

Standard-compliant testing of hearing aids

Testing of hearing aids in line with IEC 60118 and ANSI S3.22 in development, quality assurance and end-of-line production testing as well as for type approval



Your task

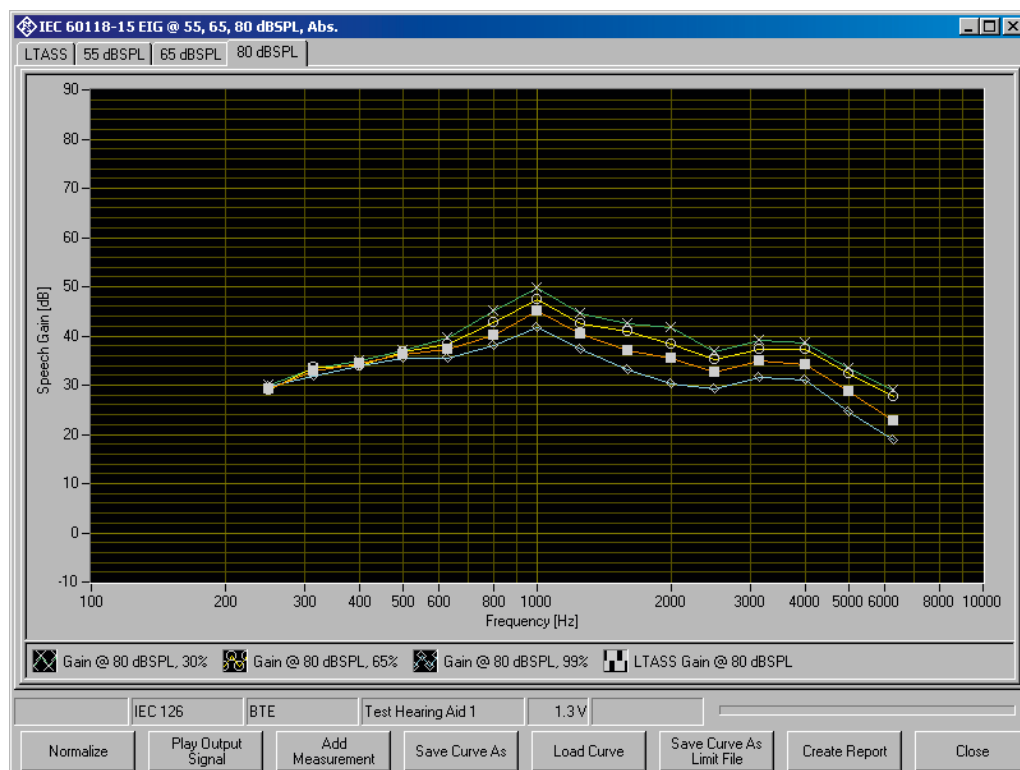
In development, quality assurance and end-of-line production testing, as well as for type approval (homologation) hearing aids have to be tested in line with IEC 60118 and ANSI S3.22. The test system must be set up in such a way that measurements run automatically and can also be performed by semi-skilled staff.

For presenting the measurement results, uniformly formatted test reports are to be created that can be submitted to homologation institutions, for example. In addition, the test system must be flexible enough to allow experts to adapt the test parameters to special measurement tasks and types of hearing aids.

Key facts

- Standard-compliant measurements of all relevant parameters
- Measurement of acoustic and inductive response of DUTs
- Customized configuration of test routines
- Convenient management of measurement results
- High measurement speed and automatic tolerance checking

Example of a speech gain measurement in line with IEC 60118-15. The diagram shows the speech gain at 80 dB sound pressure level for three percentile input levels as well as the long-term average speech spectrum (LTASS) gain.



T&M solution

When used with the R&S®UPV-K7 option, the R&S®UPV audio analyzer becomes an instrument for standard-compliant testing of hearing aids and fulfills the relevant requirements in development, production and quality assurance. The software's graphical user interface allows users to create customized test routines specially tailored to the characteristics of the DUT. Not only can the type and sequence of measurements be user-defined, the individual measurements can also be modified to meet the particular requirements.

