced version of the traditional Scan & Paint, called Scan & Paint TPA, is a solution for airborne transfer path analysis (TPA).

In a complex environment such as a vehicle interior, the surface velocity can only give an indication about the source ranking of different surfaces. In order to account for the total noise perceived, for example at the drivers' ear, the acoustic transfer paths would need to be measured. Traditionally Airborne Transfer Path Analysis (TPA) requires a multichannel front-end with multiple sensors.

The Scan & Paint TPA opens up a cost effective TPA procedure. Based on the traditional Scan & Paint method, the Microflown TPA technique requires only three channels acquired by a PU probe and a microphone. As a result of a measurement with Scan & Paint TPA, we obtain a sound pressure contribution color map overlaid on a picture of the sound source. From such a measurement the user will be able to tell which part of the studied sound source is contributing the greatest amount of noise to a given reference location.

HOW DOES IT WORK?

Airborne TPA is performed to evaluate and rank the contributions from different sound sources. With Scan & Paint TPA, the pressure referred to a certain position, can be calculated in two measurement steps.

1. Source strength measurement: similar to the standard Scan & Paint, the source strength in operational conditions is measured by scanning the surface with a PU probe. However, during the scan, a static reference microphone needs to be present. The position of the microphone is also the location toward which sound pressure contribution is calculated.
2. Transfer path measurement: The microphone used in step 1 is now replaced with an omni-directional volume velocity source (VVS). The noise source is now turned off, and the sound field is excited with the VVS. Finally, a second scan is performed with the PU probe over the surface of the sound source.

During post-processing, both scans are used to calculate local contributions from the studied area towards the reference location. Multiple scans can be combined into one measurement – this feature is particularly useful for large and complex areas. A method to validate your measurement is also embedded in the software. The validation is carried out by a simple comparison of the measured sound pressure at the reference location and the synthesized sound pressure (calculated from near field scan and transfer path measurement).

TYPICAL APPLICATIONS

- Airborne transfer path analysis
- Acoustic optimization of vehicle interior
- Trouble shooting

REQUIREMENTS

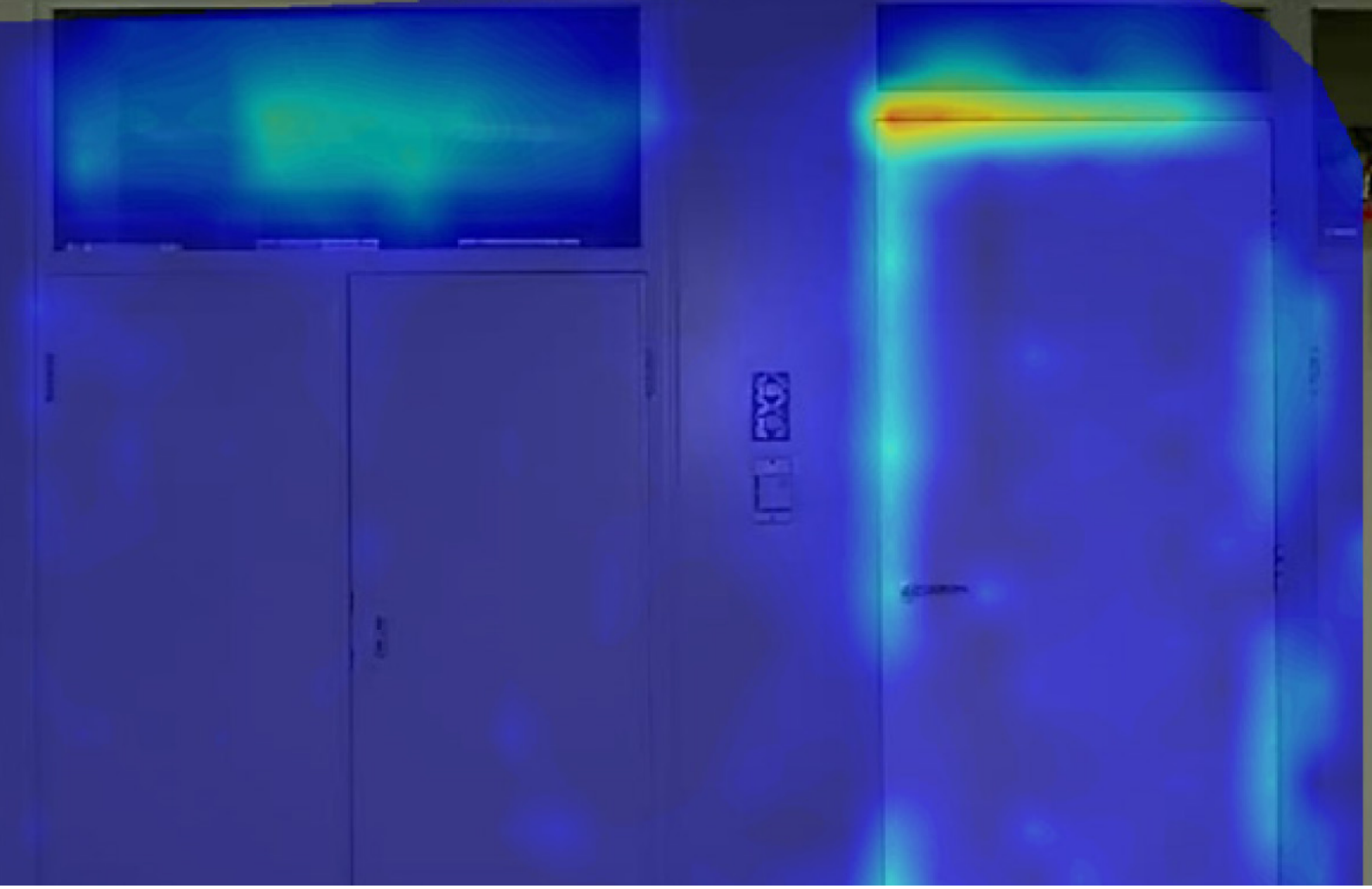
- Scan & Paint TPA software // SW-S&P-TPA
- Scan & Paint system // SP-PA-...-SCT2
- Monopole sound source // LFM, MHVS
- Class 1 microphone // REF-MIC

OPTIONAL EXTENSIONS

- Remote Handle // RH-01
- Advanced Tracking System // SP-TR-ADD

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Time-stationary conditions**
- **High resolution mapping of:**
  - **Sound pressure contribution**
  - **Relative phase**
  - **Sound pressure**
  - **Particle velocity**
  - **Sound intensity**
- **Noise source ranking**
- **Multi session processing**
- **Applicable in (real) operating environments, e.g. reverberant environments**
- **Easy to operate**
- **Fast: short setup, measurement and processing time**
- **Two sensor solution**



SOUND TRANSMISSION LOSS

POINT BY POINT, SCANNING OR MULTIPLE PROBES

Conventional measurement procedures for the characterization of sound Transmission Loss (TL) imply practical difficulties and high costs, especially in terms of testing environments.

With the use of the PU sensors from Microflown Technologies, an in-situ characterization can be achieved in a matter of minutes by directly measuring the incident and transmitted acoustic fields. Either by scanning or using fixed measurement points, the sound Transmission Loss can be represented using 2D sound visualization tools or traditional spectral representations. The TL calculation sub-module is available for both Scan&Paint 2D and Analyser software.

HOW DOES IT WORK?

SCAN & PAINT 2D + TL

This sound transmission loss measurement procedure is based on regular Scan & Paint tests. All you need to do is to drive a sound source with broadband noise and carry out a scan with a Microflown PU probe over the target areas. Two scans need to be performed: one over the emitter side and the other at the receiver side. The transmission loss software module will merge the two scans, calculate the local sound transmission loss and illustrate via colormaps. Results are computed by taking the ratio between the spatially averaged sound pressure in the emitting side and the sound intensity in the receiving side.

ANALYSER + TL

The flexibility of the Analyser software allows for performing sound Tramission Loss power spectra measurements using one or multiple PU probes. Record and define the project structure while measuring or create a working tree beforehand to follow during a measurement campaign. A chart based workflow offers an intuitive guidance through your measurements. The possibility to create measurement templates speeds up the working procedure and furthermore, it is a robust platform to handle data for repeatable measurement campaigns. Similar to the Scan&Paint TL module, results are calculated by taking the ration between the spatially averaged sound pressure and sound intensity in the emitting and receiving sides, respectively.

