



INTERNATIONAL STANDARD

Sound system equipment – Part 3: Amplifiers

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.160.10

ISBN 978-2-8322-5587-2

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and rated values	8
3.1 Terms and definitions.....	8
3.2 Rated values.....	9
4 Conditions	9
4.1 Rated conditions and standard measuring conditions	9
4.1.1 Overview	9
4.1.2 Rated conditions.....	10
4.1.3 Standard measuring conditions.....	11
4.2 Other conditions.....	11
5 Classes of operation.....	11
6 Interchangeable parts	11
7 Automatic controls	11
8 Power supply.....	12
9 Position of the volume controls	12
10 Pre-conditioning for measurements	12
11 Series of measurements	12
12 Variable consumption apparatus.....	13
13 Marking	13
14 Operating environment	13
15 Characteristics to be specified, and their methods of measurement.....	14
15.1 Power supply characteristics.....	14
15.1.1 Characteristics to be specified.....	14
15.1.2 Method of measurement	14
15.2 Tolerance of (long-term) power supply voltage variations.....	14
15.2.1 Characteristic to be specified.....	14
15.2.2 Methods of measurement	15
15.3 Tolerance of power supply frequency variations.....	16
15.3.1 Characteristics to be specified.....	16
15.3.2 Methods of measurement	16
15.4 Tolerance of power supply harmonics and ripple.....	16
15.4.1 Characteristics to be specified.....	16
15.4.2 Methods of measurement	17
15.5 Input characteristics.....	17
15.5.1 Rated source impedance, characteristic to be specified.....	17
15.5.2 Input impedance	17
15.5.3 Rated source e.m.f., characteristic to be specified	19
15.5.4 Minimum source e.m.f. for rated distortion-limited output voltage.....	19
15.6 Output characteristics	19
15.6.1 Rated load impedance, characteristic to be specified.....	19
15.6.2 Output source impedance	20
15.6.3 Output voltage and power (distortion-limited).....	21
15.6.4 Maximum effective output power (distortion-limited at 10 %).....	22

15.6.5	Regulation	23
15.6.6	Overload restoring time	24
15.7	Limiting characteristics	24
15.7.1	Overload source e.m.f.	24
15.7.2	Short-term maximum output voltage and power	25
15.7.3	Long-term maximum output voltage and power	25
15.7.4	Temperature-limited output power	26
15.8	Characteristics of protection circuits	27
15.8.1	General	27
15.8.2	Protection against potentially damaging combinations of output voltage and current	28
15.8.3	Characteristics of d.c. offset protection circuits	29
15.9	Sustaining-time for rated (distortion-limited) output voltage or power	30
15.9.1	General	30
15.9.2	Characteristic to be specified	31
15.9.3	Method of measurement	31
15.10	Gain	31
15.10.1	Voltage gain and e.m.f. gain	31
15.10.2	Maximum e.m.f. gain	32
15.10.3	Attenuation characteristic of the volume control	32
15.10.4	Attenuation characteristic of balance controls for multi-channel equipment	33
15.11	Response	33
15.11.1	Gain-frequency response	33
15.11.2	Gain-limited effective frequency range	34
15.11.3	Distortion-limited effective frequency range	34
15.11.4	Phase-frequency response	34
15.12	Amplitude non-linearity	35
15.12.1	General	35
15.12.2	Rated total harmonic distortion, characteristic to be specified	35
15.12.3	Total harmonic distortion under standard measuring conditions	35
15.12.4	Total harmonic distortion as a function of amplitude and frequency	36
15.12.5	Harmonic distortion of the n th order under standard measuring conditions	36
15.12.6	Harmonic distortion of the n th order as a function of amplitude and frequency	37
15.12.7	Modulation distortion of the n th order (where $n = 2$ or $n = 3$)	38
15.12.8	Difference-frequency distortion of the n th order (where $n = 2$ or $n = 3$)	40
15.12.9	Dynamic intermodulation distortion (DIM)	41
15.12.10	Total difference frequency distortion	43
15.12.11	Weighted total harmonic distortion	44
15.13	Noise	45
15.13.1	Characteristic to be specified	45
15.13.2	Method of measurement	45
15.14	Hum	46
15.14.1	General	46
15.14.2	Characteristics to be specified	46
15.14.3	Method of measurement	46
15.15	Balanced inputs and outputs	47
15.15.1	Balance of the input	47

