

## HMS IV.0 (Code 1500)

Digital artificial head measurement system with CompactFlash and USB interface

### Overview

The artificial head HMS IV.0 is probably the world's best-known binaural recording system to perform aurally-accurate recordings. Thanks to its 24-bit signal processing technology, the dynamic range of the HMS IV.0 is comparable to that of human hearing.

Immediately after turning it on, the HMS IV.0 is ready for use. Measurements are saved aurally-accurate. Equalized playback is possible e.g. directly from a headphone connected to the built-in output. This allows sound events to be recorded and played back just as a person would hear them if the person had been in the same position as the artificial head during the recording.

For wireless control from a smartphone or tablet, a Bluetooth® adapter and the Android app HEAD Remote Control are available.

Mobile and flexible due to its battery, the HMS IV is ready for use for several hours.

### Features

- Aurally-accurate recording and correctly equalized playback
- Interfaces: USB 2.0, AES/EBU, pulse in, RS232, analog out
- Headphone output for direct, equalized playback or monitoring
- Equalization options: Independent of direction (ID), free field (FF), diffuse field (DF), user-specific (USER) via download, linear (LIN - no equalization)
- High dynamic range thanks to 24-bit technology
- Sampling rates: 32, 44.1, 48, 88.2, 96 kHz
- Calibratable measurement system
- High input range
- Extremely low noise
- Charge indicator for battery can be polled e.g. via HEAD Remote Control App (for Android as of V. 2.3.3)
- Automatic system check
- Compatible with artificial head measurement systems HMS III.0 and HMS III.L, including HMS data
- Second artificial head (HMS IV.0, HMS III.0) or a BEQ II unit for four-channel recordings

### Extension Options

- HEAD Recorder software (notebook/PC)
- High-end headphones (HD IV.1 or HD IV.2) for correctly equalized playback
- Seat mount adapter HSM V
- Bluetooth® adapter BTA for HMS III/IV, BEQ II for receiving control signals of the HEAD Control Remote App (for Android as of V. 2.3.3)
- Triaxial laser pointer TLP for exact positioning of the HMS IV.0 (easy mounting on head platform)
- HEADlab, the modular multi-channel front-end system
- Mobile recording and playback systems SQuadriga III and SQuadriga II



## Features

### CompactFlash



Recordings can be saved directly to a CompactFlash card and played back from the card. The CF slot in the front side of the shoulder unit is easily accessible, so the card can be easily replaced.

### Playback



Via the headphone output on the back side of the HMS IV.0, a direct playback of audio signals for monitoring

or playback from the CompactFlash card is possible, e.g. with the optional dynamic headphones HD IV.1 or HD IV.2.

### USB interface

Recordings can be saved directly to a notebook or PC via the USB interface.

### Analog output

With its analog output, the artificial head can also be operated in combination with analog measurement systems.

Since the analog output signal is generated from the digital signal, the advantages of the digital signal equalization are maintained.

### Pulse inputs

The HMS IV.0 electronics allows RPM pulses to be recorded on to the digital signal via two pulse inputs. For electrical isolation, an adapter is available. For the signal conditioning, auxiliary devices can be used.

### Dynamic range

The artificial heads of the HMS IV generation are characterized by a dynamic range comparable to that of the human ear.

### Battery

The mains-independent power supply via a rechargeable battery allows high mobility and makes the HMS IV.0 ideal for mobile use.

### Equalization

Five different equalization types can be selected: ID, FF, DF, as well as a user-specific equalization setting USER, and a linear equalization LIN.

### External synchronization

Via the AES/EBU input, the artificial head can be synchronized to an external sampling rate. This function is essential for combining several digital artificial head measurement systems or for the connection to other digital systems supported by HEAD acoustics.

### Automatic system check

The HMS IV.0 automatically performs an extensive system check, during which the components in the signal path are checked for proper function. This makes sure that possible errors or failures in the measurement chain are detected. Deviations from predefined tolerance ranges are corrected automatically.

### Four-channel recordings



With two HMS IV units, four-channel recordings are possible with sampling rates up to 96 kHz. The compatibility of the HMS IV.0

also allows four-channel recordings in connection with other front-ends.

