

© Copyright SEK. Reproduction in any form without permission is prohibited.

Akustik – Filter för oktavband och delar av oktavband – Del 1: Specifikationer

*Electroacoustics –
Octave-band and fractional-octave-band filters –
Part 1: Specifications*

Som svensk standard gäller europastandarden EN 61260-1:2014. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61260-1:2014.

Nationellt förord

Europastandarden EN 61260-1:2014

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 61260-1, First edition, 2014 - Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61260, utgåva 1, 1996 och SS-EN 61260/A1, utgåva 1, 2002, gäller ej fr o m 2017-03-21.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

**Electroacoustics - Octave-band and fractional-octave-band filters
- Part 1: Specifications
(IEC 61260-1:2014)**

Electroacoustique - Filtres de bande d'octave et de bande
d'une fraction d'octave - Partie 1: Spécifications
(CEI 61260-1:2014)

Elektroakustik - Bandfilter für Oktaven und Bruchteile von
Oktaven - Teil 1: Anforderungen
(IEC 61260-1:2014)

This European Standard was approved by CENELEC on 2014-03-21. 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.

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, 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: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 29/835/FDIS, future edition 1 of IEC 61260-1, prepared by IEC/TC 29 "Electroacoustics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61260-1:2014.

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) 2014-12-21
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-03-21

This document supersedes EN 61260:1995.

EN 61260-1:2014 includes the following significant technical changes with respect to EN 61260:1995:

- a) the single document in the first edition of EN 61260:1995 is in EN 61260 series separated into the three parts covering: specifications, pattern evaluation tests and periodic tests;
- b) the EN 61260:1995 specified three performance categories: classes 0, 1 and 2. The EN 61260 series specifies requirements for class 1 and 2;
- c) in the EN 61260:1995, the design goals for the specification can be based on base-2 or base 10 design. In EN 61260 series only base-10 is specified;
- d) the reference environmental conditions have been changed from 20 °C / 65 % RH to 23 °C / 50 % RH;
- e) EN 61260:1995 specified tolerance limits without considering the uncertainty of measurement for verification of the specifications. EN 61260 series specifies acceptance limits for the observed values and maximum-permitted uncertainty of measurements for laboratories testing conformance to specifications in the standard.

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

Endorsement notice

The text of the International Standard IEC 61260-1:2014 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:

CISPR 16-1-1:2010 NOTE Harmonised as EN 55016-1-1:2010.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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

NOTE 1 When 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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-2	-	Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	-
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
IEC 61000-6-1	2005	Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	EN 61000-6-1	2007
IEC 61000-6-2	2005	Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2	2005
IEC 61000-6-3	2006	Electromagnetic compatibility (EMC) -- Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	EN 61000-6-3	2007
IEC 61672-1	-	Electroacoustics - Sound level meters -- Part 1: Specifications	EN 61672-1	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement -- Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
ISO/IEC Guide 98-4	2012	Uncertainty of measurement -- Part 4: Role of measurement uncertainty in conformity assessment	-	-
CISPR 22 (mod)	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55022	2010
			+AC	2011

