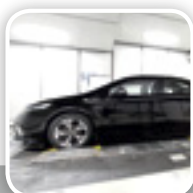




Sound engineering for technical products,  
communication systems and environmental noise



Research · Development · Engineering · Consulting



## PRODUCT INFORMATION







# Setting global standards

Today, binaural recording and playback technology is an essential part of acoustic measurement program. Especially in areas where human auditory experience is the decisive factor in evaluating sound, HEAD acoustics aurally-accurate recording and playback systems, and hearing-related analysis software is the standard. Our customers, including leading automobile, IT and telecommunications manufacturers worldwide, appreciate the competitive advantages of product sound optimization and benefit from our technology and expertise.

Furthermore, HEAD acoustics is making key contributions to the international standardization of modern processes for measuring speech quality in telecommunications. HEAD Quality Standards are now synonymous with achieving excellent speech quality.

Besides the products and services from HEAD acoustics, which are continuously being adapted to meet the requirements of our customers, our company is actively addressing far-reaching social and technology changes in the areas of mobility, transportation and communications. These developments offer exciting opportunities and new challenges. We strive to prepare our customer for the future by incorporating our ideas and visions into the products and services of today, and by actively participating in national and international research projects.





# We hear with your customers' ears

The unique measuring technology provided by HEAD acoustics takes into account the capability of the human auditory apparatus. This "aurally-accurate" technology forms the basis for conventional measurements as well as those which take into account the human auditory system. Nevertheless, the subjective evaluation of sounds always plays a central role in any product sound quality program and is thus tightly integrated into the measurement and analysis chain.

With the HMS IV, HEAD acoustics has developed the latest generation of HMS artificial head measurement systems. Immediately after turning it on, the HMS IV is ready for use. Measurements are saved to the integrated CompactFlash memory card, which is inserted into the easily accessible slot on the front side of the system.

Aurally accurate, equalized playback is possible directly from the card with a headphone connected to the built-in output of the HMS IV.

Thanks to its 24-bit signal processing technology, the dynamic range of the HMS IV is comparable to that of human hearing. Mobile and flexible due to its low weight, the HMS IV can be taken anywhere and is ready for use at any time. For wireless control of the HMS IV from a smartphone or tablet, we now offer the intuitive Android app HEAD Remote Control RC, which is available free of charge.





HEAD acoustics

HMS *flash* V

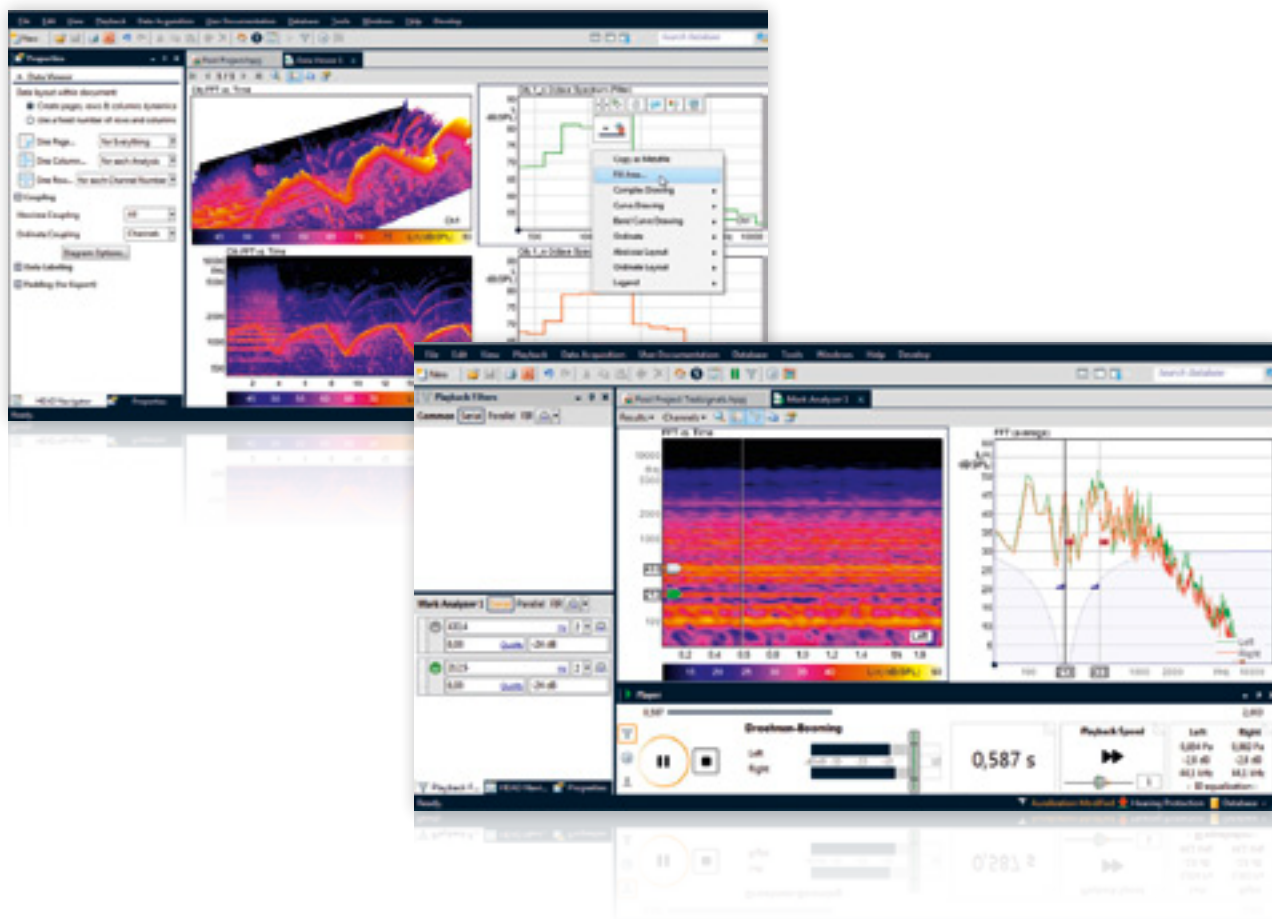
HEAD acoustics®





# Detailed sound and vibration analysis

The ArtemiS SUITE is an integrated software solution from HEAD acoustics that allows you to perform virtually any task in the area of sound and vibration analysis. Enjoy the efficient and natural workflow within ArtemiS SUITE, where all applications interact with each other perfectly.



