

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Sound system equipment –
Part 3: Amplifiers**

**Équipements pour systèmes électroacoustiques –
Partie 3: Amplificateurs**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



IEC 60268-3

Edition 4.0 2013-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Sound system equipment –
Part 3: Amplifiers**

**Équipements pour systèmes électroacoustiques –
Partie 3: Amplificateurs**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE **XB**
CODE PRIX

ICS 33.160.10

ISBN 978-2-83220-735-2

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Conditions	8
3.1 Rated conditions and standard measuring conditions	8
3.1.1 Overview.....	8
3.1.2 Rated conditions	8
3.1.3 Standard measuring conditions	9
3.2 Other conditions.....	9
4 Classes of operation.....	9
5 Interchangeable parts.....	10
6 Automatic controls.....	10
7 Power supply.....	10
8 Position of the volume controls	10
9 Pre-conditioning for measurements	11
10 Series of measurements	11
11 Variable consumption apparatus.....	11
12 Marking	11
13 Operating environment	12
14 Characteristics to be specified, and their methods of measurement.....	12
14.1 Power supply characteristics	12
14.1.1 Characteristics to be specified	12
14.1.2 Method of measurement	12
14.2 Tolerance of (long-term) power supply voltage variations	13
14.2.1 Characteristic to be specified.....	13
14.2.2 Methods of measurement	13
14.3 Tolerance of power supply frequency variations	14
14.3.1 Characteristics to be specified	14
14.3.2 Methods of measurement	14
14.4 Tolerance of power supply harmonics and ripple	15
14.4.1 Characteristics to be specified	15
14.4.2 Methods of measurement	15
14.5 Input characteristics	15
14.5.1 Rated source impedance, characteristic to be specified.....	15
14.5.2 Input impedance	15
14.5.3 Rated source e.m.f., characteristic to be specified.....	17
14.5.4 Minimum source e.m.f. for rated distortion-limited output voltage.....	17
14.6 Output characteristics.....	18
14.6.1 Rated load impedance, characteristic to be specified.....	18
14.6.2 Output source impedance	18
14.6.3 Output voltage and power (distortion-limited).....	19
14.6.4 Regulation	20
14.6.5 Overload restoring time	20
14.7 Limiting characteristics	21
14.7.1 Overload source e.m.f.	21

14.7.2	Short-term maximum output voltage and power	21
14.7.3	Long-term maximum output voltage and power	22
14.7.4	Temperature-limited output power	23
14.8	Characteristics of protection circuits	24
14.8.1	General	24
14.8.2	Protection against potentially damaging combinations of output voltage and current.....	24
14.8.3	Characteristics of d.c. offset protection circuits	25
14.9	Sustaining-time for rated (distortion-limited) output voltage or power	26
14.9.1	General	26
14.9.2	Characteristic to be specified.....	27
14.9.3	Method of measurement	28
14.10	Gain.....	28
14.10.1	Voltage gain and e.m.f. gain	28
14.10.2	Maximum e.m.f. gain.....	28
14.10.3	Attenuation characteristic of the volume control	28
14.10.4	Attenuation characteristic of balance controls for multi-channel equipment	29
14.11	Response	30
14.11.1	Gain-frequency response.....	30
14.11.2	Gain-limited effective frequency range	30
14.11.3	Distortion-limited effective frequency range	31
14.11.4	Phase-frequency response	31
14.12	Amplitude non-linearity	31
14.12.1	General.....	31
14.12.2	Rated total harmonic distortion, characteristic to be specified	31
14.12.3	Total harmonic distortion under standard measuring conditions	32
14.12.4	Total harmonic distortion as a function of amplitude and frequency.....	32
14.12.5	Harmonic distortion of the <i>n</i> th order under standard measuring conditions.....	33
14.12.6	Harmonic distortion of the <i>n</i> th order as a function of amplitude and frequency	34
14.12.7	Modulation distortion of the <i>n</i> th order (where <i>n</i> = 2 or <i>n</i> = 3)	34
14.12.8	Difference-frequency distortion of the <i>n</i> th order (where <i>n</i> = 2 or <i>n</i> = 3)	36
14.12.9	Dynamic intermodulation distortion (DIM).....	37
14.12.10	Total difference frequency distortion.....	39
14.12.11	Weighted total harmonic distortion	40
14.13	Noise	41
14.13.1	Characteristic to be specified	41
14.13.2	Method of measurement.....	41
14.14	Hum.....	42
14.14.1	General	42
14.14.2	Characteristics to be specified	42
14.14.3	Method of measurement.....	42
14.15	Balanced inputs and outputs	43
14.15.1	Balance of the input	43
14.15.2	Overload (distortion-limited) peak-to-peak common-mode input voltage	44
14.15.3	Balance of the output	44

14.16	Cross-talk and separation in multi-channel amplifiers.....	46
14.16.1	Characteristics to be specified	46
14.16.2	Method of measurement.....	46
14.17	Gain and phase differences between channels in multi-channel amplifiers	47
14.17.1	Gain difference	47
14.17.2	Phase difference.....	48
14.18	Dimensions and mass, characteristics to be specified	48
Annex A (informative)	Balanced interfaces.....	56
Annex B (informative)	Specification of a multi-channel amplifier.....	57
Bibliography.....		59
Figure 1	– Example block diagram for multi-channel amplifier	49
Figure 2	– Arrangements for the Class D amplifier	50
Figure 3	– Arrangements for measuring input impedance.....	51
Figure 4	– Oscillogram when measuring overload restoring time	52
Figure 5	– Protection against potentially damaging combinations of output voltage and current	53
Figure 6	– Arrangement for combining two input signals	54
Figure 7	– Frequency spectrum below 30 kHz of the signal for measuring dynamic intermodulation distortion.....	54
Figure 8	– Arrangement for measuring the balance of a balanced input	55
Figure 9	– Arrangement for measuring the internal impedance balance of a balanced output	55
Figure 10	– Arrangement for measuring the voltage symmetry of a balanced output	55
Figure B.1	– Block diagram for a 5.1 channel surround amplifier.....	57
Figure B.2	– Block diagram for a 5 channel surround amplifier.....	58
Table 1	– Different rated total harmonic distortion and rated distortion-limited output power specifications for the same amplifier.....	27
Table 2	– Distortion components due to dynamic intermodulation distortion falling in the frequency range up to 20 kHz	38

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 fourth edition cancels and replaces the third edition published in 2000. This edition constitutes a technical revision.

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

- rated condition of multi-channel amplifier is expanded;
- arrangement for the D-class amplifier is added;
- method of measurement for output power (distortion-limited) is expanded;
- Annex B is newly added.