IEC 61606-3

Edition 1.0 2008-10

INTERNATIONAL STANDARD

Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics – Part 3: Professional use

IEC 61606-3:2008(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE X

ICS 33.160.30

ISBN 978-2-88910-549-6

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

Part 3: Professional use

FOREWORD

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International Standard IEC 61606-3 has been prepared by IEC technical committee 100:Audio, video and multimedia systems and equipment.

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

FDIS	Report on voting
100/1428/FDIS	100/1453/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.

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

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 International Standard is to be used in conjunction with IEC 61606-1.

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- withdrawn,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
- amended.

A bilingual version of this publication may be issued at a later date.

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

Part 3: Professional use

1 Scope

This part of IEC 61606 is applicable to the basic measurement methods of audio equipment for professional use.

The definitions, measuring conditions and methods common to both consumer and professional equipment are described in the IEC 61606-1.

This standard contains details of definitions and measuring conditions and methods applicable to professional equipment which differ from those described in IEC 61606-1.

This standard excludes consideration of

- measurement of low-quality audio devices,
- measurement of low-bit-rate audio devices (‘sub-band’ or ‘perceptual’ coding devices),
- measurement of devices which significantly modify time or frequency characteristics of the signal, such as pitch shifters or reverberators,
- measurement of signals from analogue input to analogue output, beyond the most general,
- EMC and safety related testing.

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 60268-1, *Sound system equipment – Part 1: General*

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

IEC 60958-1, *Digital audio interface – Part 1: General*

IEC 61260, *Electroacoustics – Octave-band and fractional-octave-band filters*

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

AES11-2003, *AES Recommended Practice for Digital Audio Engineering – Synchronization of digital audio equipment in studio operations*

3 Terms and definitions

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

3.1
aliasing components
see definition in IEC 61606-1

3.2
analogue full-scale input and output amplitude
when applied to an analogue input of the EUT, it produces digital full-scale amplitude within the EUT; conversely, the analogue output full-scale amplitude is that which is produced at an analogue output from the EUT by a digital full-scale amplitude within the EUT

NOTE 1 Sometimes the range of an analogue input or output path may be less than that corresponding to digital full-scale amplitude. For this reason, analogue full-scale input and output amplitudes are usually inferred by driving the converters at a lower amplitude (see 6.3.1.1 and 6.3.2.1).

NOTE 2 The ideal values of these amplitudes cannot be defined within the standard since they are different for different EUTs, and may be modally variable for a single EUT.

NOTE 3 Where these values are unknown for an EUT at the outset of testing, they should generally be established first (using the methods described in 6.3.1.1 and 6.3.2.1 since it may subsequently be necessary, for example, to drive an analogue input at –60 dB_{FS} or to measure an amplitude at an analogue output in dB_{FS} relative to a digital stimulus.

3.3
coding format
a numerical convention used to represent digital audio data at the inputs or outputs of the EUT

NOTE This standard is primarily intended to be applied to EUTs which transact digital audio signals expressed as a stream of LPCM (Linear Pulse Code Modulation) samples; that is, a stream of binary words, directly representing the amplitudes of successive audio samples quantised at the sampling frequency, and rendered as binary 2's complement numbers. Positive analogue voltages correspond to positive digital sample values (that is, 2's complement numbers whose most-significant bit (MSB) is zero). Many of the methods described in the standard are applicable to other coding formats.

3.4
decibels full-scale
dB_{FS}
the r.m.s. amplitude of a sinusoid described in 3.10 is defined as 0 dB_{FS}, where the amplitude of any signal can be defined in dB_{FS} as 20 times the common logarithm of the ratio of the r.m.s. amplitude of the signal to that of the signal defined in 3.10

NOTE Analogue amplitudes at the input or output of an EUT can be expressed in dB_{FS} by referring to the analogue full-scale input or output amplitudes as defined in 3.2.

3.5
digital audio interface
a physical medium upon which digital audio data are transferred into or out of the EUT

NOTE Digital audio interfaces may include packaged media (such as in the case of a CD player) or radio-frequency (RF) carriers (such as in the case of a set-top-box) as well as conventional copper or optical digital interconnections.