TYPICAL APPLICATIONS

- Transmission loss
- Sound package optimization
- Trouble shooting & sound leakage

REQUIREMENTS

SCAN & PAINT 2D + TL

- Scan&Paint 2D // SP-PA-PR-SCT2
- Scan&Paint 2D TL module // SW-S&P-TL

ANALYSER + TL

- PU Probe(s)
- Analyser // SW-SA
- Transmission Loss module // SW-SA-TL

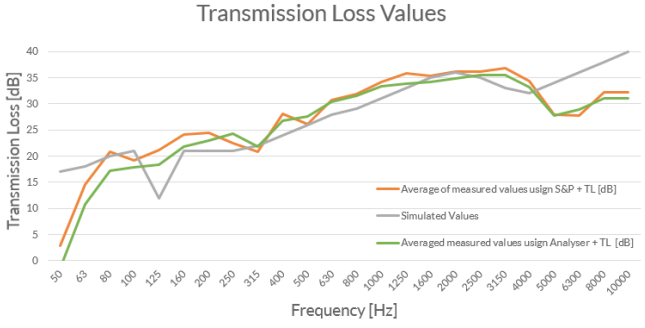
FEATURES

SCAN & PAINT 2D + TL

- **One sensor solution**
- **Scanning based method**
- **It requires a camera**
- **Spatial representations and spectral results**
- **Characterize multiple partitions through scans**
- **Additional setup time and post-processing required**
- **Sound leakage and TL results from the same data**

ANALYSER + TL

- **One or multiple sensors**
- **Scanning and fix point**
- **No camera required**
- **No spatial representations, only spectral quantification**
- **Characterize one or multiple partitions**
- **Very fast methodology**
- **Measurement campaign and task lists can be predefined**



SOLUTIONS

SOUND POWER RANKING

COMMUNICATING IN SOUND POWER

Sound power is a suitable approach for benchmarking and compliance tests, providing robust and repeatabtle results

The Microflown sensor opens a new approach for sound power measurements on e.g. (electric) drivelines or components. The muti-capture module of the Analyser software enables to combine multiple data-sets and link an arbitrary set of measurements to a particular area of devices, machines or structures investigated. Sound power (ranking) of noise sources is a suitable approach for benchmarking and compliance tests, providing robust and repeatable results. PU sensors are offering companies a viable solution to have the testing capabilities in house. Quantitative measurement results make it that sound power can be considered as a very good "communication tool" between different parties e.g. OEM's and Suppliers. With small PU intensity probes it is easy to apply an array of multiple sensors e.g. around a driveline, and capture the whole object in one measurement. This enables to measure the sound power for non-stationary conditions as for example during an engine run-up.

HOW DOES IT WORK?

Sound power is commonly used as a quantitative description of the acoustic output of a device. It describes the acoustic impact of a machine or device in its operational environment. The Microflown sensor opens a new approach for sound power measurements on drivelines or components. The sensors enable direct measuring of both sound pressure & particle velocity, thus the sound intensity can be intuitively obtained by taking the cross spectrum between both; allowing sound intensity and sound power measurements across a broad frequency range. Furthermore the sensors are hardly affected by the environment, allowing measurements in situations with a high pressure over intensity ratio (p/I index) making it possible to measure directly at a test bench. In combination with the order analysis sub-module, the RPM and Orders can be used to synchronize the multiple captures. This allows to see the overall sound power per order or for selected order ranges. The possibility to create measurement templates speeds up the working procedure and furthermore offering a platform that ensures robust data for repeatable measurement campaigns. Furthermore sound power ranking tables can be generated. The table provides detailed insight to the contribution of (sub-) components contributing to overall sound power.

TYPICAL APPLICATIONS

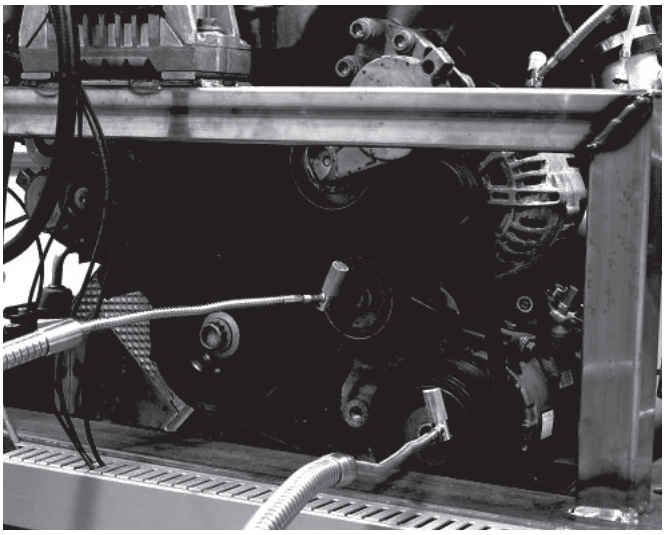
- In-situ sound power estimation
- Total sound power level
- Sound power ranking
- Sound power per order(s)
- Machinery
- Powertrain
- Electric Vehicles
- Appliances & Electronics

REQUIREMENTS

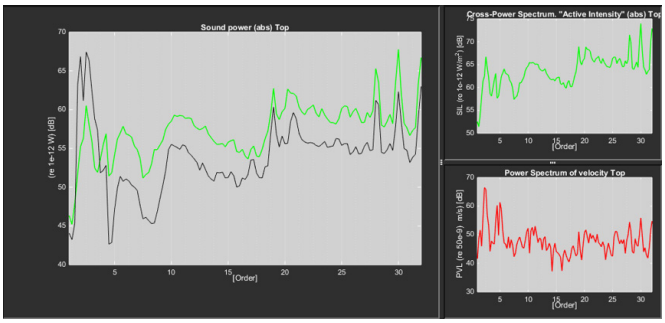
- PU Probes
- Analyser Base // SW-SA
- Analyser Multi Capture // SW-SA-MC
- Analyser Order Analysis // SW-SA-OA
- Irregular Grid // IRG-PM2

FEATURES

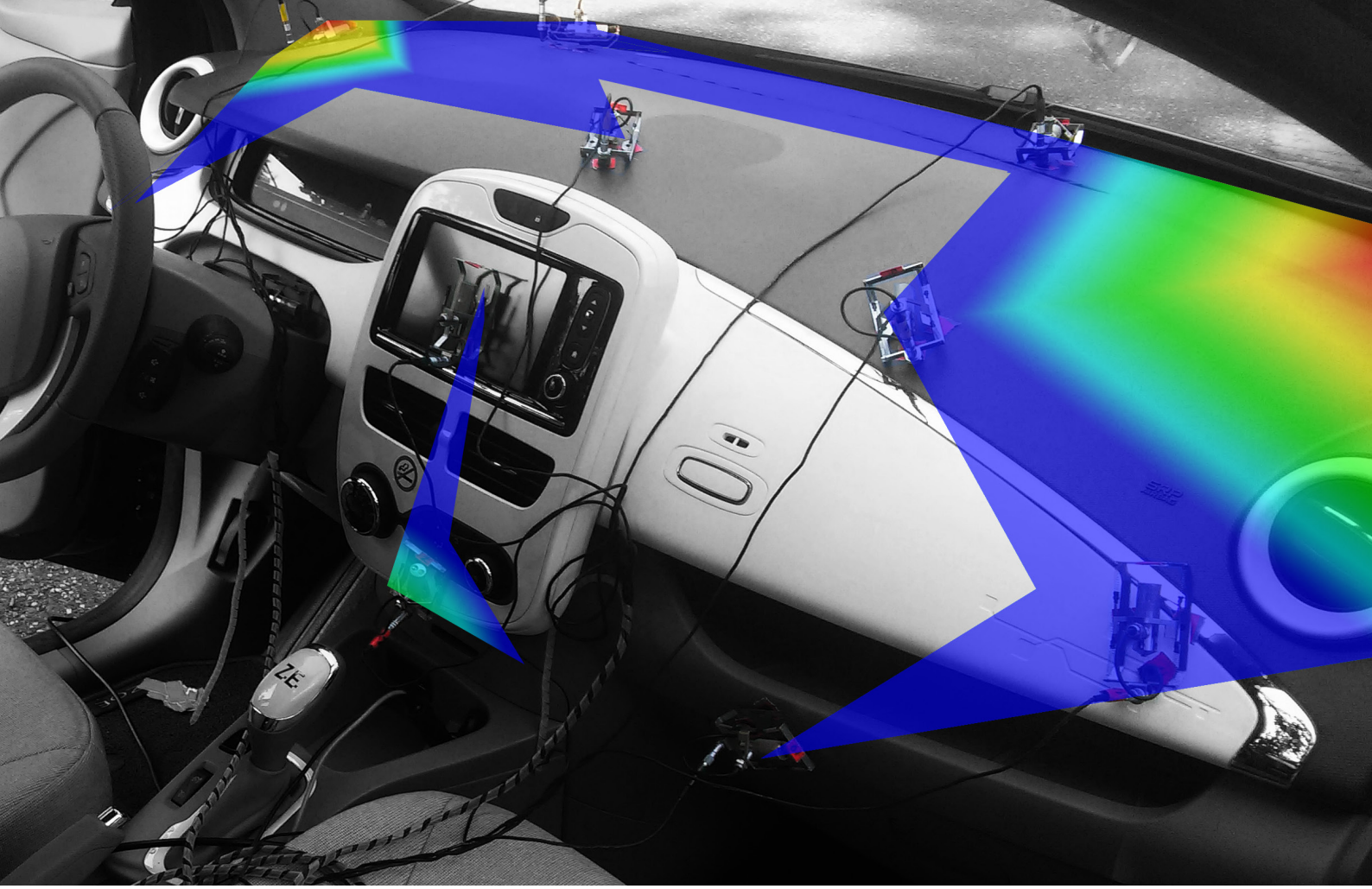
- **Frequency range: 20 Hz - 10 kHz**
- **Total sound power level**
- **Sound power ranking**
- **Sound power per order(s)**
- **Low suceptibility to pressure over intensity (p/I)**
- **Easy to apply array configuration**
- **In-situ, operating conditions**



			Area (m^2)	PWL (dB)	Intensity (uW/m^2)	Total contribution %
Total			0.1688	74.24	0.1575	
	Front Face		0.0338	72.64	0.5443	69.1206
		Front	0.0338	72.64	0.5443	69.1206
	Cabinet		0.1350	69.14	0.0608	30.8794
		Side Right	0.0338	62.28	0.0501	6.3618
		Top	0.0338	58.55	0.0212	2.6978
		Side Left	0.0338	63.52	0.0667	8.4644
		Back	0.0338	65.50	0.1052	13.3554



SOLUTIONS



PANEL NOISE **CONTRIBUTION**

DETAILED ACOUSTIC ANALYSIS OF A VEHICLE INTERIOR

The Microflown PU-based Panel Noise Contribution Analysis is a very fast and accurate method to measure and analyse sound source locations and their local contributions.