Like all other functions of the HMS IV.0, four-channel recordings in stand-alone operation can be (remotely) controlled and saved to a CompactFlash card.

### Extensions (optional)

#### Seat Mount Adapter HSM V



The HSM V seat mount adapter is a stable and convenient platform for mounting an artificial head and other devices on a car seat.

#### Triaxial laser pointer TLP

In order to position the HMS IV exactly and reproducibly, the TLP can be mounted easily on the top mounting platform of the artificial head. With its three laser beams, the position and orientation of the HMS IV.0 can then be adjusted exactly.

#### Bluetooth® adapter BTA

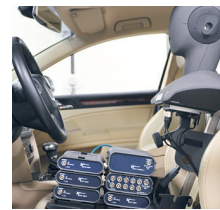


In combination with the HEAD Remote Control App for Android smartphones or tablets the Bluetooth® adapter allows to control

remotely artificial heads from a distance of up to 10 meters (30 ft).

The HEAD Remote Control is available via the Download Center on the homepage of HEAD acoustics.

### Front-end system HEADlab



The modular multi-channel front-end system HEADlab is ideal for the use of one or more HMS IV units.

The controllers *labCTRL I.1* and *labCTRL I.2* have one HMS interface each, and in combination with an input module *labHMS*, up to four artificial heads can be used. In addition, the input module *labDX* has one HMS interface, too.

Various HEADlab modules are available with which user can customize their systems with up to 360 channels (artificial heads, CAN, OBD-2, FlexRay, pulse, line, ICP sensors, condenser microphones, etc.).

### Front end SQadriga III



Only 2 cables are needed to connect an HMS IV.0 to SQadriga III. In addition, SQadriga III provides real-time analyses

in both stand-alone and front-end mode. CAN FD, FlexRay, pulse, or GPS quantities can be recorded, up to six ICP or other sensors, video cameras, etc. can be connected, too.

### Front end SQadriga II



SQadriga II has an HMS interface for recording artificial head signals via adapters and adapter cables in digital form.

Furthermore, with SQadriga II GPS, CAN respectively OBD-2 and pulse channels and also up to six ICP or other channels can be recorded, both in stand-alone mode as well as in front-end mode.

## Standard Delivery Items

- HMS IV.0 (Code 1500)  
Digital Artificial head measurement system with CompactFlash and USB interface
- Power supply for HMS IV  
15 V / 60 W / XLR 4-pin  
90 to 275 V AC, 50 to 60 Hz
- HCF IV.08 (Code 1599-08)  
CompactFlash card, 8 GB
- PCC I.9x (Code 997x)  
Mains cable (local specification)
- CUSB II.1.5 (Code 5478-1.5)  
Cable USB 2.0, 1.5 m (59")
- CXX II.3 (Code 5177-3)  
Cable AES/EBU  
XLR 3-pin, male ↔ XLR 3-pin, female, 2.95 m (118")
- HEAD Tools setup DVD
- HSC IV (Code 1524)  
Carrying case for HMS IV
- Equalization CD
- Manual
- BTA (Code 1968)  
Bluetooth® adapter for HMS III/IV, BEQ II for receiving control signals of the HEAD Control Remote App (for Android as of V. 2.3.3)
- HCF IV.16 (Code 1599-16)  
CompactFlash card, 16 GB
- CF card reader (USB 2.0) for transferring the card contents to a PC
- Pulse adapter (for electrical isolation of the pulse inputs)
- CMD III.0 (Code 9809)  
Breakout cable 2 x BNC ↔ D-Sub, 15-pin (Pulse In for HMS), 1.5 m (59")
- CDB III.1 (Code 9811)  
Breakout cable D-Sub 15-pin ↔ 2 x BNC (Analog Out for HMS), 1.5 m (59")
- CXO I.1 (Code 5176)  
Power supply cable  
XLR 4-pin ↔ cable lugs, 2 m (79")
- PDB II.1 (Code 3716)  
Power Distribution Box  
Passive Power Distribution Box

