



Code 1705

# HMS II.5

**Head Measurement System, with 3.3 Pinna and Artificial Mouth  
(without Ear Simulators)**

# OVERVIEW

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## HMS II.5

### Code 1705

Head Measurement System, with 3.3 Pinna and Artificial Mouth (without Ear Simulators)

HMS II.5 is an artificial head with an artificial mouth. The system is ideally suited for measurements which require only speech playback or an additional/concurrent talker. HMS II.5 realistically replicates the acoustically relevant structures of the human anatomy.

The artificial mouth of HMS II.5 has a two-way loudspeaker design and complies with the requirements from Recommendation ITU-T P.58. It is capable of reproducing the full spectrum of human voice with lowest distortion, allowing high-quality measurements.

## KEY FEATURES

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Geometric and acoustic characteristics according to Recommendation ITU-T P.58

Modular design for easy retrofitting with compatible components

Geometry of head and torso simulator according to IEC 60318-7

Artificial mouth:

- › Low-distortion two-way design with very wide frequency range (up to fullband)
- › Acoustic characteristics according to Recommendation ITU-T P.58
- › Digital equalization with ACQUA

## APPLICATIONS

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Measurements with additional/concurrent talker

Testing speech recognition systems

# DETAILS

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HMS II.5 is an artificial head which is ideally suited for playback in the field of telecommunications under realistic conditions. Complying with the geometric and acoustic characteristics of Recommendation ITU-T P.58, HMS II.5 is appropriate for every measurement scenario which includes speech playback.

## DESCRIPTION

### Artificial Mouth

The artificial mouth of HMS II.5 is fully compliant with Recommendation ITU-T P.58. It realistically reproduces the acoustic behavior of a talking person. The two-way loudspeaker design provides an excellent frequency response. The wide frequency range makes it ideally suited for measurements in super-wideband and full-band applications. The artificial mouth is optimized for use with the optional *coreOUT-Amp2* hardware board from the *labCORE* hardware platform.

### Playback

The artificial mouth of HMS II.5 is powered by the optional *coreOUT-Amp2* hardware board from *labCORE*. ACQUA supports comfortable and precise equalization of the mouth.

### Modularity

The modular design of the artificial ear enables adding or changing ear simulator(s) and pinnae quickly. This facilitates the installation of a left-side and/or right-side ear simulator for monaural/binaural measurements. Another advantage is the interchangeability with either the ear simulator of the low-noise variant HMS II.3 LN (with pinna type 3.3) or the low-noise ear simulator with a pinna having a human-like ear canal of HMS II.3 LN HEC (with pinna type 4.4).



*HMS II.5 mounted on the HTB VI torso box*

## Accessories

HMS II.5 can be equipped with the AN HMS artificial nose. It makes measurements of nose-supported device, e.g., AR/VR glasses more reproducible and convenient to set up.

HMS II.5 has a mounting plate on top that provides fixation for the TLP II triaxial laser pointer for precise alignment of HMS II.5.

The HTB VI torso box simulates a human torso. It is included in the scope of supply by default. HMS II.5 mounted on HTB VI forms a head and torso simulator (HATS) according to Recommendation ITU-T P.58. The bottom plate of HMS II.5 provides a Camlock coupling for convenient mounting on HTB VI.

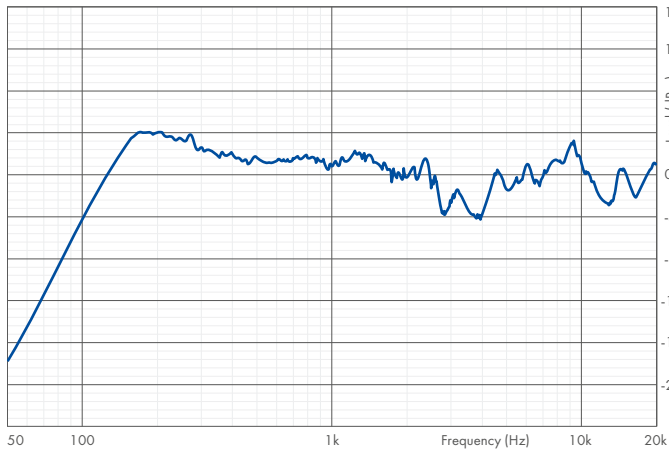


Front view of the artificial mouth. The loudspeaker assembly consists of two tweeters and one woofer.