ArtemiS SUITE combines all the necessary tools for carrying out comprehensive sound and vibration measurements and analyses with data management, reporting, and automation, all contained in one consistent software environment.

HEAD acoustics software has gained popularity for its ability to greatly improve productivity of noise and vibration engineers. It does this first by utilizing a straightforward pool project approach that quickly links data with analyses and graphical displays to ease the set-up and processing of large amounts of data. Secondly, at its core is the Mark Analyzer, which allows users to interact with data using a listen-analyze-filter approach to quickly "find and fix" noise problems.

The ArtemiS SUITE is based on state-of-the-art technologies and will optimally support you in your work today and in the future. The broad design of the software structure allows for a seamless integration of future developments as well as customer-specific adaptations.

Conducting benchmarking testing and product performance often yields large amounts of data, which must be managed to ease future retrieval. Documentation of these data sets is crucial. Feedback from our customers has been incorporated into the documentation module. Simply create your custom templates and populate them with the required data fields for documenting your data. Once documented, this metadata can be used in database searches for the creation of reports or to automatically fill in fields in your standardized reports.

Just populate predefined reports directly from within the Pools. You simply start the calculation, view the data, and click a button to export the report to PowerPoint® – never before has reporting been so easy!

Among the many other functions, which you will find indispensable for your daily work, are configurable display properties for analyses, basic statistic calculations in the Pools, and extended document management for a custom layout of windows within the ArtemiS SUITE.



# SQuadriga II

The first truly portable noise and vibration data acquisition

A member of the SQuadriga family, the industry standard for over 10 years for highly portable noise and vibration recording and playback.

The overwhelming success of the SQuadriga family of products is due to rugged and compact design and high level of functionality even in stand-alone mode. Engineers tasked with finding and fixing problems need only carry a SQuadriga II and the necessary transducers into the field. Once the SQuadriga II is switched on, it is ready to start taking sound and vibration data. Capture of the desired signal may be validated immediately after recording via playback through the optional binaural headset BHS II or headphones. Calibrated recordings are easily transferred to a notebook PC via an SD card for

further analysis and troubleshooting in ArtemiS SUITE. SQuadriga II also performs well as a connected front end to a PC to form an integrated recording and analysis system.

Due to SQuadriga II's many inherent features, there is no need to rely on connection to a tablet to perform standard measurement tasks. Basic functions such as channel set-up, calibration, triggering and monitoring of input levels are easily carried out using the built in function keys, menus and touchscreen. Spectral analyses and level vs. time measurements can be



viewed on recorded data and SQadriga II offers the unique capability of calculating loudness and sharpness.

SQadriga II features many I/O possibilities including eight channels of dynamic inputs and outputs, artificial head measurement system, binaural headset, CAN, and GPS, and can be further extended by attaching another

SQadriga II or certain HEADlab modules. Other embedded features include the possibility to play out signals while recording, monitoring of CAN, pulse and GPS channels, and interactive listening and filtering of recorded data. The continuous updates of firmware and functionality will lead to even more enhancements in the future.

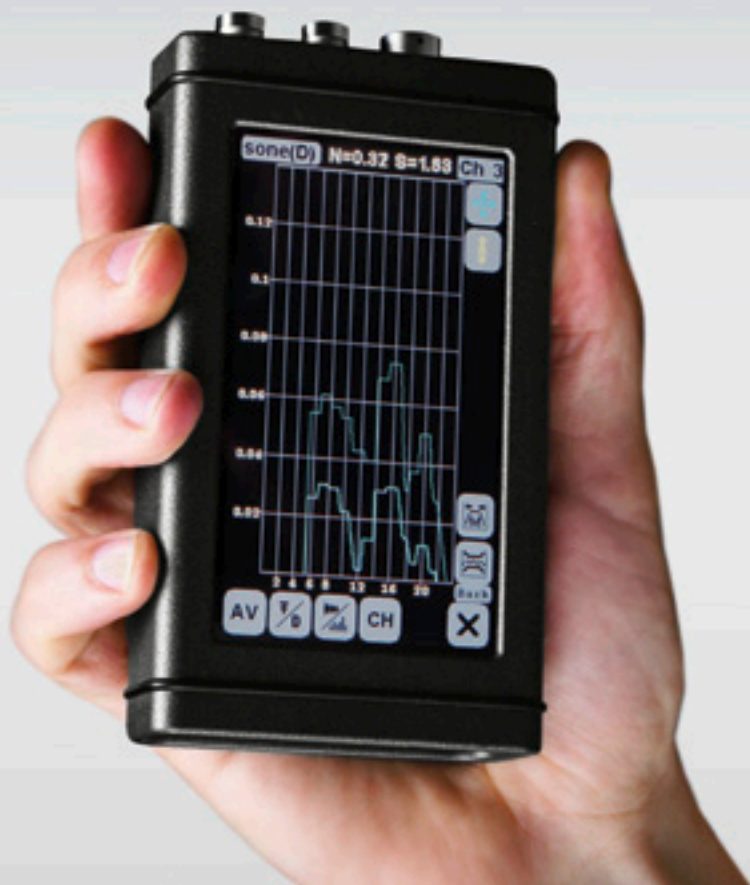
# BHS II

## Binaural recording and playback

The binaural headset BHS II is a combination binaural headphone and microphone. The BHS II is an ICP® sensor that conveniently plugs directly into the SQadriga II or SQobold by using a LEMO connector. When used in combination with those devices, it forms

a convenient system for capturing and evaluating noises in the field. To ensure the accuracy of your measurement set-up prior to taking data, you can calibrate the BHS II microphones. In order to minimize wind noise, the headset can be outfitted with a removable wind-screen.





