



ACQUA user interface for EN 50332 with measurement tree (left) and SMD settings (center), exemplary ACQUALyzer measurement result (right)

## Description

Hearing impairment is a serious health issue. A common cause of hearing damage in humans is exposition to high sound pressure levels over long periods of time. This is typical for noisy work environments (in which hearing protection mostly is mandatory now), but it can also appear in other, less obvious situations. Young people often are prone to listen to music at high sound pressure levels. This can be during concerts and in clubs, but also with headphones and portable audio players. (e.g. smartphones). The latter use case is especially dangerous because it rarely is perceived as hazardous. With headphones, it is very easy to reach critical sound pressure levels at the ear drum. Additionally, the duration of exposure typically is high (e.g. on the daily commute). The result – irreversible gradual hearing damage – most often is diagnosed when the damage has been done.

To curb further spread of hearing damage due to excessive sound pressure levels from headphones and portable audio devices, the EU has issued the norm EN 50332. It defines maximum output

voltages for source devices as well as a maximum efficiency for headphones and earphones. This results in a natural limit to the maximum sound pressure level that can be achieved when these devices are combined. By making compliance with EN 50332 mandatory for such devices sold in the EU, manufacturers must test their products for compliance during development.

HEAD acoustics implemented the European norm in its entirety into the measurement standard EN 50332 for ACQUA. If desired, measurements can be modified or extended to conduct additional tests. Also, tests can be combined to create individual test sequences.

The EU norm EN 50332 is divided into two main parts:

- Measurements for combinations of mobile players and headphones/earphones sold by manufacturers as “one-package sets”
- Measurements for arbitrarily combined mobile players and headphones/earphones (sold separately by different manufacturers)

Overview of database revisions and specification versions		
Database Revision	Based on Specification Versions	Min. ACQUA Version
7	EN 50332-1 (08/2014), EN 50332-2 (08/2014), EN 50332-3 (04/2018)	4.0.100

(Older releases are available upon request)

## DATA SHEET

### EN 50332 (Code 6789)

#### Maximum sound pressure measurements – headphones and portable audio equipment

#### Overview

The European norm EN 50332 specifies maximum sound pressure level and input/output voltage measurements for headphones and earphones associated with portable audio equipment. This norm is mandatory for such devices in a large number of countries. Thus, conformance with EN 50332 is important for any manufacturer of mobile consumer electronics.

HEAD acoustics implemented EN 50332 specifications in an automated test suite for the communication quality analysis system ACQUA.

#### Key Features

- Convenient automated testing
- Supports wired and wireless headphones, earphones and headsets
- Complete implementation of EN 50332-1/-2/-3

#### Applications

- Automated analysis of maximum sound pressure level for headphones and earphones associated with portable audio equipment according to the European norms:
  - EN 50332-1/2014-08
  - EN 50332-2/2014-08
  - EN 50332-3/2018-04

The ACQUA standard EN 50332 addresses both parts, allowing evaluation of portable audio source devices and headphone/earphone separately. The connection between source and headgear can be wired (analog) or wireless via Bluetooth® A2DP.

In addition to portable audio devices like smartphones and standalone mobile players, the test suite also allows to test portable FM receivers for EN 50332 compliance.

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## General Requirements

- **ACQUA (Code 68xx)**, Advanced communication quality analysis system in one of the following versions:
    - Full License (Code 6810)
    - Workplace (Code 6830, for post-analysis and documentation only)
    - Compact Systems (Code 6860.xx)
  - **labCORE (Code 7700)**, Modular Multi-channel Hardware Platform with
    - **coreBUS (Code 7710)**, labCORE I/O Bus Mainboard
    - **coreBEQ (Code 7740)**, labCORE Binaural Equalization Software Extension
    - **coreIN-Mic4 (Code 7730)**, Microphone input board
  - One of the following **HEAD measurement systems**
    - **HMS II.3 (Code 1230)**, HEAD measurement system with ear simulator, pinna type 3.3 or 3.4 with
    - **HIS L (Code 1231)**, HEAD impedance simulator, left ear (only for HAE-BGN)
- or**
- **HMS II.3-LN (Code 1230.3)**, HEAD Measurement System, Low-Noise Version with 3.3 Pinna, Right Ear Simulator & Artificial Mouth with
  - **HIS L-LN (Code 1231.3)**, HEAD impedance simulator, left ear, low-noise version

## Options

- **coreBT (Code 7780)**, labCORE Bluetooth hardware/software extension (only required for Bluetooth tests)
- **coreBT-EXT (Code 7781)**, labCORE extended codec software (only required for Bluetooth tests with Qualcomm® aptX™)
- **CPB II (Code 6098)**, Adapter 6.3mm phones plug <> Banana plug male, for tests according to EN 50332
- **6.3 mm <> 3.5 mm phones adaptor** (not provided by HEAD acoustics, for headphones with 3.5mm plug only)
- **Radio Transceiver**, (not provided by HEAD acoustics, for FM tests only)

## Delivery Items

- **EN-50332 (Code 6789)**, as ACQUA database
- **V2C file** (for ACQUA)

SMDs in ACQUA database	
<b>Part 1 &amp; 3 – One-package set characteristics</b>	
LAeq Run 1-5, Left Ear, Right Ear, Both Ears	
Calculate Mean LAeq, Left Ear, Right Ear, Both Ears	
CSD Measurements	
Check compatibility with EBU R 128 (optional)	
<b>Part 2 &amp; 3 – Player characteristics</b>	
Measure Max. Output Voltage, Left Channel, Right Channel	
Calculate Max. Output Voltage, Left Channel, Right Channel	
CSD Measurements	
Check compatibility with EBU R 128 (optional)	
<b>Part 2 – Analog headphone/earphone characteristics</b>	
Measure Offset to 94 dB SPL, Run 1-5, Left Ear, Right Ear	
Check Offset to 94 dB SPL, Run 1-5, Left Ear, Right Ear	
Measure Level, Left Ear (Laeq_LE_A), Run 1-5, Left Ear, Right Ear	
Output Voltage, Left Ear (Vout_LE_A), Run 1-5, Left Ear, Right Ear	
Calc. Vwbc, Left Ear (Vwbc_LE_A), Run 1-5, Left Ear, Right Ear	
Additional Informative Measurements	
Peak of time signal (plausibility check), Left Ear, Right Ear	
Distortion (sinusoidal), Left Ear, Right Ear	
Electrical Impedance, Left Ear, Right Ear	
<b>Part 2 – Bluetooth® (A2DP) headphone/earphone characteristics</b>	
Measure LAeq for Bluetooth® devices -10 dBFS, Run 1-5, Left Ear, Right Ear	
Calculate Mean LAeq, Left Ear, Right Ear	
Calculate Minimum LAeq, Left Ear, Right Ear	
<b>Part 1 &amp; 2 – FM receiver tests</b>	
LAeq Run 1-5, Left Ear, Right Ear, Both Ears - FM Receiver	
Calculate Mean LAeq, Left Ear, Right Ear, Both Ears - FM Receiver	
Measure Max. Output Voltage, Left Channel - FM Receiver	
Calculate Max. Output Voltage, Right Channel - FM Receiver	



Exemplary measurement setup for EN50332 compliance of a Bluetooth headset on HMS II.3.