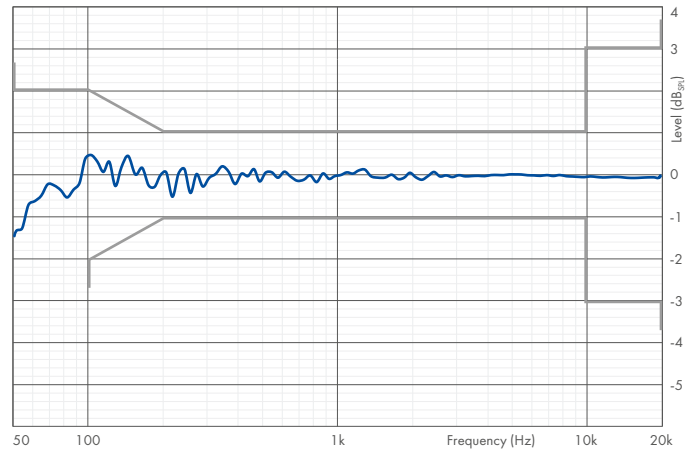
## TECHNICAL DATA

### Artificial Mouth

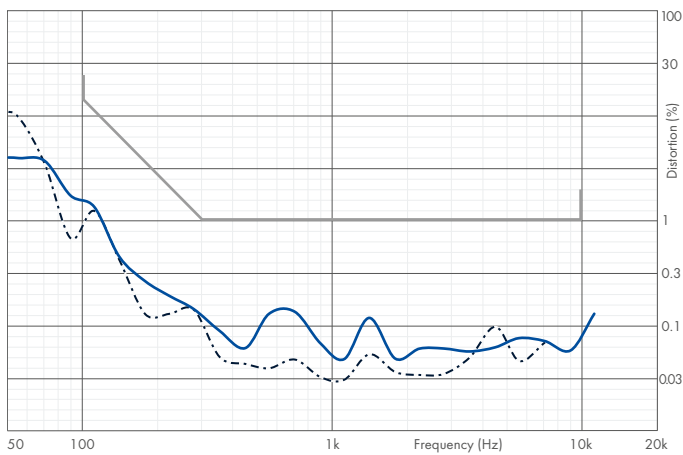
Loudspeaker configuration	2-way
Impedance	4 Ω
Frequency range	
› Unequalized	› 100 Hz – 20000 Hz (± 4 dB)
› Equalized	› 50 Hz – 20000 Hz (± 1 dB), exceeds ETSI TS 102 924
Power handling	
› P (continuous)	› 20 W
› P (short-term)	› 50 W (max. power is electrically limited > 6 kHz)
Total Harmonic Distortion (THD)	at Mouth Reference Point (MRP), equalized, with coreOUT-Amp2
› at 0 dB <sub>PA</sub> (94 dB <sub>SPL</sub> )	› < 4% (100 Hz), < 0.5% (200 Hz – 20000 Hz), exceeds Recommendation ITU-T P.58
› at 6 dB <sub>PA</sub> (100 dB <sub>SPL</sub> )	› < 6% (100 Hz), < 1% (200 Hz – 20000 Hz)
› at 12 dB <sub>PA</sub> (106 dB <sub>SPL</sub> )	› < 10% (100 Hz), < 2% (200 Hz – 20000 Hz)
› at 18 dB <sub>PA</sub> (112 dB <sub>SPL</sub> )	› < 3% (200 Hz – 20000 Hz)
Max. continuous output level	at MRP, equalized, with coreOUT-Amp2
› Pink noise	› min. 112 dB <sub>SPL</sub> (50 Hz – 16000 Hz), min. 106 dB <sub>SPL</sub> (20 Hz – 20000 Hz)
› Sine	› min. 112 dB <sub>SPL</sub> (200 Hz – 6000 Hz) at THD < 3%, min. 106 dB <sub>SPL</sub> (100 Hz – 10000 Hz) at THD < 10%
› Real speech according to Recommendation ITU-T P.501	› No audible distortion up to approx. 110 dB <sub>SPL</sub>



Typical frequency response of unequalized two-way mouth (—)



Typical frequency response of equalized two-way mouth (—) vs. ETSI TS 102 924 tolerance scheme (—)



2nd (—) and 3rd (---) order harmonic distortion of equalized two-way mouth at 0 dB<sub>po</sub> vs. Recommendation ITU-T P.58 tolerance scheme (—)

