HEAD acoustics

APPLICATION EXAMPLES INCLUDED

Code 3302

SQobold

Mobile Four-Channel Recording and Playback System

OVERVIEW

SQobold

Code 3302

Mobile four-channel recording and playback system with psychoacoustic analyses, sound level meter functionality, GPS data recording, and much more.

SQobold is a versatile and highly functional measurement system for mobile data acquisition. Together with the binaural BHS II headset you can record, analyze, and play back noise events with very little preparation aurally accurately.

The compact dimensions, the long-lasting battery, and the comfortable handling make SQobold the ideal companion for mobile recordings. Recordings are stored on the device and can immediately be documented, evaluated by several real-time analyses during or after recording, and also be played back

KEY FEATURES

Four-channel recording, two-channel playback

Compact and handy

Wide range of connection options, such as BHS II connector, two analog BNC inputs with ICP, pulse input, USB host connector, GPS antenna connector

Modular functional scope through SQobold Packages

Real-time analyses with filtering (SQP 01)

Sound level meter function for single-channel or two-channel measurements, two-channel, e.g., with binaural sensor (SQP 02)

Video function (SQP 03)

Battery capacity for up to six hours of self-sufficient stand-alone usage

64 GB internal storage

APPLICATIONS

Mobile sound and vibration analysis

NVH measurement, for example, during a test drive

Environmental measurement, e.g., noise mapping

Soundscape research, e.g., Sound Walks

DETALS

SQobold is the next step in the evolution of binaural recording, analysis, and playback technology pioneered by HEAD acoustics. Despite its handy dimensions, SQobold features multiple connection options that make it suitable for a wide range of applications. Particularly in combination with the BHS II binaural headset, SQobold shows its strengths: handy, highly mobile, very versatile, and intuitive to use. In stand-alone mode, SQobold saves recordings to the internal storage or to a connected USB stick. In frontend mode, recordings are saved on the computer.

Using the sound level meter function, you can also measure psychoacoustic quantities such as loudness and sharpness according to standardized methods aside from classic quantities. Measurements are stored internally or alternatively on a USB stick.

Optional SQobold Packages (SQP) allow you to tailor the functional range of SQobold to your specific tasks. SQobold Packages can be installed at any time using HEAD Companion, an accompanying software that offers many administrative functions, such as firmware updates.

Connection options

In order to perform binaural recordings, the BHS II headset can be connected to the BHS connector. The channel 3 and 4 BNC connectors are available for additional ICP sensors. Alternatively, you can connect an additional binaural sensor such as the BHM III.3 head microphone or the HSU III.2 artificial head microphone to the BHS connector (using the CLB I.3 adapter) or to two of the BNC connectors.

The GPS connector is designed for connecting a GPS antenna that allows SQobold to receive and record GPS data.

Additionally, you can connect further sources and record their signals. For example, a video camera to the USB host connector with which you observe the measurement situation. The video is stored as an AVI file in MJPEG format alongside the audio recording and is played back in parallel. The USB host connector also allows for the usage of a USB stick as storage, the connection of a PCAN-USB FD adapter for the recording of CAN FD data, or the connection of the BSU binaural sensor unit or the SQope binaural digital headset.

GPS
GPS antenna

BHS
BHS II
with CLB I.3: ICP sensors,
e.g., HSU III.2/BHM III.3

ICP/Analog input
ICP sensors, e.g.,
HSU III.2/BHM III.3

Micro USB
Computer

USB host
Video camera/USB stick/
PCAN-USB FD adapter/
BSU/SQope

Pulse input
Pulse sensors

Power In

Operating modes

The two operating modes *stand-alone mode* and *frontend mode* allow for a flexible usage within a wide variety of recording situations.

In stand-alone mode, the large internal storage and the powerful battery allow for extensive mobile measurements. The intuitive operation via the touch display supports and simplifies your work. Recordings are either stored in the internal storage or on a connected USB stick. Handy and light, SQobold does not need a lot of space in your bag.