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	8
4 Reference environmental conditions.....	12
5 Performance requirements.....	12
5.1 General.....	12
5.2 Octave frequency ratio	13
5.3 Reference frequency	13
5.4 Exact mid-band frequencies	13
5.5 Nominal mid-band frequencies.....	13
5.6 Band-edge frequencies.....	14
5.7 Time-averaged signal levels	14
5.8 Filter attenuation	14
5.9 Reference attenuation	15
5.10 Relative attenuation	15
5.11 Normalized effective bandwidth	18
5.12 Effective bandwidth deviation	19
5.13 Linear operating range	19
5.14 Time-invariant operation.....	20
5.15 Anti-alias filters	20
5.16 Summation of output signals.....	21
5.17 Overload indicator	21
5.18 Filter decay time.....	21
5.19 Maximum input signal.....	21
5.20 Output terminals and terminating impedances	22
5.21 Power supply check	22
5.22 Sensitivity to various environments.....	22
5.22.1 General.....	22
5.22.2 Ambient air temperature and relative humidity	22
5.23 Electrostatic-discharge and electromagnetic-compatibility requirements	22
5.23.1 General.....	22
5.23.2 Electrostatic discharges.....	23
5.23.3 Immunity to power-frequency and radio-frequency fields	23
5.23.4 Emission limits	25
6 Instrument marking	25
7 Instruction manual	26
7.1 General.....	26
7.2 Operation.....	26
7.3 Testing.....	27
Annex A (informative) Relationship between tolerance interval, corresponding acceptance interval and the maximum-permitted uncertainty of measurement	28
Annex B (normative) Maximum-permitted expanded uncertainties of measurement	29
Annex C (informative) Examples of conformance assessment to specifications of this standard	30

C.1	General.....	30
C.2	Conformance criteria	30
C.3	Example test results	31
Annex D (informative) Base 2 filters		33
Annex E (normative) Nominal mid-band frequencies		34
E.1	Mid-band frequencies for octave-band and one-third-octave-band filters.....	34
E.2	Mid-band frequencies for one-half-octave-band filters	34
E.3	Mid-band frequencies for other bandwidths	34
Annex F (informative) Normalized frequencies at breakpoints of acceptance limits on minimum and maximum relative attenuation for one-third-octave-band filters.....		36
Annex G (informative) Filter response to exponentially swept sinusoidal signals.....		38
G.1	Exponential frequency sweep	38
G.2	Response of set of band-pass filters to a sweep.....	38
Annex H (informative) Measurement of filter decay time.....		41
H.1	General.....	41
H.2	Measurement of filter decay time	41
H.2.1	Instruments with the capability to measure reverberation time	41
H.2.2	Instruments without the capability to measure reverberation time	41
Bibliography		43
Figure 1 – Minimum and maximum limits on relative attenuation as a function of f/f_m for class 1 and class 2 octave-band filters		17
Figure A.1 – Relationship between tolerance interval, corresponding acceptance interval and the maximum-permitted uncertainty of measurement.....		28
Figure C.1 – Examples of conformance assessment		32
Figure G.1 – Relation between the logarithmic frequency scale and the linear time scale due to the exponential sweep.....		40
Table 1 – Acceptance limits on relative attenuation for octave-band filters		15
Table 2 – Limits for radiated disturbance of class B Information Technology Equipment (ITE) at a distance of 10 m.....		25
Table 3 – Limits for conducted disturbance to the voltage of a public supply of electric power		25
Table B.1 – Maximum-permitted expanded uncertainties of measurement		29
Table C.1 – Examples of conformance assessment		31
Table E.1 – Mid-band frequencies for octave-band and one-third-octave-band filters in the audio range		35
Table F.1 – Acceptance limits on relative attenuation for one-third-octave-band filters.....		37

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROACOUSTICS –
OCTAVE-BAND AND FRACTIONAL-OCTAVE-BAND FILTERS –****Part 1: Specifications****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 61260-1 has been prepared by IEC technical committee 29: Electroacoustics.

This first edition of IEC 61260-1, future IEC 61260-2 and future IEC 61260-3, cancel and replace the first edition of IEC 61260 published in 1995, and Amendment 1:2001. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the IEC 61260:

- a) the single document in the first edition of IEC 61260:1995 is in IEC 61260 series separated into the three parts covering: specifications, pattern evaluation tests and periodic tests;
- b) the IEC 61260:1995 specified three performance categories: classes 0, 1 and 2. The IEC 61260 series specifies requirements for class 1 and 2;
- c) in the IEC 61260:1995, the design goals for the specification can be based on base-2 or base 10 design. In IEC 61260 series only base-10 is specified;

- d) the reference environmental conditions have been changed from 20 °C / 65 % RH to 23 °C / 50 % RH;
- e) IEC 61260:1995 specified tolerance limits without considering the uncertainty of measurement for verification of the specifications. IEC 61260 series specifies acceptance limits for the observed values and maximum-permitted uncertainty of measurements for laboratories testing conformance to specifications in the standard.