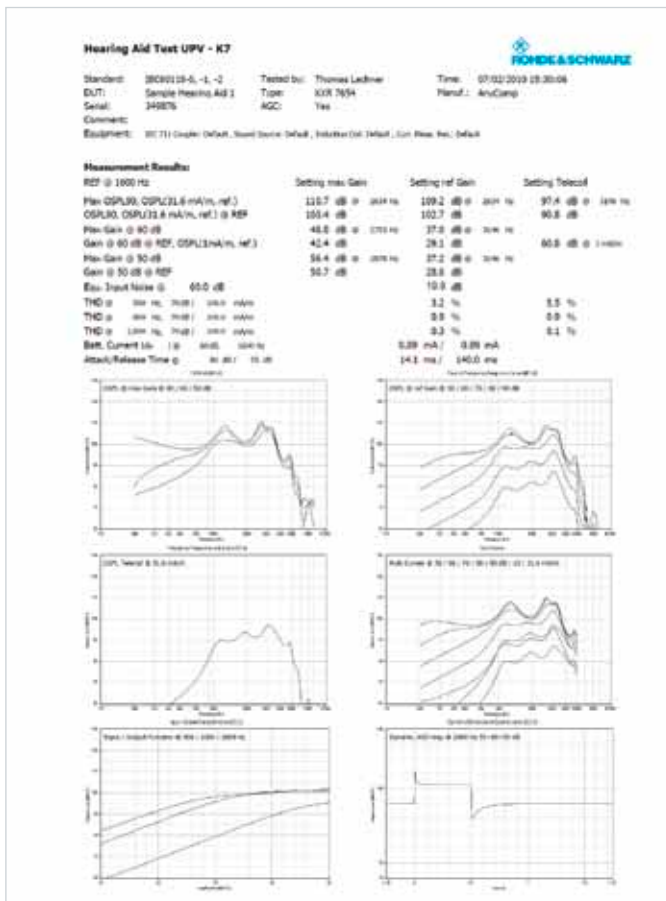
A series of parameters such as highpass or lowpass filters can be set centrally so that they are valid for all measurements.

Calibration values for acoustic devices such as sound source, microphone and ear simulator are recorded, managed and automatically taken into account by means of suitable routines.

All results are stored on the R&S®UPV audio analyzer and can be exported in different file formats or printed as test reports.

A powerful database system manages all measurement data, the required information about the DUTs and the test equipment used as well as calibration values and climatic data.

The measurement results can be summarized in an overview report.



If measurements with speechlike test signals in line with IEC 60118, part 15, also need to be performed, the R&S®UPV-K7 option can be extended with the R&S®UPV-K71 software option.

Benefits and key features

Convenient operation and customized configuration of test routines

The application is operated via an easy-to-use GUI. Users can select the tests they need from an extensive list of measurements and combine them into a test routine that runs automatically. The individual measurements can be modified to meet specific needs. All settings are documented in comprehensive parameter sets.

Versatile graphics provide a quick overview of all measurement results. Limit values and limit-value traces can be entered so that automatic pass/fail evaluations can be performed. For detailed analyses, a cursor can be used in the measurement graphics; the zoom function makes it possible to magnify sections.

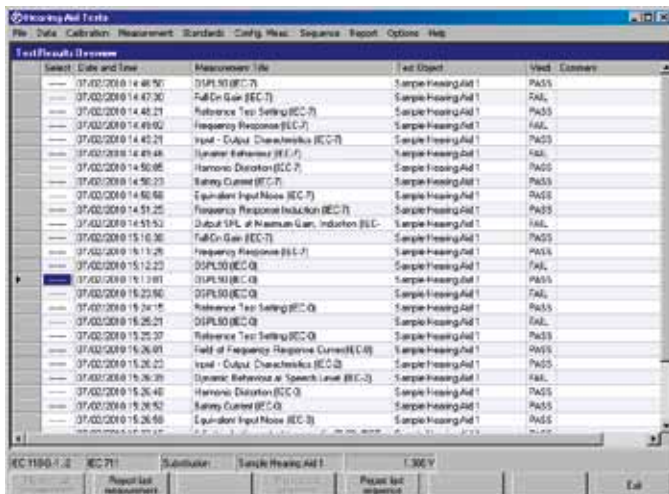
Measured values and trace data can be exported for evaluation by using other programs. For comparison purposes, traces that have already been archived as well as reference traces can be imported into the current measurement graphic.