# SQobold

Sound and vibration analysis that fits in your pocket

The new dimension of advanced  
recording and playback systems

SQobold is a recording and playback system that allows acoustic measurements to be performed virtually everywhere. With a length of less than 15 cm (5.6") and a weight of less than 500 g (1.1 lb), the compact SQobold fits in your pocket, and thanks to its powerful rechargeable battery, it can run in stand-alone mode for up to 6 hours. In combination with the binaural headset BHS II, aurally accurate recordings of sound events can be quickly made and can be analyzed and played back right on site. Furthermore, SQobold can be used as a precision sound level meter. In addition to common level quantities ( $L_{eq}$ ,  $L_{max}$ , etc.), it is possible to display and save psychoacoustic quantities loudness and sharpness, which allows measurements in the

areas of soundscapes and psychoacoustics. Besides the headset connector, SQobold provides two BNC inputs, a pulse input, GPS, and the possibility to connect a USB video camera for visual documentation. Data acquired in stand-alone operation is saved directly to the built-in 64-GB memory or optionally to a USB stick.

Besides its versatility and handy design, SQobold also excels with its ease of operation and its large, brilliant touch display. This makes SQobold an optimal stand-alone device or frontend for mobile sound and vibrations measurements, which can be used for soundscape research, NVH applications, environmental measurements, and much more.



# Impact Measurement

## Examination of dynamic properties

The design and dimensioning of newly developed machine components has a significant influence on the acoustic vibration behavior of the entire machine. For a targeted component design, it is thus essential to determine the natural vibration modes of all components to be used in a mechanical system during development.

With the ArtemiS SUITE and the tool pack ASM18, such analyses can be performed quickly and easily. With just a laptop computer, a mobile recording frontend (such as SQadriga II or SQobold), an accelerometer, and an impact hammer, you have a complete mobile system for the analysis of vibrational behavior.

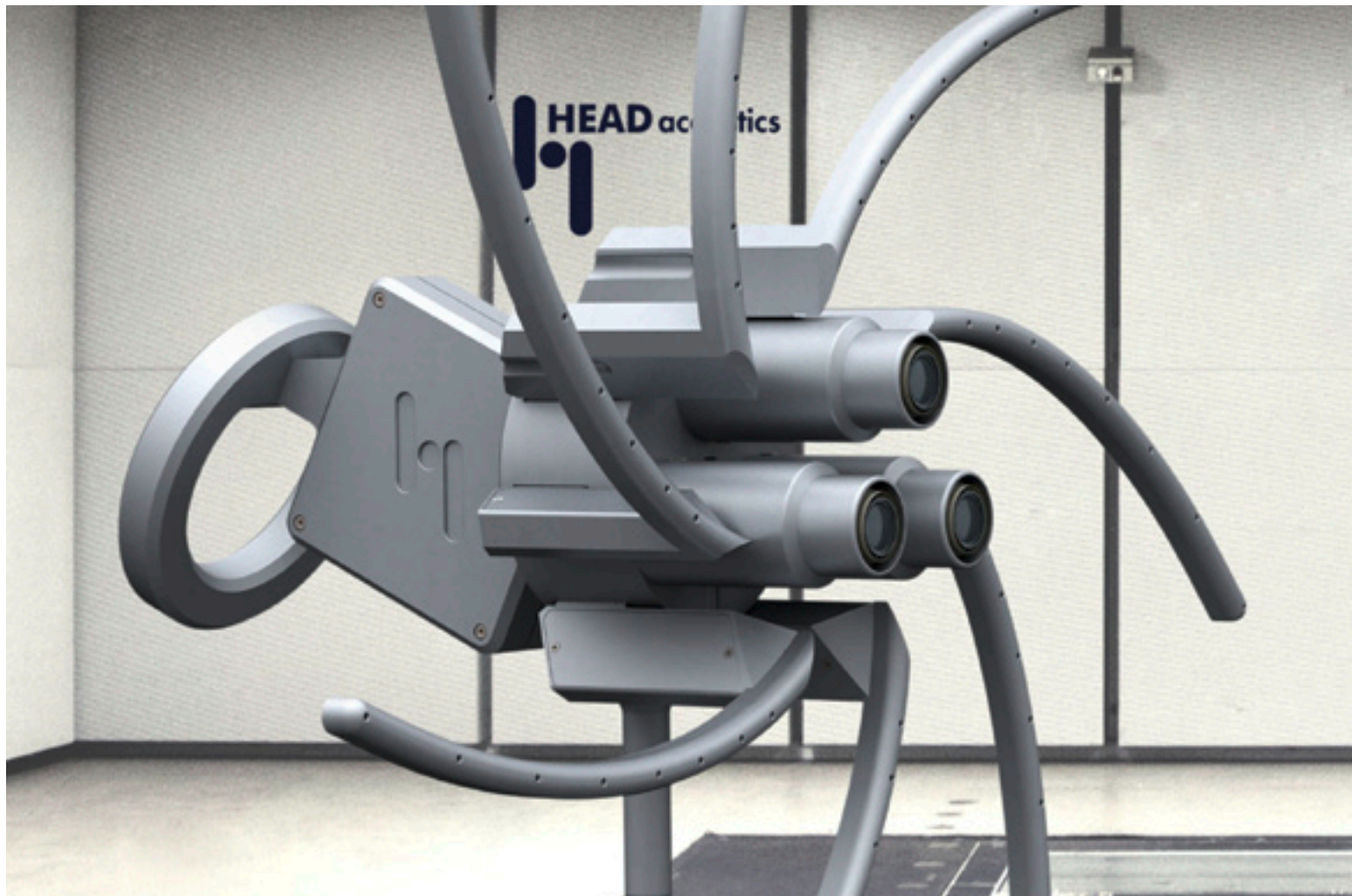
The versatile and user-friendly *Impact Measurement* function for acquisition of measurement data was primarily designed for occasional users of modal analysis. Step by step, the straightforward user interface guides you through the entire application until your measurement data are completely analyzed.