3.6
digital audio signal
see definition in IEC 61606-1

3.7
digital zero
see definition in IEC 61606-1

3.8
equipment under test
EUT
see definition in IEC 61606-1

NOTE In structuring an equipment or installation specification, it is important to consider the way in which the different elements of the equipment might best be segmented for the purposes of the specification or measurement. A basic D/A converter, for example, would represent a simple EUT with 'General characteristics', 'Digital input characteristics' and 'Analogue output characteristics'. But consider a large studio mixing console, which may have many different functional blocks, and many different inputs and outputs of different types and in different domains. Such a mixing console example might be considered as a collection of different elements; for example, 'analogue line inputs', 'analogue mic inputs', 'AES3 inputs', 'channel equalizers', 'mix bus processors' etc. Typically, different measurement criteria are applicable to each different element, and different performance levels might be specified. In such a case each element or subsystem should, where possible, be considered as a discrete 'EUT' and should be specified and measured individually. In addition, typical signal paths through the entire equipment may also be specified, and their performance criteria stated as a single EUT.

3.9
folding frequency
half the sampling frequency of the EUT

NOTE 1 Signals above this frequency applied to the EUT are subject to aliasing.

NOTE 2 Complex EUTs may have an input folding frequency and an output folding frequency which are different. In such cases, where input or output is unspecified, the folding frequency shall refer to the lower frequency.

3.10
full-scale amplitude
FS
amplitude of a 997 Hz sinusoid whose peak positive sample just reaches positive digital full-scale (in 2's-complement a binary value of 0111…1111 to make up the word length) and whose peak negative sample just reaches a value one away from negative digital full-scale (1000…0001 to make up the word length) leaving the maximum negative code (1000…0000) unused

3.11
high and low interference frequencies
moderately high and low signal frequencies of 15 kHz and 60 Hz respectively at which certain interference effects may be quoted if a graphical report is not required

3.12
in-band amplitude
an amplitude measurement incorporating a standard low-pass filter so as to exclude out-of-band components above the upper band-edge frequency

3.13
in-band frequency range
see definition in IEC 61606-1

3.14
input word length
the maximum audio word length which can be applied to a digital input of the EUT at its present settings, for which the least significant bit is not ignored

3.15
interface jitter
timing errors in the transitions of a digital audio carrier or reference sync, owing to cabling effects or jitter in the clock of the sourcing equipment

3.16
jitter susceptibility
the effect on EUT performance as a result of sampling jitter caused by interface jitter on the incoming reference sync

3.17
maximal measuring amplitude
a signal amplitude of –1 dB_{FS}, close to (but below) full scale amplitude, which is applied to the EUT in certain of the described methods

NOTE This definition can apply to either a digital or an analogue signal (see 3.4).

3.18
normal load impedance
required differential input impedance of the analogue measuring equipment defined as 100 kΩ or more, in parallel with not more than 500 pF in this standard

3.19
normal measuring amplitude
a signal amplitude of −20 dB_{FS}, representative of a typical operating amplitude, which is applied to the EUT in certain of the described methods

NOTE This definition can apply to either a digital or an analogue signal (see 3.4).

3.20
normal measuring frequency
a signal frequency of 997 Hz, representative of a typical mid-range frequency, which is applied to the EUT in certain of the described methods

3.21
normal source impedance
required differential output impedance of the analogue measuring equipment defined as 50 Ω or less for a balanced output and 25 Ω or less for an unbalanced output in this standard

3.22
out-of-band amplitude
amplitude measurement incorporating a standard out-of-band filter so as to exclude in-band components below the upper band-edge frequency

3.23
out-of-band frequency range
frequency range from the folding frequency to 192 kHz (or some other stated maximum)

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

3.24
output word length
number of significant bits transmitted by a digital output of the EUT at its present settings, of which none is continuously zero

3.25
residual amplitude
an amplitude measurement incorporating a standard band-reject filter to suppress the effects of an unwanted frequency, usually the stimulus frequency

3.26
sampling frequency
f_s
the rate at which audio samples are processed within the EUT