The Panel Noise Contribution Analysis (PNC) is a well-known methodology for an airborne Transfer Path Analysis (TPA) in a car interior. Pressure contribution from individual panels towards a reference point can be very accurately calculated. The Microflown PNC method uses only PU-probes for measuring source strength as well as transfer function by reciprocal measurements. Thanks to the physical advantages of particle velocity over sound pressure, there is no need for acoustic treatment of the interior under test. This allows to perform simultaneous multipoint PNC measurements of a full car interior in a short time.

HOW DOES IT WORK?

Four steps are required to determine the contributions from all areas (panels e.g.: drivers' door, headliner) of the vehicle interior. Typically the whole car interior would be divided into 11 panels. Each panel would be measured with 11 PU probes. Four steps are required to perform panel noise contribution analysis:

1. The probes are attached to the car interior surfaces (car doors, headliner, dashboard, etc.)
2. Source strength: this measurement needs to be performed while the vehicle is exciting the sound field. This step can be done on a roller test bench but it is also possible to perform the measurement while driving the vehicle on the road, thus including e.g. wind noise. The source strengths are determined by measuring the acoustic particle velocity close to the panel surfaces.
3. Transfer path measurement: this measurement is done reciprocally by using an omni-directional sound source at the reference position and measuring the sound pressure at the panels. The vehicle has to be parked with the engine turned off.
4. The operational data (step 2) are linked with the measured transfer paths (step 3). The individual panel contributions are calculated towards a specific reference point. In a car interior this would typically be the drivers' ear.

TYPICAL APPLICATIONS

- Acoustic optimization of vehicle interior
- Sound package optimization
- Troubleshooting

REQUIREMENTS

- PNC software // SW-SA-PNC
- Array of PU probes
- Monopole sound source // LFM, MHVVS
- Reference microphone // REF-MIC

FEATURES

- **Frequency range: 100 Hz - 2 kHz**
- **High degree of detail**
- **Very fast: perform measurements on a full car interior in 1 day**
- **Flexible: scattered array, measure whilst driving**
- **Structure and acoustic properties of the vehicle are unaltered by the measurement**
- **Applicable in (real) operating environments, e.g. reverberant environments**

END OF LINE
QUALITY CONTROL

FAST, EASY, ACCURATE AND NO NEED FOR ANECHOIC CONDITIONS

Microflown particle velocity probes provide the cutting edge in the field of acoustic end of line control. With Microflown particle velocity probes, products can be tested directly in the manufacturing environment without the need of removing them from the production line.

Compared to traditional microphones the Microflown probes have a up to 40 dB lower susceptibility to background noises and reflections. Furthermore the method is a non-contact method so there are no mass load effects or difficulties that occur when mounting the sensor on the test object.

Not only a ground breaking sensor but the combination of it with the knowledge and experience of our top engineers make it possible to deliver a complete end-to-end solution for any End Of Line (EOL) control application. From product analysis, testing procedure design up to production line implementation.

We are capable of providing a customized solution that meets your expectations.

HOW DOES IT WORK?

Testing a manufactured unit at the end of the assembly line is a critical step in the production process. Any defective products must be separated from the functional units. Reliable detection of defective units is the primary objective of any EOL tests. Maximizing the output and minimizing the false rejection rate is the ultimate goal of our End of Line Quality Control applications.

Each product has its own unique vibro-acoustic behaviour pattern. Hidden within that pattern is crucial information regarding the functioning and condition of the product itself, as well as the manufacturing process that created it. The ability to take advantage of such information can significantly reduce manufacturing costs as well as the number of faulty products coming of the production line. Moreover, the non-destructive nature of acoustic EOL testing procedures enables their direct implementation on the production line itself.

Up till now numerous acoustic quality control procedures were encumbered by the physical properties of pressure microphones used in the control process. Acoustically sealed rooms, anechoic chambers, all require substantial resources and complicated measurement routines. With our particle velocity sensor you can forget about these arrangements! Moreover, the Microflown sensor can be used for acceleration measurements. This feature makes it a perfect non-contact alternative for existing accelerometer based EOL quality control procedures.

TYPICAL APPLICATIONS

- Product evaluation and quality control
- Acoustic EOL testing implemented in s production line
  Balance testing of rotating components
- Non-contact vibration testing

FEATURES

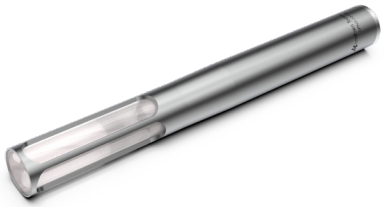
- **Frequency range: 20 Hz - 10 kHz**
- **Non contact method**
- **Integration possible in production line (manufacturing environment)**
- **Very fast method: measurement, automatic analysis and result in a few seconds**
- **Low suscepebility to background noise and reflections**
- **No need for anechoic room**

SENSORS

U SENSORS / 1D

The U sensors include an one directional particle velocity sensor. Choose from different packages and sensor angles based on your requirements. The 1D velocity probes can be used for non-contact way to measure surface vibratation. Furthermore a typical application were End Of Line quality control.

½" U Regular 0 degrees // SPN0
Single sensor kit, including: MFPA-1, cabling, calibration report, protective case. // KIT-PA-SPN0



½" U regular 90 degrees // SPN90
Single sensor kit, including: MFPA-1, cabling, calibration report, protective case. // KIT-PA-SPN90

The SPN90 has a shorter cap, allowing to position the particle velocity sensor as close as possible to the surface under test whilst protecting it from frontal impacts. The SPN90 is especially useful for integration in End Of Line quality control system.

USP PROBES / 3D

The USP probe is Microflown's most extensive sound probe. It is a true 3D sound intensity probe. It comprises of three orthogonally placed directional particle velocity sensors and sound pressure microphone. The USP probe is a standard product in the Scan & Paint 3D system, but can also be used for other applications such as End Of Line quality control or function as an Acoustic Vector Sensor.

½" USP Regular // UR
Single sensor kit, including: MFPA-4, cabling, calibration report, protective case. // KIT-PA-UR

Properties	SPN0	SPN90	UR
Length:	129 mm	117 mm	128 mm
Body diameter:	12,7 mm (1/2")	12,7 mm (1/2")	12,7 mm (1/2")
Connector type:	7 pin Lemo F	7 pin Lemo F	7 pin Lemo F
Velocity sensor			
Frequency response (±1 dB)	40 - 8.000 Hz	40 - 8.000 Hz	40 - 8.000 Hz
Frequency response (±2 dB)	20 - 10.000 Hz	20 - 10.000 Hz	20 - 10.000 Hz
Max. PVL (re 5e-8 m/s):	130 dB	130 dB	130 dB
Pressure sensor			
Frequency response (±1 dB)	N/A	N/A	40 - 8.000 Hz
Frequency response (±2 dB)	N/A	N/A	20 - 10.000 Hz
Max. SPL (re 2e-5 Pa) :	N/A	N/A	112 dB

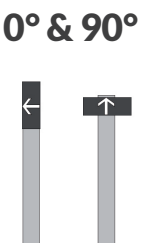
PU PROBES / 1D

The PU probes comprise of one directional particle velocity sensor and one omni-directional sound pressure MEMS-microphone. The PU probes are the most popular Microflown sensors and they are used in a range of Microflown solutions, such as Scan & Listen, Scan & Paint and the Acoustic Camera. Sound intensity is easily calculated by taking the time averaged product of the particle velocity and sound pressure signals. This makes the PU probes true sound intensity probes, covering the full frequency range from 20 Hz - 10 kHz.