Measurement of all relevant parameters

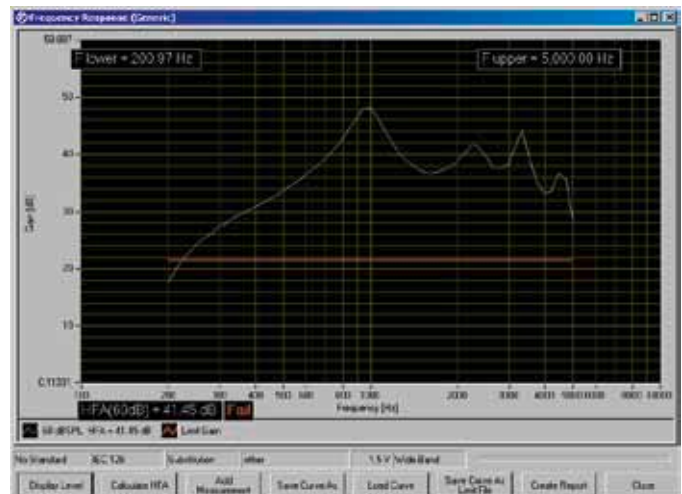
The easy-to-use measurement software performs measurements in line with either the IEC 60118 or ANSI S3.22 standard. All conventional measurements can be carried out:

- ▀ Maximum saturation sound pressure level (SSPL)
- ▀ Output sound pressure level (OSPL)
- ▀ Full-on acoustic gain response curve
- ▀ Reference test setting of gain control
- ▀ Acoustic frequency response curves and transmission frequency range
- ▀ Hearing aid's battery current
- ▀ Total harmonic distortion at selectable frequencies/levels
- ▀ Equivalent input noise
- ▀ Steady state input-output characteristics
- ▀ Settings for telecoil measurements on hearing aid
- ▀ Induction coil response
- ▀ Equivalent acoustic input signal with inductive response
- ▀ Total harmonic distortion with inductive response
- ▀ Maximum high-frequency average (HFA) magneto-acoustical sensitivity level (MASL) of induction pick-up coil
- ▀ Equivalent test loop sensitivity (ETLS), Relative simulated equivalent telephone sensitivity (RSETS)
- ▀ Dynamic automatic gain control (AGC) characteristics
- ▀ Multi-curve displays, e.g. for displaying the effect of gain control at selectable sound pressure levels
- ▀ Long-term average speech spectrum gain (with R&S®UPV-K71 option)
- ▀ Speech gain at three percentile input levels (30 %, 65 %, 99 %, with R&S®UPV-K71 option)

Overview of test results.



Frequency response measurement in line with IEC 60118-0.



Acoustic and inductive response of DUTs

The R&S®UPV-K7 software package supports measurements of the acoustic as well as inductive (telecoil) response of hearing aids.

Measuring the acoustic or inductive response of hearing aids requires a suitable test chamber equipped with a loudspeaker and/or telecoil. These devices do not come with the R&S®UPV-K7 option. The required test microphones and couplers for connecting the hearing aid to the audio analyzer are also not part of the option described here.

High measurement speed and automatic tolerance checking

In production applications, the R&S®UPV audio analyzer's high measurement speed ensures a large throughput. The measurement speed can be optimized by flexibly adapting it to the DUT characteristics.

Measurement results can be automatically checked for compliance with tolerance limits. Together with the pass or fail information, all readings are documented and saved. This ensures consistent production quality and seamless verification of all test relevant data.

Convenient management of measurement data

On the R&S®UPV audio analyzer, all measurement results are stored in a large database in universally readable XML files.

Information about the tested hearing aids, the test equipment used (e.g. type of test microphone), measurement time and person performing the test, etc., is also managed in this database and can be called up at any time. Climatic data (temperature, air pressure, humidity) and relevant calibration values can be kept in the database as well.

Versatile report generation

The report generator in the R&S®UPV-K7 option makes it possible to compile results into reports with just a few mouse clicks. Reports can be exported in different file formats to other applications.