A particularly useful feature is the fully automated configuration of all required measurement parameters, such as sampling rate, block size, and windowing, specifically for the object to be measured and the type of hammer tip used. This ensures that even inexperienced users achieve optimal measurement results right from the start. Of course, all settings can also be configured manually.

During the data acquisition, the software indicates which points are to be struck next and monitors the quality of the strikes performed. Unsuitable double strikes, strikes exceeding the measurement range, or strikes with low coherence are discarded automatically, whereas data from successful strikes are collected, averaged, and saved to a documented HDF file.

The acquired data can subsequently be viewed in a *Data Viewer*, included in an automatically generated report, or exported to the ME'scopeVES™ software with a click of the mouse. ME'scopeVES™ provides you with tools for determining the modal parameters and generating visual animations of the natural vibration modes.





# HEAD VISOR VMA II.1

Real-time localization of sound sources

An Innovation from HEAD acoustics  
in microphone array technology

The HEAD VISOR Array VMA II.1 is an innovation from HEAD acoustics that uses microphone array technology to quickly localize sound sources. The HEAD VISOR is a highly integrated system, which makes its setup and operation a breeze. Often the desired information about the origin of a disturbing noise is acquired within a few minutes after setting up the system.

Thanks to its unique, spiral-shaped microphone layout and its sophisticated algorithms, the HEAD VISOR provides outstanding spatial and temporal resolution for acoustic analysis. Even highly dynamic processes can be separated and apportioned precisely.

With its three cameras, the HEAD VISOR continuously tracks the distances to all objects in the image during the measurement and uses this information for an exact calculation of the sound pressure level emitted from the respective position.

For complex measurement objects, a number of highly sophisticated algorithms are available, which allow the removal of sound reflections, entire sound sources, or even individual sound components from the total signal. This gives users unparalleled insight into the acoustic behavior of the measurement object.





# HEAD VISOR PROBE

## Hunting for low-frequency noise

In order to effectively reduce the low-frequency noise components often generated and emitted by machines, it is essential to identify the exact source of the sound events. The HEAD VISOR PROBE, used in combination with the HEAD VISOR, is a tool that supports you in the localization of the sources of emitted airborne sound.

The tip of the lightweight and flexible probe contains two microphones, which are moved along the surface of the test object during a measurement. They record all frequencies of sound emitted by the surface along with their direction and location. The current position of the probe is continuously tracked by the three cameras

of the HEAD VISOR. For this purpose, the head of the probe is equipped with twelve LEDs, by means of which the system can reliably identify the location of the sound source at any time. Using a built-in push button, you can selectively measure individual sections of the test object and combine them into an overall image.

The evaluation of the near-field measurement takes place directly in the intuitive HEAD VISOR software. The HEAD VISOR PROBE provides you with a useful solution allowing both near- and far-field measurements to be acquired in a single recording. That way, the entire frequency range from 20 Hz to 20 kHz can be evaluated.

## HEAD VISOR Software

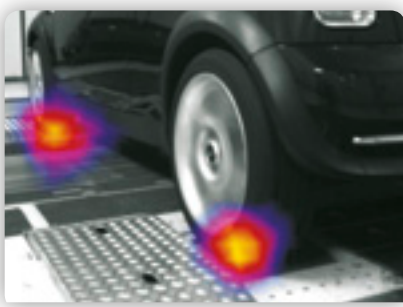
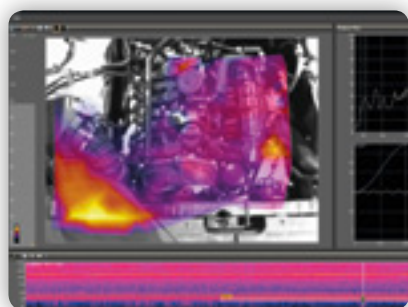
### Recording, evaluation, and presentation of highest-quality acoustic measurements

The intuitive HEAD VISOR software immediately displays the complete results of all functions of the HEAD VISOR and the HEAD VISOR PROBE without a noticeable delay, thus significantly speeding up your work.

All measurement data are saved as raw files by HEAD VISOR, allowing users to apply any settings – such as distance measurements, frequency ranges and algorithms to be used – retroactively at any time. Highly sophisticated additional algorithms provide further insight into the acoustics of complex measurement objects. Emitted sounds can be differentiated by location, frequency, order, or sound components, and sorted by their signal levels. The obtained detailed results can be

compiled and documented into a single overall image with a dynamic range of up to 30 dB (HDR function). Using sophisticated trigger functions, the system can automatically start and stop measurements and sort the results accordingly. This allows an effortless and systematic acquisition of measurement data.

With the built-in screen recorder, the entire user interface is "filmed" during your evaluation. All results are thus directly converted into an audiovisual movie that you can include in the presentation of your results. Creating impressive presentations has never been so quick and easy.





*labCTRL I.2*

USB/LAN controller for the data combining and synchronization of up to 10 HEADlab input modules



*labPWR I.1/I.2*

Power box (40W/100W) for the power supply



*labV6*

6-channel line/ICP® module with BNC



*labDX*

Digital module with CAN, FlexRay, pulse and AES/RS232 interfaces



*labP2*

Playback module with two headphone outputs



*labO2*

Playback module with XLR and BNC outputs





# HEADlab

## The multichannel front-end system

HEADlab is a compact multichannel front-end system for mobile data acquisition. Due to its modular concept individual modules are easily configured into flexible, customized systems that adapt to your changing requirements. The combination possibilities range from compact systems to decentralized multichannel systems for extensive measurements with a large number of channels.