½" PU Regular // PR
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PR

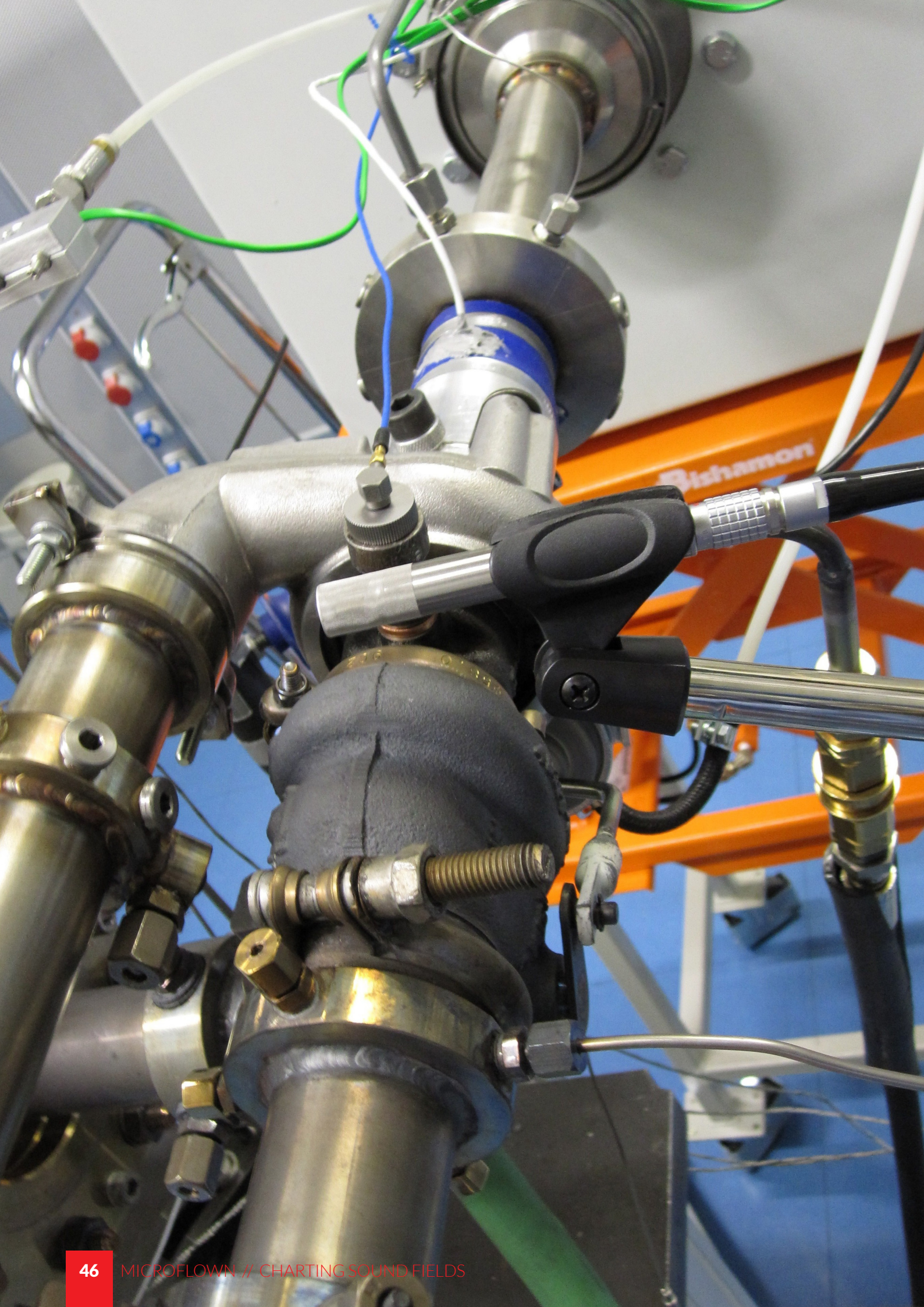
½" PU Mini // PM
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PM

PU Match 0 & 90 degrees // PTN0 & PTN9
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PTN0 & KIT-PA-PTN9



PU Voyager // PV
Option to Voyager Standard(+) including: cabling, calibration report, protective case. // PV

Properties	PR	PM	PTN0/9	PV
Length:	89,5 mm	41 mm	58 mm	97,5 mm
Body diameter:	12,7 mm (1/2")	12,7 mm (1/2")	7 mm	12,7 mm (1/2")
Connector type:	7 pin Lemo F	4 pin Lemo F	4 pin Lemo F	4 pin Lemo F
Velocity sensor				
Frequency response (±1 dB)	40 - 8.000 Hz	40 - 8.000 Hz	80 - 8.000 Hz	100 - 7.000 Hz
Frequency response (±2 dB)	20 - 10.000 Hz	20 - 10.000 Hz	20 - 10.000 Hz	20 - 8.000 Hz
Max. PVL (re 5e-8 m/s):	125 dB	125 dB	130 dB	130 dB
Pressure sensor				
Frequency response (±1 dB)	60 - 7.000 Hz	60 - 7.000 Hz	40 - 10.000 Hz	100 - 7.000 Hz
Frequency response (±2 dB)	20 - 10.000 Hz	20 - 10.000 Hz	20 - 10.000 Hz	20 - 8.000 Hz
Max. SPL (re 2e-5 Pa) :	112 dB	112 dB	130 dB	130 dB



FRONT ENDS

DAQ / DATA ACQUISITION SYSTEMS

Data acquisition systems are used to convert analog to digital signals. The digital data is then transferred for recording via a USB-connection to the computer. All Microflown solutions are equiped with the Scout V2. Only the Acoustic Camera includes a Zodiac data acquisition system, which provides 24 channels of analog to digital conversion.

Scout V2 | 4 Channel DAQ // SCT2

The Microflown 4 channel data acquisition system is the standard product for most of the Microflown solutions. The Scout V2 is equiped with inputs for 4x line level channels, tacho, external trigger and two outputs (line out and amplified).

HEIM PWACA // PWACA

DATaRec® 4 - Power module for DIC24.

HEIM Link Module // LMF2FE

DATaRec® 4 - Link Module allows to connect multiple DIC24s for higher channel count.

HEIM 24 Channel DAQ // DIC24

DATaRec® 4 - DIC24 is a 24 channel voltage / ICP® data acquisition system. Each input channel is completely independent and consists of an amplifier, 24 bit A/D converter and anti aliasing filter.

CATALOG

SIGNAL CONDITIONERS

MFPA / PREAMPLIFIERS

The launch of the new Microflown preamplifiers (MFPA) improves the quality and usability of the measurement chain:

- Your probe and signal conditioner do not longer need to be matched for calibration, the new preamplifiers are now interchangeable and offer more flexiblity.
- New circuitry allowed us to lower the self-noise and support the sensor's full dynamic range of over 130 dB, eliminating the need of the High/Low Gain switch. This makes the new preamplifiers not only more user friendly but also error-proof.
- The new MFPA is provided with 1, 2 or 4 inputs, adapted to your corresponding probe type.

UPGRADE your old Microflown preamplifiers and front ends to the new MFPA / SCT2 now! Contact: info@microflown.com

1 Channel Preamplifier // MFPA-1

The Microflown 1-channel signal conditioner is used to power any 1D velocity probe and to amplify the received particle velocity signal to 1 channel line level BNC output.

2 Channel Preamplifier // MFPA-2

The Microflown 2-channel signal conditioner is used to power any PU probe and to amplify the received pressure and particle velocity signals to 2 channels line level, BNC output.

4 Channel Preamplifier // MFPA-4

The Microflown 4-channel signal conditioner is used to power a USP probe and to amplify the received sound pressure (1x) and particle velocity (3x) signals to 4 channels line level BNC outputs.

24 Channel Preamplifier // MFPA-24 & MFPA-24B

The MFPA-24 enables the direct connection of 12 PU probes (2 channels per probe) to a front-end, eliminating the need of separate signal conditioners for every probe. The MFPA-24B enables the direct connection of 12 PU probes (2 channels per probe) to our hand held array platform via single 50 Pin multi-core cable. The electronics provide power to the probes and amplify the received particle velocity and sound pressure signals to line level outputs.

The output connector is a 50 pin Sub-D, compatible with the 50 pin Sub-D to 24 BNC cable (CAB-50-24BNC).

MFPA-24 MFPA-24B

CATALOG

SOUND SOURCES

VVS / VOLUME VELOCITY SOURCES

Microflown volume velocity sources (VVS), also known as an sound monopole or acoustic point source, can be used for a wide range of applications like transfer path analysis, airborne source quantification, component vibroacoustic behavior characterization, airborne source quantification and pass by noise simulations.A Microflown high dB sensor at the nozzle allows measuring directly the emitted volume velocity in m^3/s.

Low Frequency VVS | 30 - 500 Hz // LFM

Including:

- High dB Match (volume velocity sensor) // HM
- 1 Ch. preamplifier // MFPA-1
- Power amplifier for the driver
- Accessories // cabling, power supplies, probe case
- Pelican Case

Mid-High Frequency VVS | 300 - 12.000 Hz // MHVVS

Including:

- High dB Match (volume velocity sensor)
- 1 Ch. preamplifier // MFPA-1
- Integrated power amplifier for the driver
- Accessories // cabling, power supplies, probe case
- Pelican Case

Properties	LFM
Frequency range:	30 - 500 Hz
Height:	445 mm
Body diameter:	330 mm
Weight:	11.8 kg
Tube outer diameter:	160 mm
Tube inner diameter:	150 mm
Power RMS / Maximum input signal (RMS):	200 W / 40 V
Sound power level:	122 dB
Sound pressure @ 1meter:	111 dB

Properties	MHVVS
Frequency range:	300 – 12.000 Hz
Height:	95 mm
Body diameter:	200 mm
Weight:	5 kg
Hose (diameter / length):	44 / 3.000 mm
Nozzle (diameter / length):	14 / 90 mm
Power RMS:	60 W
Sound power level:	107 dB
Sound pressure @ 1meter:	96 dB

SOURCES THAT WILL HELP YOU FIND THE RIGHT DIRECTION

ACCESSORIES

SCAN & PAINT / ADVANCED TRACKING

Scan & Paint uses a color tracking algorithm to find the position of the probe in the camera image. The Advanced Tracking System for Scan & Paint is recommended for dark environments and optimal tracking performance.