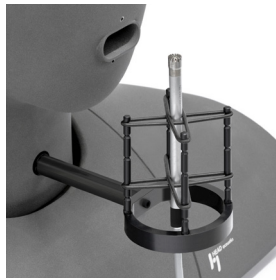
## Other

Dimensions and Weight	
Overall dimensions (Width × Height × Depth)	460 mm × 400 mm × 210 mm 460 mm × 790 mm × 400 mm mounted on HTB VI
Weight	Approx. 5 kg (standard scope of delivery) Approx. 13 kg mounted on HTB VI
Environmental Conditions	
Operating temperature range	0 °C – 50 °C (32 °F – 122 °F)
Storage temperature range	-20 °C – 70 °C (-4 °F – 158 °F)
Humidity	20% – 80% relative humidity (non-condensing environment)

# FEATURES

## MICROPHONE HOLDER

A snap lock at the throat can accommodate the delivered microphone mount for calibration of the mouth. Durable rubber rings can accommodate optional microphones of different sizes.



## PINNA

The anatomically shaped pinna type 3.3 of HMS II.5 replicates the geometry of a human auricle. HMS II.5 provides connections for retrofitting all appropriate combinations of ear simulators and pinnae.



## ARTIFICIAL MOUTH AND ARTIFICIAL NOSE

The two-way loudspeaker design of the artificial mouth provides excellent frequency coverage, a high maximum SPL, and very low distortion.

The optional AN HMS artificial nose can be fixed at the facial crosshair of HMS II.5.



## BOTTOM PLATE

The bottom plate provides a speakON connector for the artificial mouth. Two 7-pin LEMO connectors prepare for easy retrofitting of left and right ear simulators.

A quick-clamping mechanism enables easy and fast attaching of HMS II.5 to the HTB VI torso box. The thread (3/8" UNC) below allows to fasten HMS on, e.g., the optional HMT III tripod.



# EAR SIMULATOR AND PINNA OPTIONS

By default, HMS II.5 has a left and right pinna type 3.3. It is extendable by a left and/or right ear impedance simulator. The modular design of the HMS II Series enables to build numerous different configurations optimized for specific purposes.



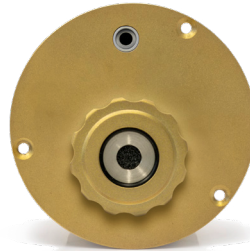
## HMS II.3

- › Impedance simulator with straight ear canal
- › Anatomically shaped pinna type 3.3 with straight ear canal



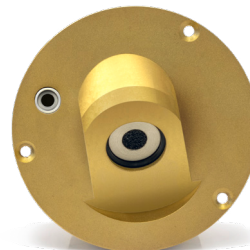
## HMS II.3 LN

- › Low-noise impedance simulator with straight ear canal
- › Anatomically shaped pinna type 3.3 with straight ear canal



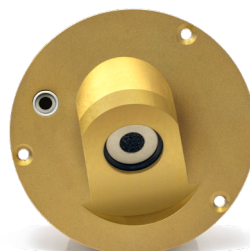
## HMS II.3 LN HEC

- › Low-noise impedance simulator with human-like ear canal
- › Anatomically shaped pinna type 4.4 with human-like ear canal



## HMS II.3 ViBRIDGE

- › Low-noise impedance simulator with human-like ear canal
- › Anatomically shaped pinna type 4.4 with human-like ear canal and bone conduction simulation



# OPTIONS

## General

AN HMS (Code 1418)

- › Extension for Head Measurement System HMS: Artificial nose

UG HMS/HSU move°S (Code 1750)

- › Upgrade HMS/HSU to move°S, motorized head turning version

HSM V (Code 1520)

- › HEAD Seat Mount adapter for HMS/HSU

HSC V-V2 (Code 1525-V2)

- › Carrying case for HMS II.x

HMT III (Code 1961)

- › Height-adjustable tripod for Head Measurement System

SB HRT (Code 6501)

- › Stand base for mounting HMS II.x on HRT I

TLP II (Code 1969)

- › Triaxial Laser Pointer for HMS/HSU positioning

## Ear Simulator Retrofitting

Delivery of left impedance simulators includes the cable LEMO 7-pin male <> LEMO 7-pin male, black, 2.95 m (Code 1721-3)

