

INTERNATIONAL STANDARD

Audio and audiovisual equipment – Digital audio parts – Basic measurement
methods of audio characteristics –
Part 1: General

IEC 61606-1:2009
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUDIO AND AUDIOVISUAL EQUIPMENT – DIGITAL AUDIO PARTS – BASIC MEASUREMENT METHODS OF AUDIO CHARACTERISTICS –

Part 1: General

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International Standard IEC 61606-1 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

The significant technical changes with respect to the first edition are the following:

- changed the period of preconditioning;
- add A weighting filter in measuring instruments;
- correct the wrong reference number;
- some inappropriate descriptions have been improved.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/1547/FDIS	100/1581/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts of the IEC 61606 series, under the general title *Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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AUDIO AND AUDIOVISUAL EQUIPMENT – DIGITAL AUDIO PARTS – BASIC MEASUREMENT METHODS OF AUDIO CHARACTERISTICS –

Part 1: General

1 Scope

This part of IEC 61606 is applicable to the basic methods of measurement of the audio characteristics of the digital audio part of audio and audiovisual equipment for all of consumer use, professional use and personal computer.

The common measuring conditions and methods, described in this standard, are used for the measurement of the performance characteristics of equipment having an audio bandwidth equal to approximately one-half of the sampling frequency of a system, where the audio information is processed in the form of digital data. CD players, DAT recorders, digital amplifiers, digital sound broadcast receivers and television broadcast receivers with digital sound are examples.

This standard describes test methods for equipment which has digital input with analogue output and analogue input with digital output. Future revisions of this standard will cover digital-in/digital-out and analogue-in/analogue-out tests.

This standard does not apply to a lossy compression signal and also does not apply to power amplifiers.

NOTE 1 A digital audio system having an analogue input and an analogue output with digital signal processing may have different characteristics from those of a pure analogue audio system due to sampling of the audio signal and performance of incorporated A/D and D/A converters. Measurement methods described in IEC 60268-3 may not give correct results when applied to a digital system.

NOTE 2 The methods described are mostly based on sampling frequencies of 32 kHz and higher.

NOTE 3 For tests of those systems of digital-in – digital-out, and analogue-in – analogue-out tests, refer to AES17.

NOTE 4 This standard is planned to harmonize with the first edition of IEC 61606 (1997)¹, AES17 and EIAJ CP-2150.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60038, *IEC standard voltages*

IEC 60107-5, *Recommended methods of measurement on receivers for television broadcast transmissions – Part 5: Electrical measurements on multichannel sound television receivers using the NICAM two-channel digital sound system*

¹ IEC 61606:1997, *Audio and audiovisual equipment – Digital audio parts – Basic methods of measurement of audio characteristics* (this publication has been replaced by the IEC 61606 series)

IEC 60268-2, *Sound system equipment – Part 2: Explanation of general terms and calculation methods*

IEC 60268-3, *Sound system equipment – Part 3: Amplifiers*

IEC 60958 (all parts), *Digital audio interface*

IEC 61606-2, *Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics – Part 1: Consumer use*

IEC 61606-3, *Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics – Part 3: Professional use*

IEC 61606-4, *Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics – Part 4: Personal computer*

IEC 61079-4, *Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band – Part 4: Electrical measurements on sound/data decoder units for the digital subcarrier NTSC system*

IEC 61079-5, *Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band – Part 5: Electrical measurements on decoder units for MAC/packet systems*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61883-6, *Consumer audio/video equipment – Digital interface – Part 6: Audio and music data transmission protocol*

ITU-R BS 468-4, *Measurement of audio-frequency noise voltage level in sound broadcasting*

AES17, *AES standard method for digital audio engineering – Measurement of digital audio equipment*

3 Terms, definitions, explanations and rated values

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

aliasing components

output frequency components below the folding frequency made from the input signal above the folding frequency

3.1.2

analogue full-scale amplitude

nominal signal level at the analogue input of an EUT corresponding to the digital full-scale level

3.1.3

coding format

series of data bit stream with control information in accordance with the standard for which the EUT is designed, such as IEC 60958, IEC 61883-6 or some kind of AV interface

NOTE A coding word is arranged as a 2's complimentary binary form in this standard.

3.1.4

digital audio signal

series of digital signals expressed by sampled data

NOTE This data is constructed with LPCM (Linear Pulse Code Modulation) data.

3.1.5

digital interface for measurement

type of input or output digital interface which is used for measurement, such as IEC 60958, IEC 61883-6 or some kind of AV interface

NOTE Details are defined in IEC 61606-2 (consumer use) or IEC 61606-3 (professional use).