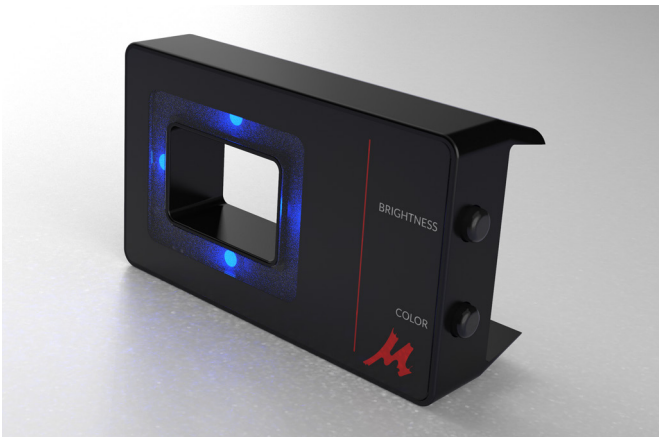
Advanced Tracking System // SP-TR-ADD

The Advanced Tracking System is a special upgrade dedicated for Scan & Paint. It improves the process of locating the sensor on a camera image, thus reducing the total measurement time.

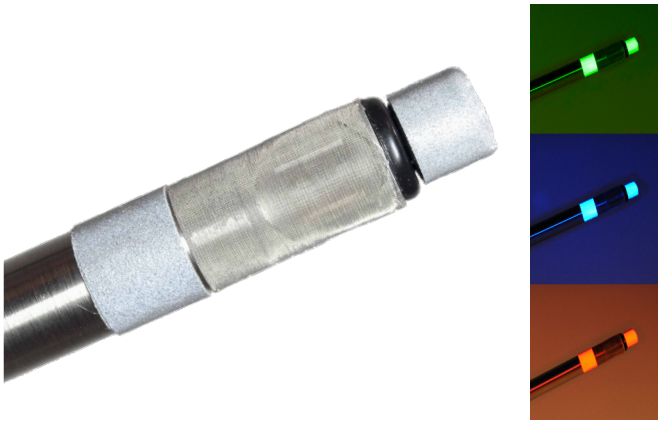
The Advanced Tracking software module allows the color tracking algorithm to detect any changes to the orientation of the probe in real-time.

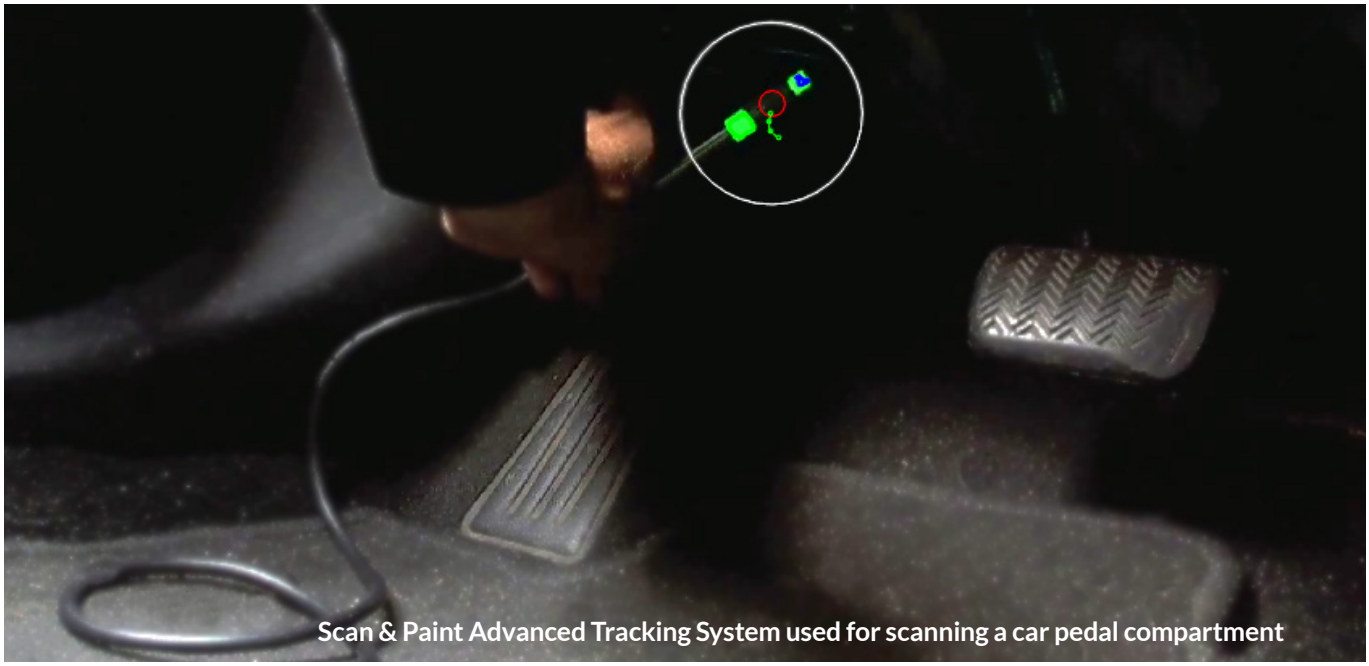
The USB Camera Light Ring can be fixed around the camera lens to illuminates the Reflectors on the probe. This allows the Advanced Tracking to detect the sensor position even in the most adverse lighting conditions.

Light Ring



Reflectors





Scan & Paint Advanced Tracking System used for scanning a car pedal compartment

PORTABLE / REMOTE CONTROL

Remote Handle // RH-01

The remote handle is a standard product of Scan & Paint 3D, but can be used as an add-on to other solutions.

The handle allows to remotely trigger the start and stop of a measurement. Moreover, the signal status and tracking performance are communicated with relevant LED's.

FIXTURES / PROBE ADAPTERS

Probe adapters are used to extend the package of the small probes, such as the PU Mini and PU Match, allowing the probes to be hand held.

½" Probe Adaptor // ADP-PM

Suitable for:

- PU Mini // PM
- PU Match Packaged // PI

The adapter is used for applications where one of the mentioned probe packages is needed as standard ½" sized probe e.g. to make it hand held. It also makes the listed probe packages compatible with the Microflown Remote Handle (RH-01).

PU Match Handle // ACC-PTN

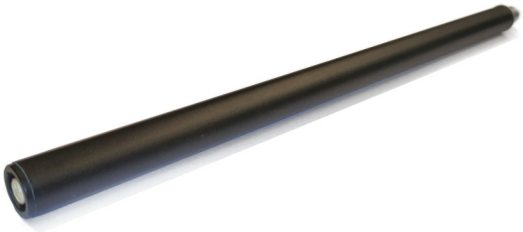
Suitable for:

- PU Match // PTN
- PU Mini // PM

The PU Match Handle allows the smallest sensors of the Microflown product family to be hand held. This accessory works as an adaptor from a 4p Lemo connector to a 7pin Lemo connector allowing the usage of thicker and better shielded cabling (CAB-LEMO-N-77).

Extension Bar 25 cm Sphere 3D // ACC-SP3D-EB

This extension bar can be placed in between the tracking sphere and the USP probe of a Scan&Paint 3D system. Using this extension will make it possible to reach narrow and physically hard to reach spots.



ACCESSORIES

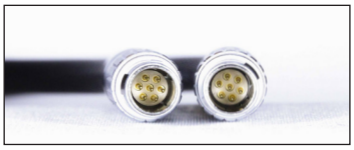
MISCELLANEOUS / WIND CAPS

Wind caps minimize the effect of the DC flow in your results on both the pressure and velocity channels.

Wind Cap // ACC-IW

The ½“ Indoor Wind Cap is specially developed to perform measurements under light wind conditions. It is applicable to any ½ inch, regular size probe. Not applicable to probes that are made ½” using an adapter.

The ½“ Indoor Wind Cap is made of a combination of material layers, allowing the measurement of the particle velocity with wind conditions, up to 15 m/s.