Delivery of right impedance simulators includes the cable LEMO 7-pin male <> LEMO 7-pin male, red, 2.95 m (Code 1722-3)

HIS L (Code 1701)

- › Head impedance simulator, left, for HMS II.3/4/5

HIS L LN (Code 1701.1)

- › Head impedance simulator, left, low-noise version, for HMS II.3/4/5

HIS L LN HEC (Code 1701.2)

- › Head impedance simulator, right, low-noise version, for HMS II.3/4/5, human-like ear canal version

HIS R (Code 1702)

- › Head Impedance Simulator, right, for HMS II.3/4/5

HIS R LN (Code 1702.1)

- › Head impedance simulator, right, low-noise version, for HMS II.3/4/5

HIS R LN HEC (Code 1702.2)

- › Head impedance simulator, right, low-noise version, for HMS II.3/4/5, human-like ear canal version

# SCOPE OF DELIVERY

HMS II.5 (Code 1705)

- › Head Measurement System, with 3.3 pinna and artificial mouth (w/o ear simulators)

HEL 3.3 (Code 1711)

- › Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 Type 3.3 and IEC 60318-7

HER 3.3 (Code 1712)

- › Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 Type 3.3 and IEC 60318-7

CSS V.3 (Code 1723-3)

- › Cable speakON plug <> speakON plug, 2.95 m

CSB II (Code 9849)

- › Adapter speakON male <> Banana plug

HTB VI (Code 1574)

- › HEAD Torso Box

HCC-HMS (Code 1741)

- › Carrying case for accessory parts HMS II.x including:

- ›› Mic-pos (Code 1731)

- Microphone positioner for HMS II.3/5/6/7

- ›› LR-MRP (Code 1626)

- Lip ring and MRP pointer

- ›› 2 × Throat blind cap (spare parts)

Manual

## Pinna Retrofitting

HEL 4.4 (Code 1715)

- › Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 type 4.4

HER 4.4 (Code 1716)

- › Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 type 4.4

HEL 4.4-V1 (Code 1715-V1)

- › Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 type 4.4, gray color

HER 4.4-V1 (Code 1716-V1)

- › Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 type 4.4, gray color

HEL 4.4 ViBRIDGE (Code 1717)

- › Flexible pinna for HMS II.3/5, left ear, according to ITU-T P.57 type 4.4, ViBRIDGE version

HER 4.4 ViBRIDGE (Code 1718)

- › Flexible pinna for HMS II.3/5, right ear, according to ITU-T P.57 type 4.4, ViBRIDGE version

HEL 4.4 ViBRIDGE-V1 (Code 1717-V1)

- › Flexible pinna for HMS II.3/5, left ear, gray color, according to ITU-T P.57 type 4.4, ViBRIDGE version

HER 4.4 ViBRIDGE-V1 (Code 1718-V1)

- › Flexible pinna for HMS II.3/5, right ear, gray color, according to ITU-T P.57 type 4.4, ViBRIDGE version

# GENERAL REQUIREMENTS

## Hardware

labCORE (Code 7700)

- › Modular multi-channel hardware platform

coreBUS (Code 7710)

- › labCORE I/O bus mainboard

coreOUT-Amp2 (Code 7720)

- › labCORE power amplifier board

## Software

One of the following software applications:

ACQUA (Code 6810)

- › Advanced Communication Quality Analysis Software, Full license version

ACQUA Compact (Code 6860)

- › Compact test system

RC-labCORE (Code 6984)

- › Remote configuration software for labCORE

VoCAS (Code 7970)