The following types of reports are supported:

- Single measurement
- User-defined selection of measurement results
- Complete test routine
- Overview for a DUT on a DIN A4 sheet
- DIN A4 landscape format with graphic

Test report of an individual measurement.



Accessories and expansions

Accessories

XLR/BNC adapter set (R&S®UP-Z1MF)

Two XLR male to BNC and two XLR female to BNC adapters facilitate the use of unbalanced cables on the R&S®UPV audio analyzer.

Cable set for R&S®UPV-K7 (R&S®UPV-Z7)

The R&S®UPV-Z7 was specially designed for connecting the R&S®UPV audio analyzer to the Interacoustics TBS25 acoustic test chamber. It includes a loudspeaker cable, an induction loop cable and a battery supply cable with circuitry for measuring the battery current.

Increasingly complex chips demand a measuring instrument that can be flexibly adapted to the different digital interface formats. With the R&S®UPV-B42 option, the R&S®UPV audio analyzer is ideally equipped to meet this requirement.



Expansions

Universal serial interfaces (R&S®UPV-B42)

State-of-the-art hearing aids increasingly use digital signal processing algorithms and therefore contain digital signal processors and mixed analog/digital chips that have to be tested in development and quality assurance. The R&S®UPV-B42 universal serial interfaces option was developed for these applications. It can be inserted into one of the two slots on the rear of the R&S®UPV audio analyzer.

The R&S®UPV-B42 option expands the R&S®UPV audio analyzer by adding universal, digital audio interfaces whose parameters can be flexibly set to match the different digital formats. Virtually all common audio chips can be connected.

The R&S®UPV-B42 consists of a plug-in card, a connecting cable and a probe (see figure).

Further information is provided in the R&S®UPV product brochure (PD 0758.1306.12 – page 11).

PDM bitstream analysis (R&S®UPV-K421)

This software package expands the R&S®UPV-B42 option to include the measurement of digital audio signals that are transmitted in line with pulse density modulation (PDM). This transmission mode is used, for example, for operating digital MEMS microphones. Sigma delta converters also use this 1 bit data stream.

Extended analysis functions (R&S®UPV-K6)

Third-octave analysis and 1/n octave analysis are important measurements throughout the field of acoustics. The levels are determined simultaneously in up to 32 third-octave bands and 128 single-tone bands.

The *transfer and coherence functions* are used to determine the transmission characteristics of a hearing aid by means of music, speech or noise signals. These functions also make it possible to determine a hearing aid's impulse response.

The function can also be used to measure *interchannel delay* – for example to determine the time delay between the input signal and the output signal of a hearing aid.

Supported standards

Standards supported by R&S®UPV-K7

- ▮ IEC 60118-0:1994
- ▮ IEC 60118-1:1998
- ▮ IEC 60118-2:1997
- ▮ IEC 60118-7:2005
- ▮ ANSI S3.22-2003

Standard additionally supported by R&S®UPV-K71

- ▮ IEC 60118-15:2009-12

Ordering information

Designation	Type	Order No.
Base unit		
Audio Analyzer	R&S®UPV	1146.2003.02
Accessories supplied		
Power cable		
Compact manual		
CD with operating manual/service manual		
Software options		
Software for Hearing Aid Measurements	R&S®UPV-K7	1401.9301.02
Hearing Aid Speech Tests	R&S®UPV-K71	1402.1004.02
PDM Bitstream Analysis	R&S®UPV-K421	1402.1104.02
Extended Analysis Functions	R&S®UPV-K6	1401.9201.02
Hardware options		
Universal Serial Interface	R&S®UPV-B42	1146.5802.02
Recommended extras		
Cable Set for R&S®UPV-K7	R&S®UPV-Z7	1401.7609.02
XLR/BNC Adapter Set	R&S®UP-Z1MF	1411.3306.02

For more information, see the R&S®UPV data sheet (PD 0758.1306.22) and the R&S®UPV product brochure (PD 0758.1306.12) and www.rohde-schwarz.com

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Environmental commitment

- | Energy-efficient products
- | Continuous improvement in environmental sustainability
- | ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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