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

FDIS	Report on voting
29/835/FDIS	29/839/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 the parts in the IEC 61260 series, published under the general title *Electroacoustics – Octave-band and fractional-octave-band filters* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

INTRODUCTION

IEC 61260:1995 and its Amendment 1:2001 are now separated into the following three parts of IEC 61260 series:

- Part 1: Specifications
- Part 2: Pattern evaluation tests (under consideration)
- Part 3: Periodic tests (under consideration)

For assessments of conformance to performance specifications, IEC 61260-1 uses different criteria than were used for the IEC 61260:1995 edition.

IEC 61260:1995 did not provide any requirements or recommendations to account for the uncertainty of measurement in assessments of conformance to specifications. This absence of requirements or recommendations to account for uncertainty of measurement created ambiguity in determinations of conformance to specifications for situations where a measured deviation from a design goal was close to a limit of the allowed deviation. If conformance was determined based on whether a measured deviation did or did not exceed the limits, the end-user of the octave-band and fractional-octave-band filters incurred the risk that the true deviation from a design goal exceeded the limits.

To remove this ambiguity, IEC Technical Committee 29, at its meeting in 1996, adopted a policy to account for measurement uncertainty in assessments of conformance in International Standards that it prepares.

This first edition of IEC 61260-1 uses an amended criterion for assessing conformance to a specification. Conformance is demonstrated when (a) measured deviations from design goals do not exceed the applicable *acceptance limits* and (b) the uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty. Acceptance limits are analogous to the tolerance limits allowances for design and manufacturing implied in the IEC 61260:1995.

Actual and maximum-permitted uncertainties of measurement are determined for a coverage probability of 95 %. Unless more-specific information is available, the evaluation of the contribution of a specific filter or filter set to a total measurement uncertainty can be based on the acceptance limits and maximum-permitted uncertainties specified in this standard.

ELECTROACOUSTICS – OCTAVE-BAND AND FRACTIONAL-OCTAVE-BAND FILTERS –

Part 1: Specifications

1 Scope

1.1 This part of the IEC 61260 series specifies performance requirements for analogue, sampled-data, and digital implementations of band-pass filters. The extent of the pass-band region of a filter's relative attenuation characteristic is a constant percentage of the exact mid-band frequency for all filters of a given bandwidth. An instrument conforming to the requirements of this standard may contain any number of contiguous band-pass filters covering any desired frequency range.

1.2 Performance requirements are provided for two filter classes: class 1 and class 2. In general, specifications for class 1 and class 2 filters have the same design goals and differ mainly in the acceptance limits and the range of operational temperature. Acceptance limits for class 2 are greater than, or equal to, those for class 1. Maximum-permitted expanded uncertainties of measurement are also specified.

1.3 Performance requirements are given for designs where the octave frequency ratio and the mid-band frequencies are powers of ten.

1.4 Band-pass filters conforming to the performance requirements of this standard may be part of various measurement systems or may be an integral component of a specific instrument such as a spectrum analyser.

1.5 This standard specifies the ranges of environmental conditions for operation of the filters. The required range depends on whether the instrument containing the filters is designed to be operated in a controlled environment or more generally in the field.

1.6 Band-pass filters conforming to the requirements of this standard are capable of providing frequency-band-filtered spectral information for a wide variety of signals, for example, time-varying, intermittent or steady; broadband or discrete frequency; and long or short durations.

2 Normative references

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

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-6-1:2005, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2:2005, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61000-6-3:2006, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*
Amendment 1:2010

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

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM: 1995)*

ISO/IEC Guide 98-4:2012, *Uncertainty of measurement – Part 4: Role of measurement uncertainty in conformity assessment*