In frontend mode, SQobold is connected via USB to a Windows computer on which you start ArtemiS SUITE or HEAD Recorder as your recording software. Afterwards, you connect the desired sensors to SQobold, select SQobold as your recording frontend in the recording software, configure the channels, and you can immediately start recording.

Convenient – intuitive – efficient

Especially while examining soundscapes or during sound walks , the advantages of binaural recording technology, psychoacoustic analyses, exceptional mobility, and intuitive handling SQobold provides become apparent.

Within a few seconds after switching on, SQobold is ready for operation and can be configured via the touch screen. Then you put on BHS II and you can immediately start a recording, for example, very comfortably with your thumb by pressing the recording button on the side of the housing.

Thereby the internal 60 GB storage and the powerful battery allow for multi-hour measurements without any problems.

Display

All functions and menus are accessible via the large display. During a measurement, you can have relevant information displayed in the form of level indicators, diagrams, or tachometers. In addition, you can display the video preview of a connected video camera and thus observe the measurement situation.

Various sensor types

In addition to binaural sensors, SQobold also supports ICP microphones, accelerometers, DC sensors, and many more. This allows you to meet the requirements of many different measurement tasks.

Simply select the desired sensor from a Sensor Library, connect it to a compatible connector, and you can start measuring immediately.

Binaural recordings with BHS II

With the combination of SQobold and BHS II binaural headset, you can perform reliable and precise noise analyses and evaluation. SQObold and BHS II are perfectly attuned to each other and record noise events as a human would perceive them. BHS II is simply connected to the specific BHS connector. The configuration of the two channels used is then automatically adjusted and the correct recording equalization is activated.

Thanks to the low weight and high wearing comfort, you can comfortably wear BHS II even for a long period of time.

The combination of SQobold and BHS II is therefore the ideal tool for measurements where the human hearing sensation is the determining factor for evaluating acoustic noise events.

Furthermore, with this combination you can not only record and evaluate environmental noise on site but also background noise in a laboratory, a test bench, or in a moving vehicle.

Binaural playback with BHS II

Unlike stereo recordings by conventional microphones, binaural recordings not only convey the tone quality and the level true to the original when played back but also the complete spatial representation of the recorded sound field.

Recordings with several different co-occurring sound sources as they are typical for road traffic, for example, contain, when played back, all information so that you can separate and locate single sound sources.

Comparable analysis results through equalization

To ensure comparable results in the joint analysis of binaural and conventional recordings, acoustic signals are recorded equalized. For this, SQobold uses the ID equalization developed by us which is suitable for most sound field situations. Other equalizations, such as Free Field (FF) and Diffuse Field (DF), are also available for respective measurement situations.

If you play back a recording made with SQobold with a binaural playback device, for example, BHS II, the playback creates the same hearing impression as the original sound field.
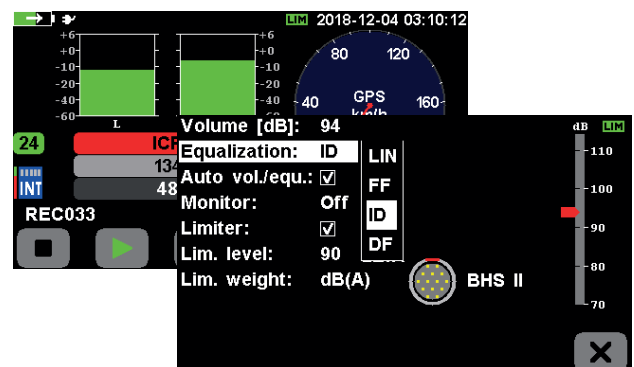
IN PRACTICE

Sound level meter function

With the *SQP 02 – Advanced Level Meter* (code 3304) license, the level meter function is activated. This license enables you to use SQobold as a two-channel sound level meter and measure a variety of physical and psychoacoustic quantities. Among them, for example, current sound pressure level, maximum sound pressure level, loudness, and sharpness. This allows you to determine sound pressure levels and quantify noise in order to make a qualified assessment of environmental noise or workplace noise, for example.

Simultaneously, SQobold can record the time signal during the measurement. Thus you have the opportunity to directly supervise the measurement and the additional option to subject the recording to further analyses later on.