You can use HEADlab for data acquisition in sound and vibration evaluations. Its applications include sound optimization and sound design for technical products, evaluation of environmental noise, or almost any other task required for sound and vibration measurements.

The extensive selection of modules, such as signal, microphone, HMS, CAN/FlexRay, playback, thermal and strain gage, provides both a considerably higher number of channels and a variety of connection possibilities for almost any application. HEADlab grows with your needs!



**labV12**

12-channel line/ICP®  
module with BNC



**labM6**

6-channel microphone  
module for connecting  
condenser microphones



**labHMS**

Digital module with three  
AES/RS232 interfaces



**labT6**

6-channel input module for  
connecting thermocouples



**labSG6**

6-channel input module with  
electrically isolated inputs



Learn more about our front ends and use the QR-Code for further information!  
[www.head-acoustics.de/eng/nvh\\_headlab\\_modules.htm](http://www.head-acoustics.de/eng/nvh_headlab_modules.htm)

# labCOMPACT12

## Compact "single module" system for precise multichannel analysis

labCOMPACT12 is a compact and simplified HEADlab system, which combines the basic functions of a controller with a multichannel module. The "single module" technology is a flexible and affordable solution for multichannel analysis, particularly in the development of household appliances and office equipment.

labCOMPACT12 is a 12-channel Line/ICP® module with optional per-channel high-pass filters. Sensors are connected to the D-Sub connectors on the front side. The analog inputs work with sampling rates up to 48 kHz on all twelve channels, or 96 kHz on six

channels. This handy module excels with high phase accuracy of 24-bit data and a signal-to-noise ratio of 107 dB(A).

Via the HEADlink interface, the system can be easily extended with an additional HEADlab module. Alternatively, you can cascade and synchronize labCOMPACT12 with other HEADlab systems via the SYNC connectors. The direct connection to a laptop or PC via USB or LAN ensures secure and stable data transfer. The module is controlled and configured via the HEAD Recorder software module of ArtemiS SUITE.





# BrakeOBSERVER

Optimizing driving comfort, reducing brake noise

BrakeOBSERVER is the ideal solution for the sound optimization and assuring acoustic quality of brake systems. The BrakeOBSERVER is designed to identify the causes of brake noise. It combines the detection and recording of annoying brake noise events with the capability to evaluate noise and any of its relevant influences.

The combination of hardware and software is excellently suited for recording and processing annoying noise events. Furthermore, the system records all the important parameters necessary for the evaluation of noise events during test drives or on dynamometers. During the test drive, BrakeOBSERVER provides immediate feedback

of brake noise statistics or notes about the events. The software interface is fully customizable to meet different requirements for the judgment of brake noise quality.

The multichannel front end MMF III.0 with its built-in Toughbook docking station, is equipped to acquire all the signals necessary for brake examinations. Customizable connectors for Line-/ICP®, pulse sensors, and CAN/FlexRay are provided as well as sensors for measuring temperature, humidity, and brake pressure. In combination with the Panasonic Toughbook CF-31, the front end starts and stops the BrakeOBSERVER system automatically when the ignition system or a switch is actuated.



# SoundSeat

## Realistic simulation of driving situations

For a multi-modal playback of vehicle interior sound, HEAD acoustics has developed the SoundSeat. This calibrated four-channel playback system allows a realistic playback of airborne sound components as well as vibration from the steering wheel and seat. In combination with the proven H3S simulation system for interactive, realistic acoustic simulation of driving situations, interior noise of vehicles is presented in an authentic context. Such a system allows target sounds to be defined in consultation with decision-makers and test subjects prior to building a prototype.

The airborne sound components are played back binaurally via headphones with the correct equalization. For accurate vibrational excitation, shakers are mounted under the seat and in the steering wheel.

The H3S simulation is controlled via high-quality pedals for the accelerator and brakes, and a gearshift lever. Furthermore, a touchscreen with a swivel arm is mounted on the operating console for convenient operation of H3S, e.g. for switching between different noise variants. During the simulated drive, H3S can display visual scenery as well as the current rpm and speed values on a large screen placed centrally behind the steering wheel.

The SoundSeat consists of a seat and operating console and also a 19" rack. For easy transport, the console separates in the middle and is fitted with caster wheels. For aurally accurate headphone playback, the audio signals are output via a *labP2* unit and the vibration signals via a *labO2* unit and a subsequent amplifier.





# Consulting Services

We meet your acoustics challenges with our long-standing expertise

The HEAD Consult NVH department offers you innovative methods for the acoustic and vibrational optimization of your products. Our experienced engineers and technicians will gladly assist you with your work either at our dynamometer equipped laboratories or at any of your sites worldwide. The NVH consulting department is equipped with cutting-edge, one-stop measurement technology and software. Whether you need mobile multichannel measurements with modular measurement systems, aurally accurate sound analysis by means of binaural recording and playback systems, or real-time localization of sound sources with the HEAD VISOR system: We solve your problems using the entire product range from HEAD acoustics and other tools. Use our mobile system for performing listening tests, and let us help you explore the acoustic preferences of your customers and the position of your product with respect to the competition.

As an experienced partner for speech quality in the telecommunications area, the HEAD acoustics Telecom Consulting team is optimally positioned to assist in design improvements of telecommunication devices, network components, or configurations. Whether it is Voice over IP (VoIP) communication, mobile phones, hands-free equipment, in-car communication, speech recognition and entertainment systems in vehicles, or special applications like Emergency Call (eCall): Telecom Consulting offers tests for checking speech quality and services for system optimization for a wide range of telecommunications applications. Manufacturers of VoIP and mobile phones, network operators, as well as automotive manufacturers and suppliers benefit from the latest measurement technology and proven methods in all areas of voice communications tests.