CABLES / SIGNAL CABLES

Product name	Product code	Length [m]	Connector 1	Connector 2
2,5 meter 7pin male to 7pin male Lemo	CAB-LEMO-2.5-77	2.5	7 pin Lemo M	7 pin Lemo M
10 meter 7pin male to 7pin male Lemo	CAB-LEMO-10-77	10	7 pin Lemo M	7 pin Lemo M
10 meter 7pin male to 7pin female Lemo | Extension cable	CAB-LEMO-10-7F7	10	7 pin Lemo M	7 pin Lemo F
1 meter 4pin male to 4pin male Lemo	CAB-LEMO-1-44	1	4 pin Lemo M	4 pin Lemo M
2,5 meter 4pin male to 4pin male Lemo	CAB-LEMO-2.5-44	2,5	4 pin Lemo M	4 pin Lemo M
1 meter 4pin male to 7pin male Lemo	CAB-LEMO-1-47	1	4 pin Lemo M	7 pin Lemo M
2,5 meter 4pin male to 7pin male Lemo	CAB-LEMO-2.5-47	2,5	4 pin Lemo M	7 pin Lemo M
5 meter high temperature, low noise 4 pin male to 4 pin male Lemo	CAB-LEMO-5-44	5	4 pin Lemo M	4 pin Lemo M
1 meter 4 pin male Lemo to USB	CAB-LEMO-USB-1-4	1	4 pin Lemo M	USB-MiniA-M
2,5 meter 7 pin male Lemo to USB	CAB-LEMO-USB-2.5-7	2,5	7 pin Lemo M	USB-MiniA-M
0,2 meter BNC cable	BNC-20CM	0,2	BNC	BNC

CABLES / ROUTER CABLES

Product name	Product code	Length [m]	Connector 1	Connector 2
DIC24 cable male | 50 pin Sub-D incl. 9 pin Lemo to power plug	CAB-DIC24	2,5	50 pin Sub-D M	50 pin Sub-D F
DIC24 cable male | 50 pin Sub-D incl. 2x BNC	CAB-50-UNV	2,5	50 pin Sub-D M	50 pin Sub-D F
50 pin Sub-D to 24 BNC male cable	CAB-50-24BNC	2,5	50 pin Sub-D F	24 BNC M


VOL
PASSENGER
1 3 5
2 4 6 R

ACCESSORIES

FIXTURES / FIXED GRIDS

Fixed array grids are grids that have a fixed amount of probes. These grids are used for Near Field Acoustic Camera applications.

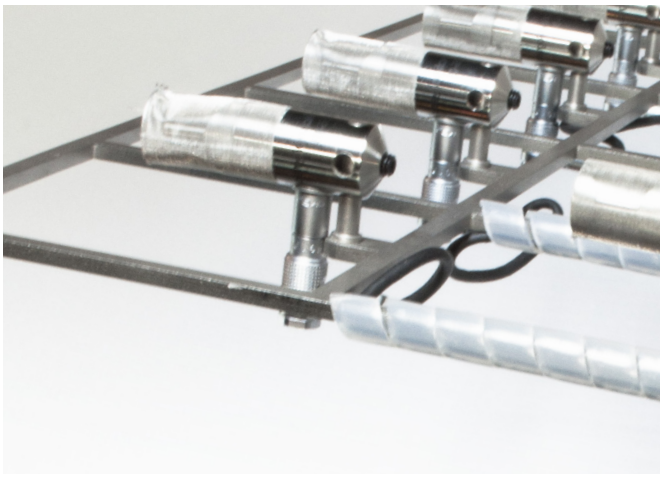
Customized grids

At Microflown we have the skills and equipment such as laser cutters and 3D printing, to design just about any array you could think of. Flat plane arrays, curved, or scattered, including or excluding cables, Lemo connectors, etc. These are all options we can create and produce on special request. Please contact us for more information about customized grids: info@microflown.com

Hand-Held Array | RECT-7.5 // ARR-GR-RECT7.5

Fixed grid compatible for PU Mini & Match, standard array configuration:

- 3x4 // 12 PU Mini or PU Match with a 75 mm inter-sensor spacing



Hand-Held Array | BiHex // ARR-GR-BIHEX

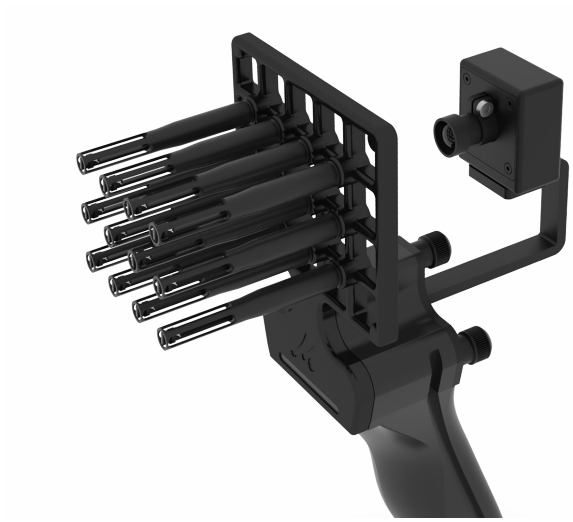
Fixed grid compatible for PU Mini & Match, standard array configuration:

- Hexagram, designed for optimal performance of Near Field Acoustic Holography)

Hand-Held Array | RECT-1.8 // ARR-GR-RECT1.8

Fixed grid compatible for Match, standard array configuration:

- 3x4 // 12 PU Mini or PU Match with a 18 mm inter-sensor spacing

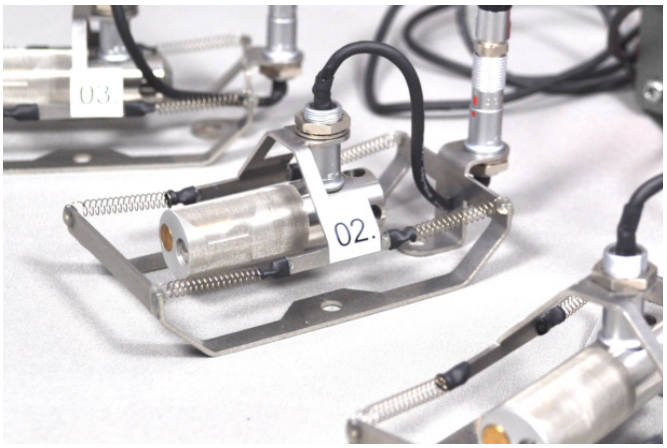


FIXTURES / SCATTERED GRIDS

The use of scattered arrays is one of the major benefits of Microflown's Acoustic Camera and PNCA-R applications. Scattered array fixtures allow to position a number of probes in an irregular fashion around the surface of the studied noise source. Depending on the circumstances one can choose to attach the probes to the surface using Scattered Array Mountings (for PU Mini only), or use flexible tubes with magnetic pods.

Irregular Grid for 12 PU Mini // IRG-PM2
Suitable for PU Mini's.
Including: 12x magnetic feet, 12x mounting for PU Mini, 10 meter flexible and extendable tube.

Scattered Array Mounting for PU Mini // SAM-PM2
This mechanically suspended Lemo connector decouples the connected PU Mini from structure born vibrations generated by the test object. Adhesive tape or velcro stickers can be used to attach these mountings directly on the surface of the test object.



CATALOG

SOLUTIONS

Microflown solutions include all hardware and software that is needed to start measuring and obtain the results as described in the previous sections of this product catalog. Laptop and accessories other than listed are only included on request.

Scan & Listen

Detailed product information see page 20

Including:

- PU probe of choice
- Scan & Listen hardware device
- Beyer Dynamics DT-770 headphones
- Accessories // cabling, battery, probe case
- Pelican Case

Scan & Paint 2D

Detailed product information see page 22

Including:

- PU probe of choice
- 2 Ch. preamplifier // MFPA-2
- 4 Ch. data acquisition // SCT2
- Scan & Paint software // SW-S&P
- Accessories // windcap, cabling, power supplies, USB camera, tripod and probe case
- Pelican Case
- Advanced Tracking System // SP-TR-ADD

Scan & Paint 3D

Detailed product information see page 24

Including:

- USP Regular
- 4 Ch. preamplifier // MFPA-4
- 4 Ch. data acquisition // SCT2
- Scan & Paint 3D software // SW-S&P-3D
- PST-Iris IR stereo camera and tripod
- IR Tracking Sphere // 3D-S&P-SPHERE
- Remote Handle // RH-01
- Accessories // pointer, cabling, power supplies, probe case
- Pelican Case

Product name	Product codes per probe				
	PU Regular	PU Mini	PU Match 0 deg	PU Match 90 deg	USP Regular
Scan & Listen	SL-PR	SL-PM	SL-PTN0	SL-PTN9	
Scan & Paint	SP-PA-PR-SCT2	SP-PA-PM-SCT2	SP-PA-PTN0-SCT2	SP-PA-PTN9-SCT2	
Scan & Paint 3D					SP3D-PA-UR-SCT2

NEAR FIELD ACOUSTIC CAMERA

Detailed product information see page 26

Including:

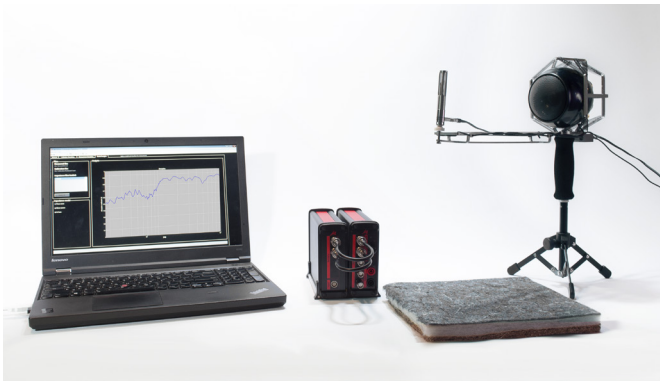
- Amount of PU probe of choice
- Preamplifier // MFPA-24 or MFPA-24B
- Data acquisition // Heim PWAC & DIC24
- Acoustic Camera software // SW-AC
- Accessories // cabling, power supplies, USB camera, probe cases, grid configuration of choice
- Pelican Case