## Accessories

### Accessories - hardware

- HSM V (Code 1520)  
Seat Mount Adapter
- HTB VI (Code 1574)  
HEAD Torso Box
- SBH I (Code 1315)  
Stand base for HMS IV
- HMT II (Code 1962)  
Tripod
- HWS (Code 1960)  
Windshield for outside recordings
- TLP (Code 1967)  
Triaxial laser pointer

### HEADlab

- *labCTRL* I.2 (Code 3701)  
USB/LAN controller for HEADlab
- *labHMS* (Code 3742)  
Input module with 3 AES /RS232 interfaces for connecting up to 3 HMS artificial heads
- *labDX* (Code 3741)  
Input module with CAN, FlexRay, pulse and AES/RS232 interfaces
- CDX X.3 (Code 3783-3)  
HMS connecting cable  
XLR 3-pin, male / XLR 3-pin, female / D-Sub 9-pin ↔ D-Sub 9-pin, 2.95 m (118")

## SQuadriga III / SQuadriga II

- Mobile recording and playback systems
  - SQuadriga III (Code 3324)
    - CLX X.1 (Code 3797-1)  
Adapter cable AES/EBU
    - CUSB II.1.5 (Code 5478-1.5)  
Cable USB 2.0, 1.5 m (59") (included)
  - SQuadriga II (Code 3320)
    - CLX VII.1 (Code 3352)  
Adapter cable AES/EBU
    - CLD VII.8 (Code 3358)  
Adapter cable RS232 (stand-alone mode)
    - CAB I.xx (Code 5475-xx)  
RS232-Kabel (stand-alone mode)

## Recommended headphones

- HD IV.1 (Code 2380)  
Dynamic headphone
- HD IV.2 (Code 2481)  
Dynamic headphone

HD IV.1 and HD IV.2 are factory-equalized with standard equalizer curves.

## Accessories - software

- ArtemiS SUITE Basic Framework (Code 5000)
- ArtemiS SUITE Data Acquisition Module - HEAD Recorder (Code 5004)
- ArtemiS SUITE (Code 5001ff)  
Additional ArtemiS SUITE modules

## Technical Data

### General

Type of microphones:	½" electrostatic microphones, 200 V polarization voltage
Resolution:	24 bit, oversampling 256 times ( $f_s < 50$ kHz), 128 times ( $f_s > 50$ kHz)
Frequency range:	20 Hz - 20 kHz: ±0.15 dB; 3 Hz - 20 kHz: -3 dB/+0.1 dB; electr., without equalization
Sampling rate:	32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz (internal and external synchronizable via AES/EBU 32 kHz to 96 kHz)
Equalization modes:	Independent of direction (ID), free field (FF), diffuse Field (DF), user-specific (USER), linear (LIN - no equalization)
Directional pattern:	Corresponds to the structurally-averaged directional pattern of the human outer ear to IEC 959
Filters:	Highpass (passive) 1 <sup>st</sup> order, switchable 22 Hz/180 Hz (±10 %); highpass (active) 2 <sup>nd</sup> order, 22 Hz (±10 %), all filters can be deactivated
Operation:	HEAD Recorder and HMS Remote Control (via RS232 or USB); Bluetooth® adapter BTA (with HEAD Remote Control App)
System check:	Automatic hardware check for digital and analog components and A/D converter after power on
Power supply:	Interruption-free switching between external and internal power supply. Smart charge electronics.
Extern DC supply (typ.):	10 - 18 V, max. 34 V, vehicle on-board power supply or power pack
Intern DC supply:	Battery NiMH, 12 V, 3.7 Ah (without memory effect)

## General

Current, Output	
Charging:	3 h (typ.) at recording to the CF (with remote control)
Operating time with battery:	8 h (typ.) at recording via USB to the HD
Mechanical Interface:	UNC 3/8", Camlock (series 911F)
Dimensions:	450 mm x 400 mm x 180 mm (18.31" x 15.75" x 7.09") (WxDxH)
Weight:	5.65 kg (12.46 lb)
Operating temperature:	0° C - 50° C (32° F - 122° F)
Storage temperature:	-20° C - 70° C (-4° F - 158° F)
Humidity:	0° C - 90 %, relative humidity, not condensing

