



**SLOVENSKI STANDARD**  
**SIST EN IEC 60268-3:2019**  
**01-februar-2019**

**Nadomešča:**  
**SIST EN 60268-3:2013**

---

**Elektroakustične naprave - 3. del: Ojačevalniki**

Sound system equipment - Part 3: Amplifiers

Elektroakustische Geräte - Teil 3: Verstärker

**iTeh STANDARD PREVIEW**  
Equipements pour systèmes électroacoustiques - Partie 3: Amplificateurs  
**(standards.iteh.ai)**

**Ta slovenski standard je istoveten z: EN IEC 60268-3:2018**

<https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fdde2f7239af/sist-en-iec-60268-3-2019>

---

**ICS:**

33.160.10      Ojačevalniki                      Amplifiers

**SIST EN IEC 60268-3:2019**                      **en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 60268-3:2019](#)

<https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019>

EUROPEAN STANDARD

**EN IEC 60268-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2018

ICS 33.160.10

Supersedes EN 60268-3:2013

English Version

**Sound system equipment - Part 3: Amplifiers  
(IEC 60268-3:2018)**

Equipements pour systèmes électroacoustiques - Partie 3:  
amplificateurs  
(IEC 60268-3:2018)

Elektroakustische Geräte - Teil 3: Verstärker  
(IEC 60268-3:2018)

This European Standard was approved by CENELEC on 2018-05-30. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

(standards.iteh.ai)

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**EN IEC 60268-3:2018 (E)****European foreword**

The text of document 100/2960/CDV, future edition 5 of IEC 60268-3, prepared by IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60268-3:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-02-28
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-05-30

This document supersedes EN 60268-3:2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

**Endorsement notice**

The text of the International Standard IEC 60268-3:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61606 series	NOTE	Harmonized as EN 61606 series.
IEC 60268-5:2003	NOTE	Harmonized as EN 60268-5:2003.
IEC 60268-5:2003/A1:2007	NOTE	Harmonized as EN 60268-5:2003/A1:2009.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

Publication	Year	Title	EN/HD	Year
IEC 60065 (mod)	2014	Audio, video and similar electronic apparatus - Safety requirements	EN 60065	2014
-	-		+ A1	2017
IEC 60268-1	1985	Sound system equipment -- Part 1: General	HD 483.1 S2	1989
+ A1	1988		-	-
+ A2	1988		-	-
IEC 60268-2	1987	Sound system equipment - Part 2: Explanation of general terms and calculation methods	HD 483.2 S2	1993
+ A1	1991		-	-
IEC 60417	2002	Graphical symbols for use on equipment	-	-
IEC 60958 series	series	Digital audio interface	EN 60958	series
IEC 61000-4-13	2002	Electromagnetic compatibility (EMC) -- Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests	EN 61000-4-13	2002
+ A1	2009		+ A1	2009
+ A2	2015		+ A2	2016
IEC 61000-4-17	1999	Electromagnetic compatibility (EMC) -- Part 4-17: Testing and measurement techniques - Ripple on d.c. input power port immunity test	EN 61000-4-17	1999
+ A1	2001		+ A1	2004
+ A2	2008		+ A2	2009
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 port immunity tests	EN 61000-4-29	2000
IEC 61606-1	2009	Audio and audiovisual equipment - Digital audio parts - Basic measurement methods of audio characteristics -- Part 1: General	EN 61606-1	2009
IEC 61883-6	2014	Consumer audio/video equipment - Digital interface - Part 6: Audio and music data transmission protocol	EN 61883-6	2014
IEC 61938	2013	Multimedia systems - Guide to the recommended characteristics of analogue interfaces to achieve interoperability	EN 61938	2013

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN IEC 60268-3:2019

<https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019>



IEC 60268-3

Edition 5.0 2018-04

# INTERNATIONAL STANDARD

Sound system equipment –  
Part 3: Amplifiers

**STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 60268-3:2019](https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019)

<https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019>

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.

**ITeH STANDARD PREVIEW**  
**(standards.iteh.ai)**

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

[SIST EN IEC 60268-3:2019](https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019)

<https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-fddc2f7239af/sist-en-iec-60268-3-2019>

## 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]<sup>1</sup>.

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

[SIST EN IEC 60268-3:2019](https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-f1dc2f7239af/sist-en-iec-60268-3-2019)

[https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-](https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-f1dc2f7239af/sist-en-iec-60268-3-2019)

[f1dc2f7239af/sist-en-iec-60268-3-2019](https://standards.iteh.ai/catalog/standards/sist/e8fa596c-3929-4b2b-a572-f1dc2f7239af/sist-en-iec-60268-3-2019)

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*

<sup>1</sup> 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*

## iTeh STANDARD PREVIEW

### 3 Terms, definitions and rated values

(standards.iteh.ai)

#### 3.1 Terms and definitions

SIST EN IEC 60268-3:2019

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

https://standards.iteh.ai/catalog/standards/sist/en-iec-60268-3-2019/fdc2f7239af/sist-en-iec-60268-3-2019

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1.1

###### class A

class of operation in which the current in each active device supplying the load current is greater than zero throughout each cycle of the signal for all values of load current up to, and including, the value determined by the rated output power or voltage and the rated load impedance

##### 3.1.2

###### class B

class of operation in which the current in each active device supplying the load current is equal to zero for exactly one-half of each cycle of load current

Note 1 to entry: In common usage, the term Class B is extended to the case where current flows for slightly more than one half-cycle.

Note 2 to entry: Classes G and H are modifications of class B with improved efficiency.

##### 3.1.3

###### class AB

class of operation in which the current in at least one of the active devices supplying the load current is zero for some part of each cycle of load current for some range of values of load current not exceeding the value defined by the rated output power or voltage and the rated load impedance

Note 1 to entry: At sufficiently low signal levels, a Class AB amplifier usually operates in Class A.

### 3.1.4 class D

class of operation in which all active power devices are switched between fully on and fully off at a rate faster than the highest frequency of interest, and where the wanted signal is encoded in the switching pattern

Note 1 to entry: Other classes of operation have been commercialized but no formal definitions of such classes have been submitted for standardization.

## 3.2 Rated values

A full explanation of the term "rated" is given in IEC 60268-2.

The rated conditions for amplifiers are:

- rated power supply voltage;
- rated source impedance;
- rated source e.m.f.;
- rated load impedance;
- rated total harmonic distortion, or rated (distortion-limited) output voltage or power;
- rated mechanical and climatic conditions.

NOTE 1 Total harmonic distortion and (distortion-limited) output voltage or power are interdependent. Both cannot be taken as rated conditions simultaneously because normally a given sample amplifier produces less than rated total harmonic distortion at rated output voltage or power.

NOTE 2 If the power supply frequency is critical, it is also a rated condition.

To obtain the correct conditions for measurements, the values for the above-mentioned rated conditions shall be taken from the manufacturer's specification. These values themselves are not subject to measurement but they constitute the basis for measuring the other characteristics.

Methods of measurement for these other characteristics are given in this document and the manufacturer is either required or permitted to state 'rated values' for these characteristics in the specification of the equipment. These include

- rated voltage gain;
- rated distortion limited output voltage or power (when not adopted as a rated condition);
- rated signal-to-noise ratio;
- rated equivalent noise source e.m.f.

## 4 Conditions

### 4.1 Rated conditions and standard measuring conditions

#### 4.1.1 Overview

For convenience in specifying how amplifiers shall be set up for measurement, sets of conditions are specified in this document, under the titles of "Rated conditions" and "Standard measuring conditions".