Optional:

- 24x or 36x PU probe incl. Heim Link modules

In-Situ Absorption

Detailed product information see page 30



Including:

- PU probe of choice
- 2 Ch. preamplifier // MFPA-2
- 4 Ch. data acquisition // SCT2
- In-Situ Absorption software // SW-IMP
- Piston on a sphere hardware setup
- Accessories // cabling, power supplies, probe case
- Pelican Case

Voyager

Detailed product information see page 32

Including in VYR-S:

- Voyager Device
- Accessories // USB Cable, power supply, Pin Key Tool USB memory
- Pelican Case

Extra items in VYR-S+:

- Headphones - Sony WH1000-MX3
- Lanyard
- Manfrotto table tripod
- 3/8“ to 1/4”Adapter
- Hardcopy product manual

Product name	Product codes per probe			Voyager	
	PU Mini	PI Probe	PU Match 90 deg	Standard	Standard+
Acoustic Camera	ARR-PA-PM2		ARR-PA-PTN9		
In-Situ Absorption	IMP-PA-PM-SCT2	IMP-PA-PI-SCT2			
Voyager				VYR-S	VYR-S+

SOFTWARE

VELO / MODULES

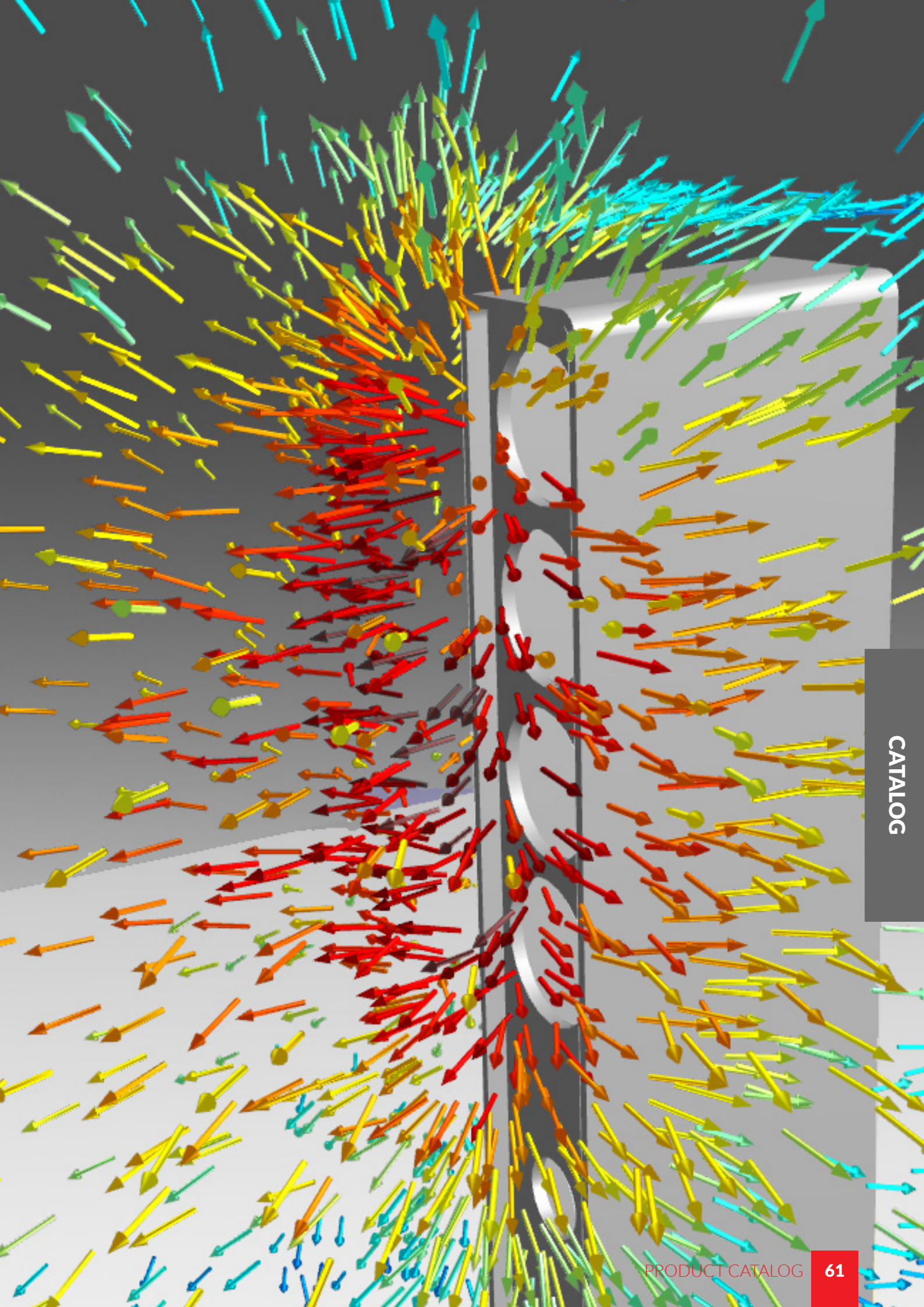
Velo is the Microflown software platform that combines the functionalities of nearly all Microflown systems into one integrated solution. Velo is fully configurable, therefore you can easily upgrade your Velo package with extra software applications or add-on modules.

Product name	Product code
Analyser	
Analyzer | Base module	SW-SA
Multi capture | Sub module	SW-SA-MC
Order Analysis | Sub module	SW-SA-OA
PNCA | Sub module	SW-SA-PNCA
TL Transmission loss | Sub module	SW-SA-TL
Scan&Paint 2D	
Scan & Paint 2D | Base module	SW-S&P
In-situ transmission loss | Sub module	SW-S&P-TL
Scan & Paint TPA | Sub module	SW-S&P-TPA
Scan&Paint 3D	
Scan & Paint 3D | Base module	SW-S&P-3D
Material Testing	
In-situ Absorption | Base module	SW-IMP
Near Field Acoustic Camera	
NF Acoustic Camera | Base module	SW-AC
Near-Field Acoustic Holography | Sub-module	SW-AC-NAH
Order Analysis	SW-AC-OA
Acoustic Shape	
Acoustic Shape | Base module	SW-AS
Order Analysis	SW-AS-OA

SYSTEM / ADD-ONS

Add-ons expand the capabilities of your current Microflown solution. An add-on contains the minimal required hardware devices and software applications to run an additional Microflown solution. For example, SP-ADD allows users that already own a Microflown PU probe to perform Scan & Paint measurements for the minimal costs. For more information please contact us: info@microflown.com

Product name	Product codes per probe				
	PU Regular	**PU Mini**	**PU Match**	**PI Probe**	**USP Regular**
Scan & Listen add-on	SL-ADD-PR	SL-ADD-PM	SL-ADD-PM	SL-ADD-PM	
Scan & Paint add-on	SP-ADD	SP-ADD	SP-ADD	SP-ADD	
In-Situ Absorption add-on		IMP-ADD		IMP-ADD	
Scan & Paint 3D add-on					SP3D-ADD
Voyager Standard or Standard+	VYR-S / VYR-S+	VYR-S / VYR-S+	VYR-S / VYR-S+	VYR-S / VYR-S+	VYR-S / VYR-S+



SUPPORT SERVICES

The service contracts can be ordered for an initial contract length of 1 year. You have the option to choose whether you would like the contract to be automatically renewed or whether it should expire after the contract period ends.

SSC+ / EXTENDED WARRANTY

To our customers that have a Software Support Contract (SSC) we offer the SSC+. This will additionally give you an extended warranty for the period of the contract. Please contact Microflown or one of our local partners to obtain more information.

SSC / SOFTWARE & SUPPORT CONTRACT

The Software & Support Contract (SSC) ensures that you always run the latest software version including all improvements and new features. The SSC includes discounts on maintenance, hardware upgrades, trainings, access to additional educational materials, and much more. Take advantage of the full range of services and personal support to achieve the best quality and efficiency in your core work.

DIRECT SUPPORT

Personal support: our team of experts is available to you for direct and personal support. With the SSC you benefit from priority service, available through telephone, skype and e-mail.

On-site support: as an SSC holder you get 10% discount on on-site training, installation, consulting and engineering services.

EDUCATION

Self education: extensive documentation and training videos are available for our SSC holders. This includes general information on acoustics, as well as information specific to Microflown systems and application cases.

Free webinars: free access to organized webinars on our products and other topics related to acoustics.

Training: get 30% discount on dedicated training for small groups at our office and benefit from the expertise of our experienced trainers.

SOFTWARE

Releases and new features: being an SSC holder you are guaranteed to have access to all new software releases. Benefit from all improvements and new features!

Software reliability: Microflown commits to keep your software updated and compatible with new Windows releases. Backward compatibility is provided until Windows XP.

DISCOUNTS

Calibration: having your Microflown sensors calibrated every two years ensures the performance of your system. You receive a 30% discount on calibration of your equipment at our accredited service center.

Repair: for repairs excluded from warranty, a 30% discount on the repair costs is provided. Furthermore, as a SSC holder, you get the highest priority, granting a return of your equipment within 7 days, to ensure the continuity of your operations.