# Advanced Communication Quality Analysis

ACQUA is an extraordinarily powerful and yet user-friendly analysis system for the evaluation of speech and audio quality in all areas of communication.







## System for communication analysis

ACQUA is a software package for speech quality measurements and analyses of components, terminals and networks. The communication analysis system allows the generation, modification and conduction of measurement sequences as well as the analysis, documentation and archiving of measurement data in the time and frequency domain.

ACQUA makes use of user- definable standards or standards based on national and international telecommunication authorities such as ETSI, ITU-T, TIA, 3GPP, GCF and PTCRB. The high degree of automation

and the ease of use of ACQUA allow complex test standards with numerous measurements to be carried out with minimal user interaction.

The dual channel analysis system for diagnosis of acoustic and/or electric transmission paths up to 24 kHz is also very user-friendly. Settings can be viewed in a clearly structured and understandable format. Reports can be generated from the measurement and analysis results which can be further edited with e.g. Microsoft® Office.

# ACOPT

## ACQUA extension modules

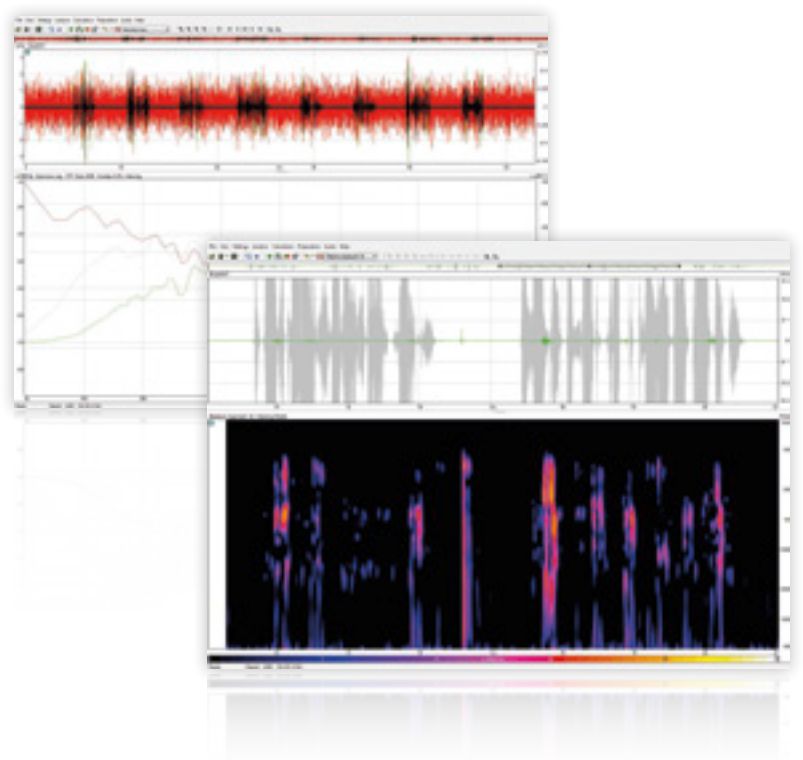
A variety of options allows the individual tailoring of ACQUA to specific fields of application which may range from the evaluation of frequency response to psychoacoustic models and speech quality analysis systems. Some of these ACOPTs – developed and implemented by HEAD acoustics – are:



3QUEST (3-fold Quality Evaluation of Speech in Telecommunications) is an optional calculation method for ACQUA which allows the objective speech quality evaluation of telecommunication terminals. It is based on the ETSI standards EG 202 396-3 and TS 103 106 which cover both wideband and narrowband scenarios in the presence of background noise.



This option provides calculation method for the assessment of the echo performance of terminals based on the new hearing model analysis EQUEST (Echo Quality Evaluation of Speech in Telecommunications).





VoIP, VoLTE, HD Voice...

# Fit for all needs!

# ACQUA front ends

Telecommunications engineers concerned with voice quality analysis frequently need to excite both the send and receive transmission paths simultaneously to test for example single talk and double talk situations. Measurement Front Ends (MFE) convert the digital test signals of the communication analysis system ACQUA

to the analog or digital formats required by terminal equipment, acoustics transducers, networks, network components, or system simulators, thus allowing complete tests in both transmission directions. These are the light-weight and compact front ends:



**MFE VI/MFE VI.1**

Analog USB and portable two-channel front end with software-controlled level adjustment/integrated mouth amplifier



**MFE VII**

Digital USB front end with V.1 1, TTL and DAI interfaces for measuring digital communication devices and transmission systems



**MFE VIII.1**

VoIP/VoLTE reference gateway with Ethernet interfaces and SIP-VoIP client



**MFE IX**

IP network impairment simulator and monitor with WLAN access point



**MFE X**

Digital front end for DECT/NG-DECT/CAT-iq™



**MFE XI**

Front end for voice and audio devices with Bluetooth® wireless technology



# Telecom measurement standards

For nearly 20 years HEAD acoustics has contributed to the development of new telecommunication standards in close co-operation with 3GPP, ITU-T, ETSI, DECT-Forum, TTA, CTIA, GSMA; always with regard to the development of quality standards for voice transmission and speech communication. The relevant standards are implemented into measurement standards for the communication analysis system ACQUA to allow automated measurements according to standard requirements or further analyses based on the comprehensive experience of HEAD acoustics. Standards are regularly updated to keep up with the latest revisions released by the standards organizations. Following are some of the telecom measurement standards we offer.