- › Voice Control Analysis System

## Compatibility of Pinnae and Ear Simulators

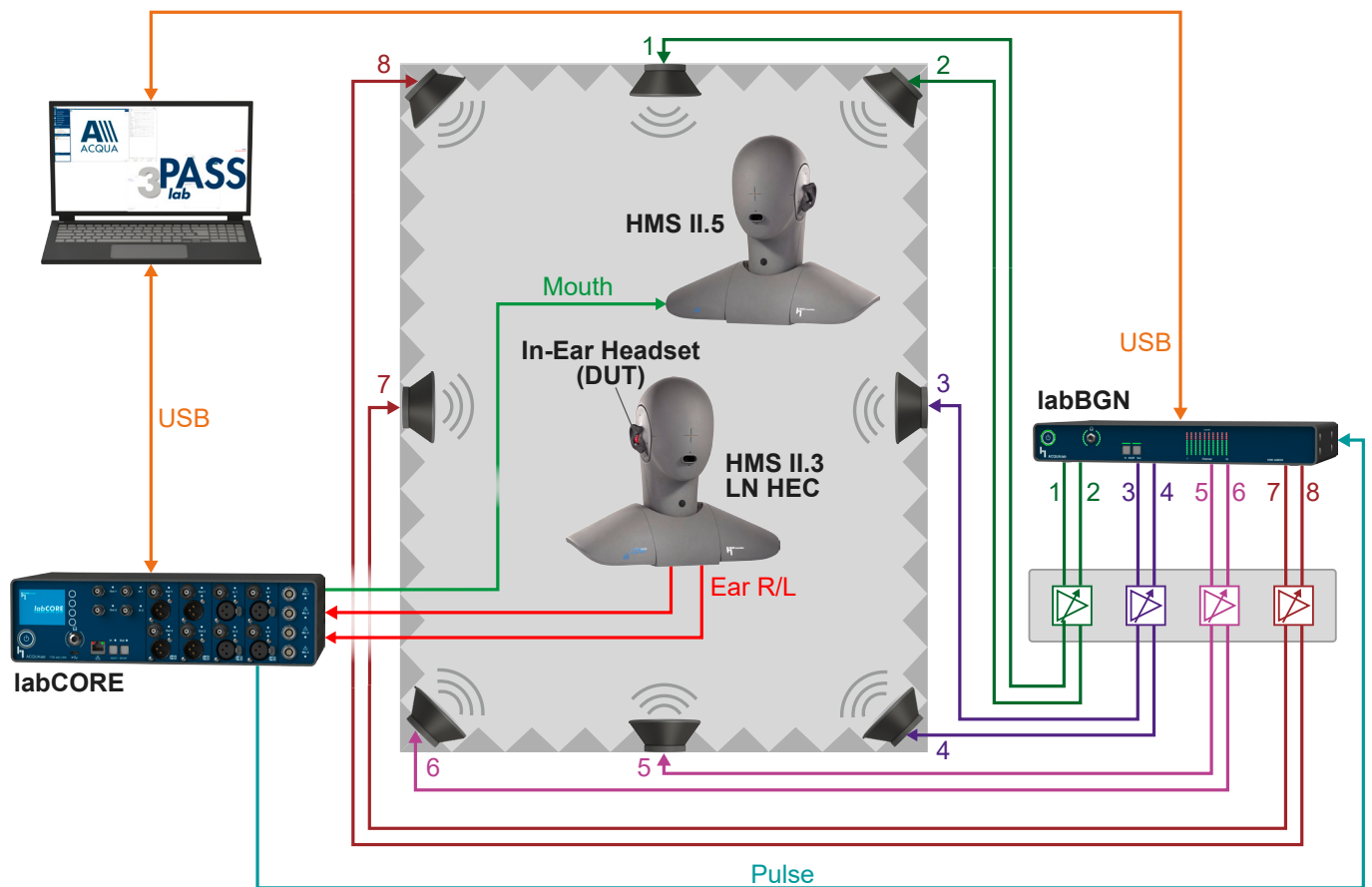
Pinna type \ Impedance simulator	HEL 3.3	HER 3.3	HEL 4.4	HER 4.4	HEL 4.4-V1	HER 4.4-V1	HEL 4.4 ViBRIDGE	HER 4.4 ViBRIDGE	HEL 4.4 ViBRIDGE-V1	HER 4.4 ViBRIDGE-V1
HIS L	•									
HIS R		•								
HIS L LN	•									
HIS R LN		•								
HIS L LN HEC			•		•		•		•	
HIS R LN HEC				•		•		•		•

# IN PRACTICE

## APPLICATION EXAMPLE

### ANC Pass-Through Mode in the Presence of Background Noise

This configuration presents testing an in-ear ANC headset with HMSII.3 LN HEC. HMS II.5 simulates an external talker to test the headset's ANC pass-through mode performance. The two artificial heads are connected to *labCORE* for recording (ears of HMS II.3 LN HEC) and playback (artificial mouth of HMS II.5). Background noise is simulated by *3PASS lab*. For full repeatability of measurements, background noise playback is synchronized by *labCORE* through a pulse connection to *labBGN*. ACQUA is the control software for generating, recording, and analyzing signals.



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