Real-time analyses

With the *SQP 01 FFT Online Analysis* (code 3303) license, SQobold offers FFT and octave analyses as well as the psychoacoustic analyses loudness and sharpness.

Psychoacoustic analyses consider the difference between the human perception and the measurement results of a measuring instrument. These analyses are adapted to the characteristics of human hearing.

You can apply all analyses during recording, while monitoring, and during playback in order to evaluate noise events and noise scenarios. Thus you will quickly find well-founded starting points, for example, for improving noise quality.

Furthermore, real-time filters are available whose quality, frequency, and attenuation can be adjusted and with which you can analyze even more focused.

Aside from the recording of airborne sound, you can use SQobold to measure the vibration characteristics of a part or an assembly. Especially the analyses *Transfer function*, *Impulse response*, or *Coherence* enable analysis and evaluation of structure-borne sound measurements performed with an impulse hammer, for example.
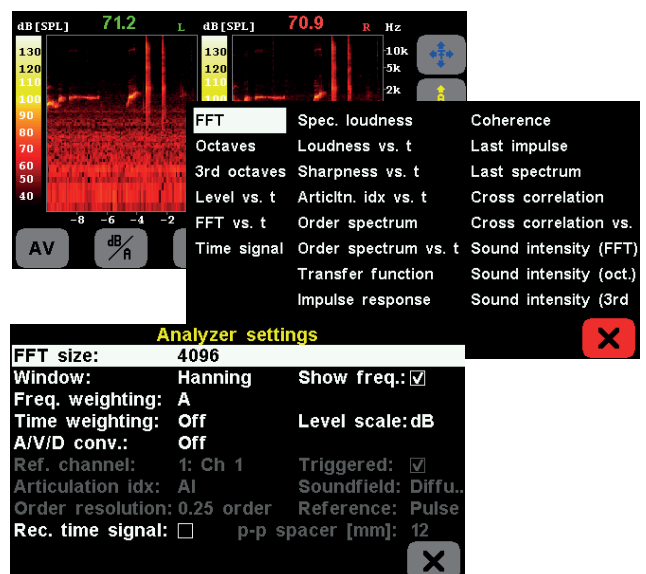
Documentation

To be able to handle a large number of recordings efficiently, descriptive information about each recording is essential. With the documentation function, SQobold offers an easy to use solution to enter and store template-based documentation before or after the recording.

The documentation templates can be created with ArtemiS SUITE and be transfered to SQobold via USB. With the template you determine which information is to be entered for a recording. This information is stored in the recording. To make entering information as comfortable as possible, you can use well-known form elements such as input fields, check boxes, and lists in the documentation template. This way you can save, for example, product details, a description of the product configuration, or details for the measurement conditions as documentation within a recording. You can use this documentation in ArtemiS SUITE to create reports later, for example.

Trigger

It is often useful to start or stop a recording based on conditions of the measured object or the measurement situation. For this, SQobold offers triggers which react to incoming signals of the pulse, GPS, CAN, and audio channels or a time and date.

Trigger can react to an ascending or a descending signal slope. Furthermore, SQobold can record signals that were present before (pre trigger) or after (post trigger) the start or stop trigger condition has been reached.
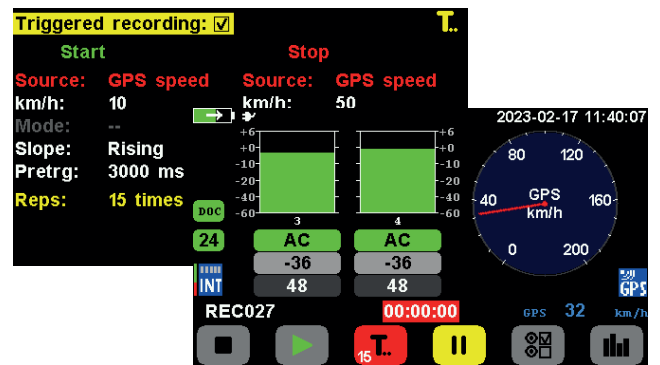
GPS

SQobold supports GPS and can be equipped with an appropriate antenna at the GPS connector. Then SQobold can not only determine the exact position based on the GPS data but also determine and decode the speed. This data can then be displayed in real time as a tachometer or a single value on the display.