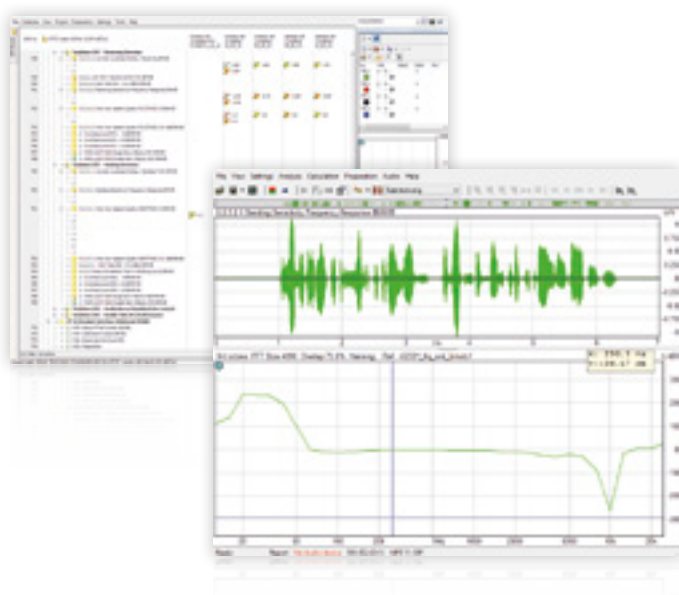


## TS 26 131-32

In this standard all speech quality measurements to assess the minimum performance requirements for the acoustic characteristics of narrowband and wideband 3G terminals are implemented according to 3GPP TS 26.131 and TS 26.132.

## P.1100 and P.1110

Speech quality assessment of narrowband (P.1100) and wideband (P.1110) car hands-free terminals according to ITU-T P.1100 and P.1110.



## GOST R55531-NB and UG GOST R55531-WB

The tests implemented in GOST R55531-NB and UG GOST R55531-WB cover all communication quality requirements in the narrowband and wideband range for in-vehicle emergency call systems. These tests are described in the Russian standard GOST R55531-2013 (ERA-GLONASS).

## ES 202 737/38 and ES 202 739/40

The ETSI standards ES 202 737, ES 202 738, ES 202 739 and ES 202 740 provide speech transmission performance requirements for 4 kHz narrowband and 8 kHz wideband VoIP terminals.

## Skype-Lync

The standard Skype-Lync comprises tests for audio quality requirements for Skype™ and Microsoft® Lync® accessories and equipment such as headsets, handsets and speakerphones. The requirements are implemented according to the "Skype & Lync Audio Test Specification".

## EN 50332

European Norm EN 50332 specifies maximum sound pressure level measurement methodology and limit considerations for headphones and earphones associated with portable audio equipment.



## HQS HEAD acoustics Quality Standards

The standards defined by the standardization bodies cover a wide range of measurements and analysis for the evaluation and optimization of communication systems. "HEAD acoustics Quality Standards" (HQS) go one step further: With the guidelines created specifically

by HEAD acoustics, customers can measure and analyze their products beyond the official standards. Thus, with HQS, customers are able to optimize their product quality. Available HQS are for example:

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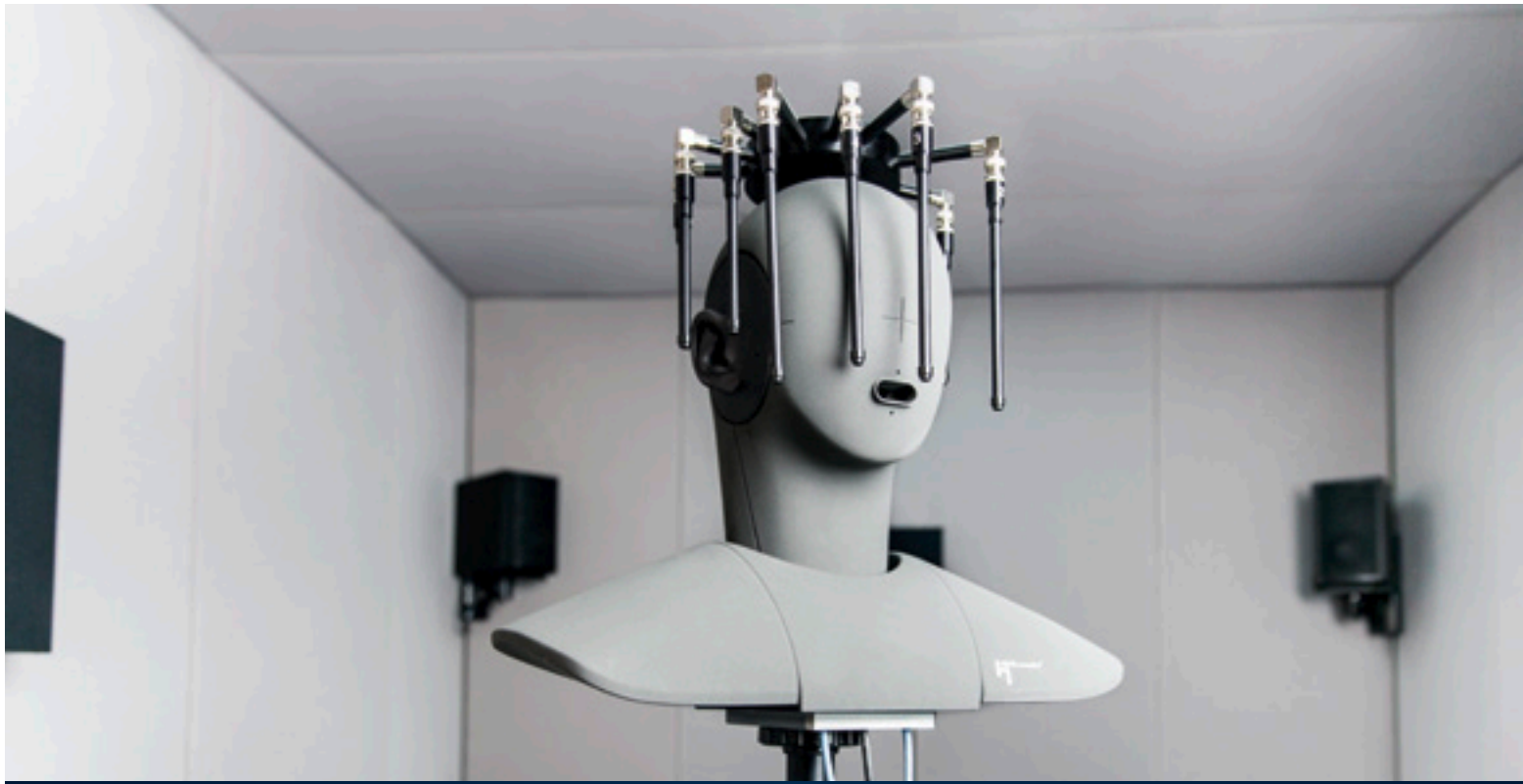
HQS-IP/-IP-Gateway/-IP-Phones to assess speech quality of VoIP systems and components. Comprehensive tests for the analysis of e.g. delay and speech transmission quality are implemented in order to optimize VoIP systems.