Rental: for your temporal need of additional equipment a 20% discount on rental prices is offered.

USC / UPDATE SERVICE CONTRACT

An Update Service Contract is offered (USC) too. This will solely provide you with the new software releases, but none of the SSC and SSC+ features.

EXTENDED WARRANTY

DIRECT SUPPORT
EDUCATION
SOFTWARE
DISCOUNTS

SOFTWARE UPDATES

USC

SSC

SSC+

RECALIBRATION

Instrumentation needs to be recalibrated frequently. We advice to recalibrate the Microflown sensors once per 2 years. In our lab, we use reference sensors that are recalibrated annually at an accredited lab.

On request higher frequencies can be calibrated. The standard calibration includes:

- Acoustic particle velocity sensors 20 Hz - 10 kHz
- Sound pressure microphones 20 Hz - 10 kHz

Using express services, turnaround time of recalibration services is normally one week. The recalibration comes including a new calibration report and if necessary in a digital format as MS Excel and/ or Text file.

Product name	Product code
All type of Scanning probes incl. MFSC-2 or MFPA-1	CAL-SP
All type of PU probes incl. MFSC-2 or MFPA-2	CAL-PU
All type of USP probes incl. MFSC-4 or MFPA-4	CAL-USP
Array of 12 PU probes incl. Router Box	CAL-ARRB
Array of 12 PU probes incl. Signal Conditioners	CAL-ARSC
Certificate of Conformance per probe	CAL-COC
Scout422	CAL-SCT
Scout V2	CAL-SCT2

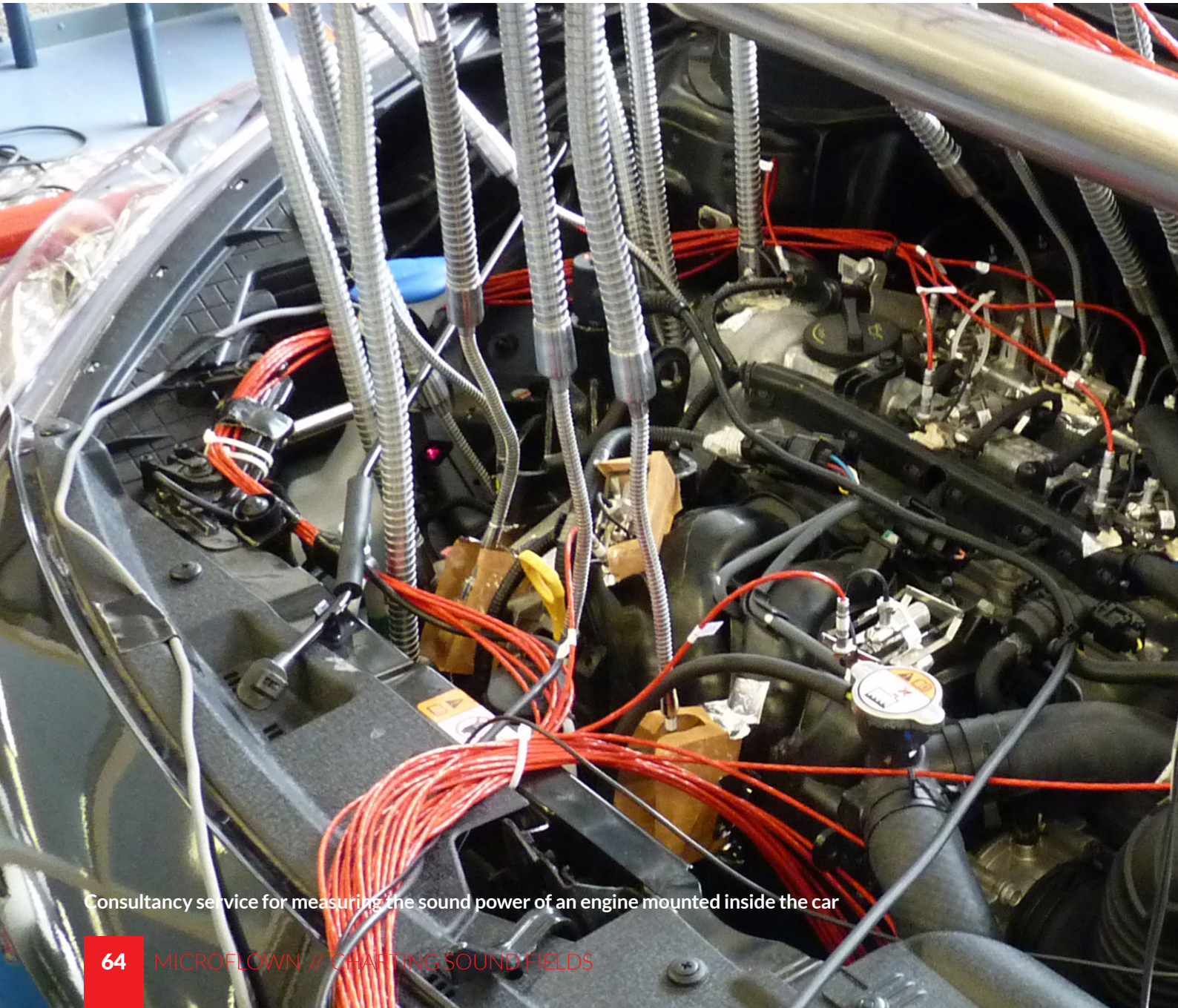
Extended Warranty	Scanning probe kits	PU probe kits	USP probe kits
1 Year	EXWP-A	EXWP-A	EXWP-B

ENGINEERING SERVICES

ACCURATE / EFFICIENT / EXPERTISE

Microflown Technologies offers a range of engineering services in the field of acoustics and vibrations. Our engineers have years long expertise in acoustics, NVH applications and signal processing. The unique Microflown sensors can be deployed for daily occuring issues or a single day measurements campaign, for troubleshooting, benchmarking, material testing and environmental noise. Depending on your application and wishes, the engineering services can include on-site or in-house measurements, the rental of equipment, and the expertise of our engineers, ensuring the most efficient solution.

For further information contact us at:
info@microflown.com



Consultancy service for measuring the sound power of an engine mounted inside the car

TROUBLESHOOTING & BENCHMARKING

Troubleshooting and benchmarking services are applicable to complete products or subcomponents in all sorts of industries, such as automotive, white goods, consumer electronics, etc. Using our Microflown sensors, accurate results of your product's acoustic behaviour can be obtained without the need for anechoic conditions or other forms of acoustic treatment. Combined with the engineering and NVH know-how of our specialist team, your troubleshooting and benchmarking research is solved effeciently and accurately.

TRAINING & TECHNOLOGY SUPPORT

Perhaps you feel that the Microflown particle velocity sensors could benefit your acoustic research, but you still have questions on how to interpretate the results? Perhaps you´re seeking for more efficient measurement strategies?

We provide educational seminars on noise and vibration related to our products. This could either be in the form of centralized general seminars or personal orientated in-house training. Based on your needs, we focus on theory, practical real-world applications and hands-on training on accurate repeatable results.

ACOUSTIC MATERIAL TESTING

Our unique sensors offer the possibility of in-situ surface impedance measurements. Our method allows verification of performance of (building) materials as installed, which is simply not possible with (destructive) Kundt's tube type of measurements.

Furthermore, we can map the acoustic impedance, as well as absorption and reflection coefficients over an image of your test object or material. Tests could be performed on anything from foam, layered panels, seats, asphalt, metal foam, liners, homogeneous and locally reacting materials.

NOISELOC LOCALIZATION

Noise is known to affect both the wellbeing and health of human beings. It is often caused by industrial activities far away from where people live. NoiseLoc is a rapidly deployable tool that allows the localization of an sound source within several days of measurements.

With the NoiseLoc system, we're offering a unique solution to the market that is able to localize and understand the roots of your environmental noise issue. This system is offered as environmental noise monitoring service directly to clients in the Netherlands. However, after sufficient education, it is also possible for acoustic consultans to rent the NoiseLoc system to perform such measurements on their own.

PANEL NOISE CONTRIBUTION

Panel noise contribution is a method to measure and analyse the distribution and contribution of sound sources inside vehicles. Typically it requires a time consuming process of applying acoustic treatment and single point measurements that could take up to a month of work. Besides that, the acoustic material that is required alters the acoustic behaviour of the vehicle's interior.

Thanks to the uniques properties of particle velocity, PNCA-R tests can now be performed very fast and accurate. Our approach uses a scattered array of PU probes. This allows for a typical resolution of over 100 individual panel contributions to be measured in a single day. Furthermore, measurments can now also be performed while driving the vehicle on the road including e.g. wind and tire noise.

REFERENCES

Audi
Fiat Auto
Alstom
Electrolux
De Koningh
Visteon
Carcoustics
Volkswagen
MIRA
Opel
PZL Swidnik
ArcelorMittal
Nokia
Hyundai
Bentley
Tesla
Rolls Royce
Solar Turbines

CONTACT DETAILS

We are based in Arnhem, a pleasant 150.000 thousand citizen's city one hour from Amsterdam. Our head office is located in the building called *"de Enk"*. This building is the former headquarter of AkzoNobel, an Amsterdam stocklisted company.

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REDUCE THE PRESSURE IN YOUR WORK...

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