You can use the recorded GPS data in ArtemiS SUITE, for example, to display the route traveled during recording on a map (OpenStreetMap).

Furthermore, you can synchronize recordings that were made at the same time with several SQobold via the GPS time stamp, for example, in HEAD Companion.
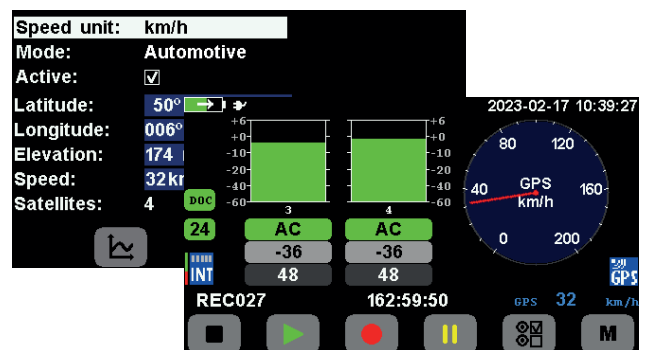
Sensor Library

If you organize your sensors using a Sensor Library in ArtemiS SUITE or HEAD Companion, you can use this library with SQobold. Simply copy the Sensor Library to the internal storage, afterwards you can select the readily configured sensors from the Sensor Library and assign them to the channels during channel configuration.

Sensor details like senor type, sensitivity, calibration date, and calibration factors are automatically used in the respective channel without having to enter any data manually. Furthermore, this information is stored in the recording and is later available for follow-up and analysis in ArtemiS SUITE.
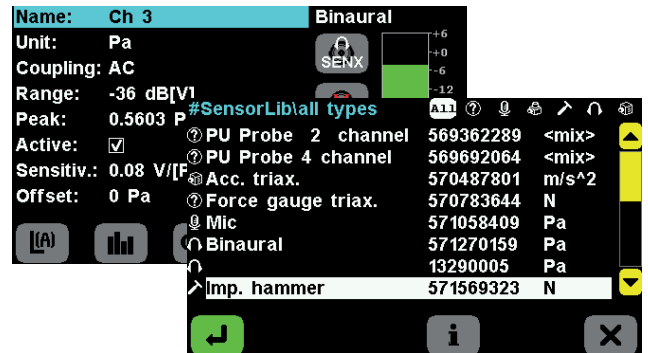

CAN, CAN FD, and OBD-2

If you have the *SQP 04 – CAN Bus Support* license (code 3306) and connect the PCAN-USB FD adapter to the USB host connector of SQobold, you can record CAN, CAN FD, OBD-2, and WWH-OBD-2 quantities.

Using a corresponding DBC file or a Sensor Library, SQobold can decode up to four quantities in real time and display them as tachometers or single values during a recording. In addition, you can use decoded quantities as a basis for triggers.

Via the PCAN-USB FD adapter, SQobold records the complete data stream of a CAN bus. Later on, you can extract this data within a Decoder Project in ArtemiS SUITE and save it as additional analog channels.
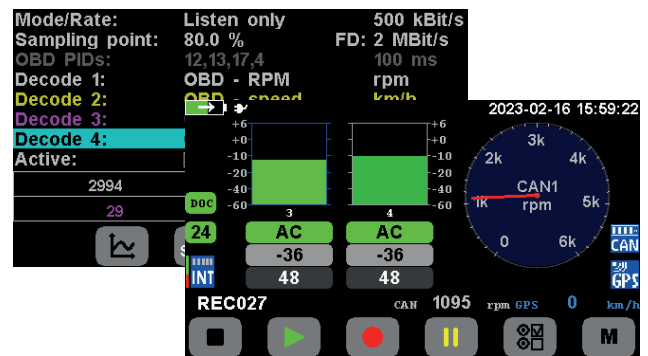
Video

To document the measurement situation as a video or as images, you can connect a video camera to the USB host connector. You can even take pictures during a recording.