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HQS-Bluetooth®-Source for analyzing speech and audio quality performance of Bluetooth® audio gateways. This standard ensures compatibility of Bluetooth® enabled mobile devices with accessories attached to these devices such as Bluetooth® connected speakerphones or headsets.

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HQS-Mobile-II and Mobile-Additions-II provide comprehensive tests for the analysis of conversational speech quality of mobile phone handsets, hands-free and mp3 headsets, e.g. delay, speech transmission quality and echo.



# Binaural recording systems

Especially for telecommunications and audio

## HMS II.3 – Binaural recording system

HMS II.3 is HEAD acoustics artificial head measurement system with ear simulators (Type 3.3 and 3.4 pinna available) and an artificial mouth. It is ideally suited for measurements of the performance of close-to-the-ear transducers: handsets, headsets, headphones, hearing

protectors and hearing aids. Because the diffraction and reflection characteristics of HMS II.3 are comparable to those of a real person, the system is ideal for all measurements in the field of telecommunications where realistic conditions are desired.

## HHP IV – Motorized handset positioner

As an optional accessory of the artificial head measurement system HMS II.3, HHP IV allows reproducible measurements of the speech transfer characteristics of handsets as a function of application force according to ITU-T recommendation P.64. The HHP IV automatically places handsets in a wide range of standard or user-defined positions. Therefore, analyzing voice quality of handsets as a function of position and application force becomes much more automated; improving test speed and accuracy while reducing operator interaction.







# Background noise simulation system

## 3-dimensional playback of acoustic sound scenarios

3PASS (3-dimensional Playback of Acoustic Sound Scenarios) is the HEAD acoustics system for background noise simulation. It is the successor of the HAE-BGN system. Its key application field is the voice and audio quality analysis of telecommunication devices and transmission systems in the presence of background noise.

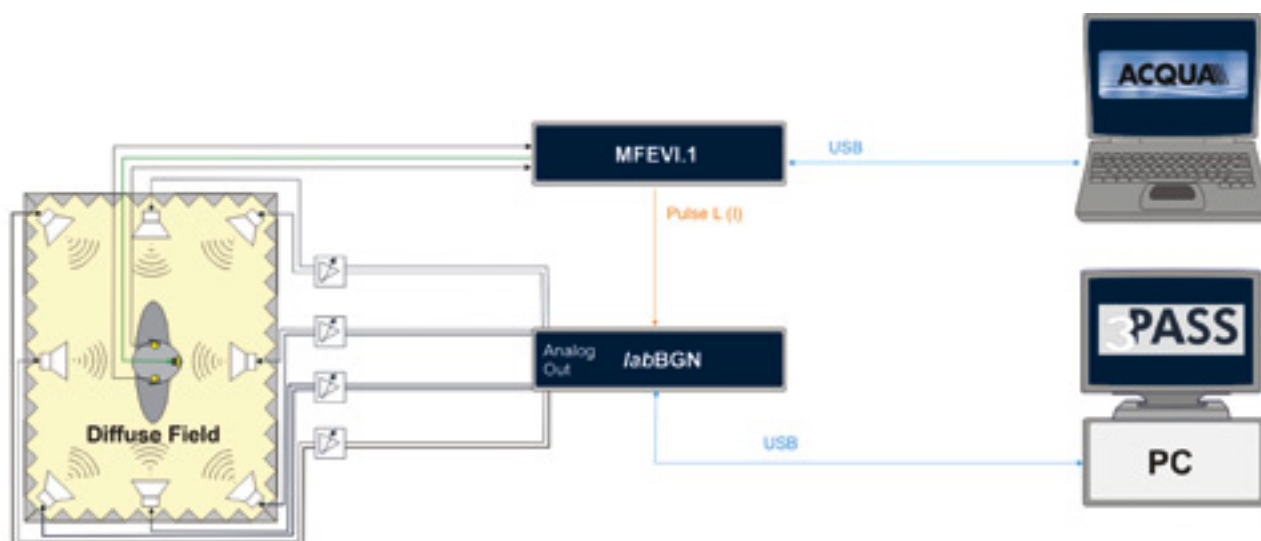
The major advantage of 3PASS compared to its predecessor is its ability to preserve and accurately reproduce the spatial characteristics of background noise, which makes the system valuable for the development of complex background noise reduction algorithms. This is of particular importance for modern smartphones, especially those with more than one microphone. Another advantage is a simplified measurement setup that requires only one *labBGN* front

end for room equalization and playback. The technical concept of the 3PASS system has been approved as ETSI standard TS 103 224.

### Major components of the system:

- 3PASS software
- Measurement front end *labBGN* (for background noise playback )
- Microphone surround array MSA I (for sound recording and room equalization)

An 8-loudspeaker setup including amplifiers and cables completes the system.





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