3.1.6

digital signal generator

all types of digital generators, which including digital sine signal generators or package media or RF signal generators

3.1.7

digital zero

signal that has a value consisting of all zeroes for all samples

3.1.8

equipment under test

EUT

equipment to be measured using the methods described in this standard

3.1.9

folding frequency

one half the sampling frequency of the digital system

NOTE Signals applied to the input with frequency components higher than this frequency are subject to aliasing.

3.1.10

full-scale level

FS

signal level of a sine wave whose positive peak value reaches the positive digital full scale, leaving the negative maximum code unused

EXAMPLE The largest positive value is 7FFFH and the largest negative value is 8001H in 16 bit data.

3.1.11

in-band frequency range

frequency range from 4 Hz to upper band-edge frequency (see 3.1.19).

3.1.12

jitter

deviation of the timing of the transitions of a clock signal from their ideal or nominal times

3.1.13

normal load impedance

impedance which is connected to output terminals of EUT

NOTE The concrete value is defined in IEC 61606-2 (consumer use) or IEC 61606-3 (professional use) or IEC 61606-4 (PC use).

3.1.14

normal measuring level

signal level equal to $-20 \text{ dB}_{\text{FS}}$

3.1.15**normal source impedance**

impedance which is connected to input terminals of EUT

NOTE The concrete value is defined in IEC 61606-2 (consumer use) or IEC 61606-3 (professional use) IEC 61606-4 (PC use).

3.1.16**out-of-band frequencies**

frequency range from folding frequency to 500 kHz.

NOTE Signals applied to the input in this frequency range are subject to aliasing.

3.1.17**sampling frequency**

f_s

number of samples of a signal taken per unit time

3.1.18**signal level**

dB_{FS}

result obtained from the following equation:

$$\text{signal level (dB}_{FS}) = 20 \log_{10} (A/B)$$

where A is the r.m.s. value of the signal whose level is to be determined, and B is the r.m.s. value of a sine wave which corresponds to full-scale level in digital data or to analogue full-scale level in analogue signals

3.1.19**upper band-edge frequency**

frequency calculated by the equation:

$$f_s \times 0,46$$

NOTE If f_s is higher than 44,1 kHz, the manufacturer may define the upper band-edge frequency between 20 kHz and $f_s \times 0,46$. In this case, the upper band-edge frequency should be stated in the system description by the manufacturer.

3.1.20**word length**

number of bits of a data element

NOTE The least significant bit of the data element should not be ignored.

3.2 Explanation of term “jitter”

The performance of conversion processes are potentially affected by jitter present on the synchronization input, the digital audio inputs, or both. For example, if the sampling clock for the analogue-to-digital converter inside the EUT is derived from or locked to either the synchronization input or a digital audio input, jitter present on that input can degrade conversion accuracy.

There are various types of jitter susceptibility to be considered such as analogue-to-digital jitter susceptibility, digital-to-analogue susceptibility, and digital-to-digital susceptibility. See AES17 for detailed discussion on the subject.

3.3 Rated values

For a full explanation of these terms, see IEC 60268-2. The following are rated conditions for digital audio equipment and should be specified by the manufacturer:

- rated supply voltage;
- rated supply frequency;
- rated pre-emphasis and de-emphasis characteristics;
- rated digital input word length;
- rated sampling frequencies.

4 Measuring conditions

4.1 Environmental conditions

Air pressure	96 kPa \pm 10 kPa
Ambient temperature	15 °C to 35 °C
Relative humidity	60 % \pm 15 %

4.2 Power supply

4.2.1 Supply voltage

The rated power supply voltage, as specified in IEC 60038, shall be used. The tolerance of the supply voltage should be ± 1 % or less. A tolerance of up to ± 10 % may be allowed if the results of the measurements are not noticeably affected.

4.2.2 Frequency(ies)

The power supply frequency(ies) specified by the manufacturer shall be used. The tolerance of the frequency should be ± 2 % or less. A d.c. power supply may be used if specified.

4.2.3 High-frequency and harmonic components (or ripples) in the power supply output

High-frequency components in the power supply output should be less than the level which affects the result of measurement.

4.3 Test signal frequencies

The frequency of the test signal shall be selected from the actual values in Table 1. In catalogues and other documents, where precision is not required or implied in the description, it is permitted to use the normal figures shown in Table 1. Unless otherwise specified, the reference frequency for measurements shall be 997 Hz, which may be stated in non-critical contexts, as 1 kHz.