For this, the *SQP 03 – Video* (code 3305) license is required. Videos and pictures are then saved next to the associated audio recording.

If you play back a recording that has a video associated with it, this video is shown in parallel on the display.
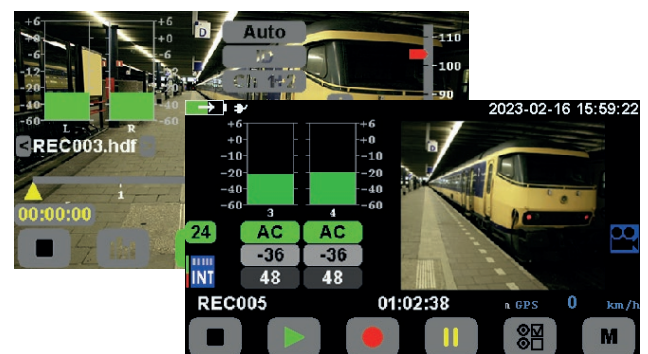
SQOBOLD PACKAGES

The features of SQobold are combined into packages, some of which are unlocked via optional licenses. Optional SQobold Packages provide features that are assigned to specific tasks.

SQobold Base Version (code 3302)

› Four-channel measurement
› Interfaces
  » Two-channel BHS input
  » Two analog BNC inputs (two additional BNC inputs with CLB I.3 adapter at the BHS input)
  » Pulse In
  » GPS connector
  » Type A USB host connector
  » USB device connector (micro USB), Windows mass storage mode to download data
› Binaural recording
  » Connection of a BHS II headset (accessory)
  » Connection of a BHM III.3 head microphone or of the HSU III.2 artificial head microphone (both accessories)
  » ID equalization (for HSU III.2: ID/FF/DF)
  » BHS II, BHM III.3, and HSU III.2 equalization via SQobold
› Binaural playback
  » Playback of two channels
  » ID, FF, and DF playback equalization for BHS II
  » Adapter CLJ I for aurally accurate playback via recommended headphones
› Trigger
  » Adjustable pre and post trigger
  » Pulse, CAN, GPS, clock (date/time), and input channels as trigger sources
  » Available modes for the input channels: Amplitude, level, and A-weighted level (each with time weighting *fast* and *slow*)

› Pulse
  » 32x oversampling
› GPS
  » Real-time display of the GPS speed as tachometer or single value
  » Supported GPS modes: Portable, Stationary, Pedestrian, Automotive, At sea, Airborne
  » Sample-accurate determination of the recording time-stamp
  » Available active GPS antenna as optional accessory: CGA I.0: wired antenna (5 m) CGA I.1: rod antenna CGA I.1-V1: angled rod antenna
› Documentation
  » Support for ArtemiS SUITE documentation templates
  » Optional or mandatory input before or after recording
› Sound level meter function
  » Parallel measurement of up to two channels
  » Multiple simultaneous time and frequency weightings
  » A, C, and Z weighting of the sound pressure level
  » Time weightings *Fast, Slow,* and *Impulse*
  » Time weighted current and maximum sound pressure level, sound exposure level as single value
  » Level vs. Time with adjustable averaging time (time weighted current and equivalent continuous sound pressure level)

SQP 01 FFT – Online Analysis (code 3303)

› Real-time analysis of the incoming signals of up to two channels
› Analysis during recording
› Playback analysis
› Available real-time analyses
  » FFT/FFT vs. Time/Octave/3rd Octave/Time Signal/ Level vs. Time/Articulation Index vs. Time/Order Spectrum/Order Spectrum vs. Time
  » FFT based analyses
    Loudness vs. Time/Spec. Loudness/Sharpness vs. Time
  » Sound intensity (with P-P probe
  » System analyses
    Transfer Function/Impulse Response/Coherence
  » dB or rms (linear) display
  » Averaging function with results saving in HDF format