## Measuring component

Nom. SPL (selectable):	84 dB <sub>SPL</sub>	94 dB <sub>SPL</sub>	104 dB <sub>SPL</sub>	114 dB <sub>SPL</sub>	124 dB <sub>SPL</sub>	134 dB <sub>SPL</sub>	144 dB <sub>SPL</sub>
Headroom (electr.):	6 dB (except for range 144 dB)						
Range:	94 dB <sub>SPL</sub>	104 dB <sub>SPL</sub>	114 dB <sub>SPL</sub>	124 dB <sub>SPL</sub>	134 dB <sub>SP</sub>	144 dB <sub>SPL</sub>	
Inherent noise (typ.) (acoust.), LIN, HP off:	15.5 dB <sub>SPL(A)</sub>	16 dB <sub>SPL(A)</sub>	16 dB <sub>SPL(A)</sub>	17.5 dB <sub>SPL(A)</sub>	24 dB <sub>SPL(A)</sub>	34 dB <sub>SPL(A)</sub>	
S/N <sub>FS</sub> (acoust.), LIN (typ.):	84.5 dB(A)	94 dB(A)	104 dB(A)	112.5 dB(A)	116 dB(A)	111 dB(A)	
Inherent noise (typ.) (acoust.), ID, HP 1 on:	13.5 dB <sub>SPL(A)</sub>	14 dB <sub>SPL(A)</sub>	14.5 dB <sub>SPL(A)</sub>	17 dB <sub>SPL(A)</sub>	24.5 dB <sub>SPL(A)</sub>	34.5 dB <sub>SPL(A)</sub>	
THD+N (typ.) (electr.), Sin 1 kHz, 0 dB, LIN:	-77 dB (0.013 %)	-87 dB (0.0045 %)	-93 dB (0.0022 %)	-87 dB (0.0045 %)	-74 dB (0.02 %)	-/-	-/-
Crosstalk (typ.) (electr.), Sin 1 kHz, 0 dB, LIN:	-119 dB	-122 dB	-122 dB	-121 dB	-107 dB	-/-	-/-
Linearity (typ.) (electr.), at 1 kHz, narrow-band:	-/-	109 dB	120 dB	122 dB	130 dB	-/-	-/-
Max. SPL:	145 dB <sub>SPL</sub> (<3 % distortion factor)						

## Interfaces

Pulse In:	Limit frequency: $f_s/2$ , max. 35 kHz, TTL-compatible, inputs not elect. isolated; with adapter the inputs are galv. isolated (10 kHz TTL, 50 %)
Analog Out (Multifunction)	
Nom. output level:	1 V <sub>eff</sub> +6 dB headroom
Inherent noise, (typ.):	S/N: 98 dB <sub>FS</sub> (+0 dB)
Intermodulation (THD+N) (typ.):	-92 dB at 1 kHz
Headphone Out:	HD IV. 1 and HD IV. 2 are factory-equalized with standard equalizer curves (FF, DF, ID); other equalizers for headphones supported by HEAD acoustics can be installed as needed
Max. SPL (typ.):	116 dB <sub>SPL</sub> (LIN) - with HD IV.1
Dynamic (S/N <sub>FS</sub> ) (typ.):	>100 dB <sub>FS</sub> (A)
Digital Out:	AES/EBU, IEC II subcode selectable; 24-bit format; 16-bit format, noise shaping activable
CompactFlash (HCF IV):	8 GB; max. size of 2 GB per file
USB:	To specification rev. 1.1. Compatible to USB 2.0 full speed; enables 2-head recordings up to 48 kHz (24 bit) and 96 kHz (16 bit)

## Miscellaneous

Radiated emission according to: EN 61326-1 (equipment class A); radiated immunity according to: EN 61326-1; safety according to: EN 61010-1.

Physical dimensions of the head designed according to ITU P.58, table 1 and comparable to ANSI 3.36, table 1.

Please note: Without HEAD Torso Box, some dimensions in P.58, table 1 are not applicable.

The monaural frequency responses comply with ITU P.58, table 4 and to those that can be derived from ANSI 3.36, table 3.

For aurally accurate recordings of sound events with very low sound pressure levels (e.g. in the IT industry), the HSU III.3 artificial head microphone is recommended.

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