15.15.2	Overload (distortion-limited) peak-to-peak common-mode input voltage.....	48
15.15.3	Balance of the output.....	49
15.16	Cross-talk and separation in multi-channel amplifiers.....	50
15.16.1	Characteristics to be specified.....	50
15.16.2	Method of measurement.....	50
15.17	Gain and phase differences between channels in multi-channel amplifiers.....	51
15.17.1	Gain difference.....	51
15.17.2	Phase difference.....	52
15.18	Dimensions and mass, characteristics to be specified.....	52
Annex A (informative)	Balanced interfaces.....	59
Annex B (informative)	Specification of a multi-channel amplifier.....	60
B.1	General.....	60
B.2	Example specification of a 5.1 channel amplifier.....	60
B.3	Example specification of a 5 channel amplifier.....	60
Bibliography	62
Figure 1	– Example block diagram for multi-channel amplifier.....	53
Figure 2	– Connection diagram of equipment for digital input.....	53
Figure 3	– Arrangements for the Class D amplifier.....	54
Figure 4	– Arrangements for measuring input impedance.....	54
Figure 5	– Oscillogram when measuring overload restoring time.....	55
Figure 6	– Protection against potentially damaging combinations of output voltage and current.....	56
Figure 7	– Arrangement for combining two input signals.....	57
Figure 8	– Frequency spectrum below 30 kHz of the signal for measuring dynamic intermodulation distortion.....	57
Figure 9	– Arrangement for measuring the balance of a balanced input.....	58
Figure 10	– Arrangement for measuring the internal impedance balance of a balanced output.....	58
Figure 11	– Arrangement for measuring the voltage symmetry of a balanced output.....	58
Figure B.1	– Block diagram for a 5.1 channel surround amplifier.....	60
Figure B.2	– Block diagram for a 5 channel surround amplifier.....	61
Table 1	– Different rated total harmonic distortion and rated distortion-limited output power specifications for the same amplifier.....	30
Table 2	– Distortion components due to dynamic intermodulation distortion falling in the frequency range up to 20 kHz.....	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOUND SYSTEM EQUIPMENT –

Part 3: Amplifiers

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60268-3 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This fifth edition cancels and replaces the fourth edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) rated condition of digital input is newly specified;
- b) tolerance of rated power supply is changed;
- c) maximum effective output power is appended to output characteristics list;
- d) "Terms, definitions and rated values" clause is complemented.

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

CDV	Report on voting
100/2960/CDV	100/3069/RVC

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

A list of all parts in the IEC 60268 series, published under the general title *Sound system equipment*, can be found on the IEC website.

This part of IEC 60268 shall be used in conjunction with IEC 60268-1:1985 and IEC 60268-2:1987.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

SOUND SYSTEM EQUIPMENT –

Part 3: Amplifiers

1 Scope

This part of IEC 60268 applies to analogue amplifiers, and the analogue parts of analogue/digital amplifiers, which form part of a sound system for professional or household applications. It specifies the characteristics that should be included in specifications of amplifiers and the corresponding methods of measurement.

NOTE The methods of measurement for digital amplifiers and similar equipment are given in IEC 61606 [1]¹.

In general, the specified methods of measurement are those which are seen to be most directly related to the characteristics. This does not exclude the use of other methods that give equivalent results.

In general, the methods are based on the simplest measuring equipment which can provide useful results. This does not exclude the use of more complex equipment that can give higher accuracy and/or allow automatic measurement and recording of results.

Rated conditions and standard measuring conditions are specified in order to allow measurements to be reliably repeated.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60268-1:1985, *Sound system equipment – Part 1: General*

IEC 60268-1:1985/AMD1:1988

IEC 60268-1:1985/AMD2:1988

IEC 60268-2:1987, *Sound system equipment – Part 2: Explanation of general terms and calculation methods*

Amendment 1:1991

IEC 60417:2002, *Graphical symbols for use on equipment – 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417*

IEC 60958:2016 (all parts), *Series, Digital audio interface*

¹ Numbers in square brackets refer to the Bibliography.

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-13:2002/AMD1:2009

IEC 61000-4-13:2002/AMD2:2015

IEC 61000-4-17:1999, *Electromagnetic Compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*

IEC 61000-4-17:1999/AMD1:2001

IEC 61000-4-17:1999/AMD2:2008

IEC 61000-4-29:2000, *Electromagnetic Compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power ports immunity tests*

IEC 61606-1:2009, *Audio and audiovisual equipment – Digital audio parts – Basic measurement methods of audio characteristics – Part 1: General*

IEC 61883-6:2014, *Consumer audio/video equipment – Digital interface – Part 6: Audio and music data transmission protocol*

IEC 61938:2013, *Multimedia systems – Guide to the recommended characteristics of analogue interfaces to achieve interoperability*