» Adjustable analysis parameters
  FFT sizes (1024, 2048, 4096, 8192, 16384)/Window (Hanning, rectangle, flat top)/Show freq/Freq. weighting (Z(lin), A, C)/Order resolution (0.1. – 1st order)/ Articulation index/Extended Articulation index/Sound field (FF, DF)/Rec. time signal (averaging of all active channels)/A, V, D conversion (acceleration, speed, displacement)
› Use of tolerance schemes (created with ArtemiS SUITE)
› Playback Analyzer for analyzing during recording
› Online Monitoring or playback with real-time filter:
  Signal analysis (filtered or unfiltered signal)
  » Bandstop, bandpass, parameterized bandpass
  » Adjustable quality, frequency, attenuation, and amplification

SQP 02 – Advanced Level Meter (code 3304)

› Loudness (ISO 532-1, DIN 45631/A1) N, N_{max}, N_5, …
› Sharpness (DIN 45692) S, S_{max}, S_5, …
› Sound field types *Free Field* and *Diffuse Field*
› Third octave, octave, and FFT spectra
  » Average band level, maximum band level, current level (display only) with parallel frequency weighting
    Parallel calculation of average band level vs. time with adjustable interval

» Taktmaximal method
» Level vs. Time, L_{AFT}, L_{AFTeq}, …
» Percentile (exceedance level)

SQP 03 – Video (code 3305)

› Operation of a USB video camera (code 0271) at the USB host connector
› AVI recording with two-channel audio track

› Parallel playback of the audio data recorded with SQobold
› Zoom feature
› Up to 30 frames/s
› Up to 1280 x 720 pixel resolution

SQP 04 – CAN Bus Support (code 3306)

› CAN FD and OBD-2 recording via PCAN-USB FD adapter
› Real-time data decoding and display

SCOPE OF DELIVERY

SQobold (Code 3302)
›   Mobile four-channel recording and playback system with sound level meter functionality

CSB VII.0
›   SMB to SMB cable with BNC adapter for pulse inputs

CUSB III.1
›   USB type A to micro USB cable, 1 m

HSC V.2
›   Bag for SQobold and accessories

DPF
›   Protection film for the display, clear

Power adapter

Manual

Data medium with Setup Package

OPTIONAL ACCESSORIES

Hardware

Binaural recording and playback
›   BHS II (code 3322)
    Binaural headset for recording and playback
›   BSU (code 1508)
    Binaural sensor unit for aurally accurate recording
›   SQope (code 3300)
    Digital, binaural headset

Binaural recording
›   BHM III.3 (code 1303)
    Binaural head microphone
›   HSU III.2 (code 1391)
    Artificial head microphone with ICP microphones

CGA I.0 (code 9855)
Active GPS antenna with cable, 5 m

CGA I.1 (code 9856)
Active GPS rod antenna

CGA I.1-V1 (code 9856-V1)
Active GPS rod antenna, angled

DPF-V1 (code 9857-V1)
Protection film for the display, matte

USB video camera (code 0271, available from HEAD acoustics); resolution HD 720, frame rate 30 fps, auto focus 10 cm up to 10 m

PCAN-USB FD adapter (code 0274)
CAN FD interface, opto-decoupled

RC X.1 (code 9850, from version B)
Cabled remote control

RC X.2 (code 9851)
Cable-less control module for RC X.1

CLB I.3 (code 9848)
Adapter (female) LEMO 14 pin to two BNC (female, 20 cm) to connect binaural sensors such as HSU III.2 or BHM III.3

CLB IV.1 (code 9826)
Breakout cable LEMO 14 pin to two BNC (male, 40 cm) for analog outputs via the BHS connector

CLJ I (code 9858)
Adapter LEMO 14 pin to 3.5 mm phone jack for connecting recommended headphones

CLB I.2 (code 9847)
Adapter LEMO 14 pin to two BNC (male), for recordings with BHS II via BNC

SCA II.2 (code 3345)
Adapter for voltage supply in a vehicle. Additionally, one of the following is necessary:
›   CLO VII.9 (code 3359)
    Adapter SCA II.2 to vehicle supply
›   CXO I.1 (code 5176) XLR 4 pin to cable lug (2 m) combined with CLX III xx (code 3676-xx) XLR 4 pin to SCA II.2

Software

ArtemiS SUITE (code 5000ff)

› Software platform for sound and vibration analyses
› Recording in frontend mode with the integrated Recorder or the Data Preparation Module HEAD Recorder (code 5024)
› Creating Tolerance Schemes, Sensor Libraries (SENX), and documentation templates with the Basic Framework (code 5000)
› Reports, e.g., for sound level meter results with the Basic Report Module (code 5002)
› Synchronous playback of videos (incl. audio track) and GPS information (OpenStreetMap) with the Advanced Playback Module (code 5011)

HEAD Companion/SQobold Simulator

(within the scope of supply of the base version)

HEAD Companion

› Firmware update
› Transferring equalization filter and calibration to SQobold
› Managing Sensor Libraries
› Merging GPS synchronized, temporally overlapping recordings
› Decoding GPS channels
› Installing SQobold Packages

SQobold Simulator

› Windows application with SQobold features
› Configurations created with SQobold Simulator can be saved and transfered to a device.

TECHNICAL DATA

General	
Number of channels	4 (two-channel BHS input/output, two analog inputs with ICP)
Connectors	LEMO 14 pin, two BNC, SMB, USB Type A, Micro USB, SMA (GPS antenna), DC headphones jack With CLB I.3 adapter: Two analog inputs at the BHS input, e.g., for HSU III.2 or BHM III.3
Resolution	Up to 24 bit delta sigma audio A/D and D/A converter
Power supply	5 V DC (±5%), polarity protection
Power consumption Fast charge (device off) Fast charge (operation) Battery operation	 2.7 A (max.) / 13.5 W (max.) 1 A / 5 W 8 W (max.) / 5 W (typ.)
Power consumption USB	500 mA (max.), no charging, operation as bus-powered device
Sampling rates	32 kHz, 44.1 kHz, 48 kHz, 51.2 kHz
Jitter (averaged)	141 ps at 48 kHz sampling rate
Equalization Recording Playback	 ID with BHS II and BHM III.3; ID/FF/DF with HSU III.2 ID, FF, DF, LIN
TFT touch screen Type Resolution	 LCD color display, 10.9 cm/4,3", capacitive multi touch 480 x 272 pixel
Dimensions (WxHxD over all)	Version A: 143 x 34 x 78 mm / version B: 143 x 35 x 78 mm
Battery Type Operating time Charging (external supply)	 LiPo, 3.7 V, 6100 mAh (version A) / 6000 mAh version B[1] 6 h (stand-alone operation, 2 channels with 48 kHz sampling rate, 2 x ICP, writing to internal storage, display in power save mode) 7,5 h (max.) with 1000 mA
Weight	490 g
Operating temperature	-20 °C – 50 °C / -4 °F – 122 °F (0% – 90% rel. humidity, non-condensing)
Storage temperature	-20 °C – 70 °C / -4 °F – 158 °F

1   You can find the version of your device on the type plate on the bottom.

BHS input

BHS input					
Number of channels	2 (LEMO 14 pin)				
Input impedance	20 kΩ				
Equivalent noise level with BHS II	28 dB_{SPL}(A) (ID equalization)				
ICP supply	18 V/4 mA, ±20% for BHS II (no TEDS)				
Equalization	ID (recording)/ID, FF, DF, LIN (playback)				
Frequency range	0 Hz – 20 kHz				
Ranges	134 dB_{SPL}	124 dB_{SPL}	114 dB_{SPL}	104 dB_{SPL}	94 dB_{SPL}
Level F_S	20 V_{PP}	6.3 V_{PP}	2 V_{PP}	0.63 V_{PP}	0.2 V_{PP}
S/N_{FS}, electric	97 dB	97 dB	96 dB	92 dB	84 dB
Noise, SPL, electric	41 dB_{SPL}(A)	31 dB_{SPL}(A)	22 dB_{SPL}(A)	16 dB_{SPL}(A)	14 dB_{SPL}(A)
THD+N at 1 kHz, -8 dB_{FS}	-78 dB 0.01%	-79 dB 0.01%	-81 dB 0.09%	-80 dB 0.01%	-77 dB 0.014%
Crosstalk attenuation	>100 dB	>100 dB	>100 dB	>100 dB	>100 dB
	1 kHz sine, identical measurement range, adjacent channels				
Analog highpass filter	Switchable: DC/2 Hz/36 Hz (1st order, ±10%)				

BNC inputs

BNC inputs						
Number of channels	2 (BNC)					
Electric strength	30 V_{PP}					
ICP supply	18 V/4 mA, ±20% for BHS II (no TEDS)					
Coupling	DC, AC, ICP, ICP/DC					
Frequency range	0 Hz – 20 kHz					
Measurement ranges dB(V) $dB(V)_{FS}$	14 dB(V) 20 $dB(V)_{FS}$	4 dB(V) 10 $dB(V)_{FS}$	-6 dB(V) 0 $dB(V)_{FS}$	-16 dB(V) -10 $dB(V)_{FS}$	-26 dB(V) -20 $dB(V)_{FS}$	-36 dB(V) -30 $dB(V)_{FS}$
Level F_S	28.3 V_{PP}	8.94 V_{PP}	2.83 V_{PP}	894 mV_{PP}	283 mV_{PP}	89 mV_{PP}
S/N_{FS}	97 dB 99 dB(A)	96 dB 98 dB(A)	96 dB 98 dB(A)	93 dB 95 dB(A)	86 dB 88 dB(A)	77 dB 79 dB(A)
THD+N at 1 kHz, -6 dB_{FS}	-83 dB 0.008%	-83 dB 0.008%	-82 dB 0.008%	-81 dB 0.009%	-79 dB 0.01%	-72 dB 0.03%
Crosstalk attenuation	>100 dB	>100 dB	>100 dB	>100 dB	>100 dB	>100 dB
	1 kHz sine, identical measurement range, adjacent channels					
Linearity (1 kHz sine, HP, AC)	117 dB	117 dB	118 dB	114 dB	103 dB	98 dB
Analog highpass filter	Switchable DC/2 Hz/22 Hz (1st order, ±10%)					
Digital highpass filter digital	Higher order, scales with f_S					
Analog lowpass filter	30 kHz (1st order, anti-aliasing)					
Digital lowpass filter	Higher order, scales with f_S					

Pulse input

Number of channels	1 (SMB connector)
Pulse frequency	Max. 600 kHz at f_S = 48 kHz
Pulse sampling rate	32x oversampling

Input voltage range
  low-level
  high-level
	0 V – +5 V (max.)
	0 V – +0.8 V
	+2.5 – +5 V (max.)

Input impedance
  U_{IH} = 2.5 V
  U_{IH} = 5 V
	830 Ω
	400 Ω

Galvanic isolation	Yes
Isolation resistance	>1 GΩ

BHS output with BHS II

Number of channels	2 (LEMO 14 pin)
Equalization	ID, FF, DF, LIN
Nominal level	110 dB_{SPL} (accuracy at 1 kHz: ±0.1 dB, electric)
Inherent noise	<23 dB_{SPL}(A)
THD+N	-57 dB (playback sine 104 dB_{SPL}, 1 kHz on R = 110 Ω)
THD+N, electric	-73 dB (unloaded)

BHS connector as analog output

Number of channels	2 (LEMO 14 pin, 2 x BNC with adapter CLB IV.1)
Nominal level	±0.1 dB at 1 kHz
Output voltage	-10 dB(V) (+6 dB headroom)
S/N	74 dB
Crosstalk attenuation	100 dB at 1 kHz

USB device

Connector	Micro USB (connection SQobold to PC)
Data transfer	480 Mbit/s (max. 10 Mbyte/s)
Supply	5 V, 500 mA

USB host

Connector	USB type A (connect USB storage media/video camera/PCAN-USB FD adapter)
Data transfer	480 Mbit/s
Data rate read/write	up to 17 Mbyte/s; up to 3 Mbyte/s
Supply	5 V / 500 mA

GPS

Number of channels	1 (SMA connector)
Supply of the active antenna	3 V, max. 20 mA
Receiver module	56 channels, -160 dBm, PPS signal
Update rate	max. 10 Hz

GREENTEST
TECHNOLOGIES

绿测科技有限公司

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