

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electroacoustics – Octave-band and fractional-octave-band filters –
Part 2: Pattern-evaluation tests**

**Électroacoustique – Filtres de bande d'octave et de bande d'une fraction
d'octave –
Partie 2: Essais d'évaluation d'un modèle**

[IEC 61260-2:2016](https://standards.iteh.ai/standards/iec/adfc873e-717f-4f6a-81fc-f81da5a1bd5d/iec-61260-2-2016)

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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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2: Pattern-evaluation tests

FOREWORD

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IEC 61260-2 edition 1.1 contains the first edition (2016-03) [documents 29/845/CDV and 29/881A/RVC] and its amendment 1 (2017-04) [documents 29/912/CDV and 29/937/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61260-2 has been prepared by IEC technical committee 29: Electroacoustics.

This first edition of IEC 61260-2 constitutes a technical revision.

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

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

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

A list of all the parts of 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 the base publication and its amendment 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

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INTRODUCTION

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

- Part 1: Specifications
- Part 2: Pattern-evaluation tests
- Part 3: Periodic tests

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 the 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 edition of IEC 61260-2 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 2: Pattern-evaluation tests

1 Scope

1.1 This part of IEC 61260 provides details of the tests necessary to verify conformance to all mandatory specifications given in IEC 61260-1:2014 for octave-band and fractional-octave-band filters.

1.2 Tests and test methods are applicable to class 1 and class 2 bandpass filters. The aim is to ensure that all testing laboratories use consistent methods to perform pattern-evaluation tests.

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 61000-4-2:2008, *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 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

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

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

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

CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

CISPR 16-2-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-3, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

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, *Uncertainty of measurement – Part 4: Role of measurement uncertainty in conformity assessment*

ISO/IEC Guide 99, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61260-1:2014, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-6-1, IEC 61000-6-2, and IEC 61000-6-3, ISO/IEC Guide 98-3, ISO/IEC Guide 98-4 and ISO/IEC Guide 99 apply.

4 Submission for testing

4.1 At least three specimens of the same pattern of bandpass filter shall be submitted for pattern-evaluation testing. As a minimum, the testing laboratory shall select two of the specimens for testing. At least one of the two specimens shall then be tested fully according to the procedures of this standard. The testing laboratory shall decide whether the full tests shall also be performed on the second specimen or whether limited testing is adequate to approve the pattern.

4.2 An instruction manual and all items or accessories that are identified in the instruction manual as integral components for the normal mode of operation shall be submitted along with the filters.

4.3 If the manufacturer of the filters supplies devices that are to be connected to the bandpass filter by cables for a typical mode of operation for the filter, then the devices and cables shall be submitted with the filter.

5 Marking of the filter and information in the instruction manual

5.1 It shall be verified that the filter is marked according to the requirements of IEC 61260-1:2014.

5.2 It shall be verified that the instruction manual contains all the information that is required by IEC 61260-1:2014 as relevant to the facilities provided by the filter.

5.3 If the filter does not conform to the requirements of 5.1 and 5.2, no pattern-evaluation tests shall be performed.

5.4 After completion of all tests, the information shall be reviewed to ensure that it is correct and that no applicable acceptance limits are exceeded.

6 Mandatory facilities and general requirements

6.1 General

6.1.1 No test specified in this part of IEC 61260 series shall be omitted unless the bandpass filter does not possess the feature described for the test. When the design of a fractional-octave-band filter, which has been pattern approved, is changed and a new pattern approval is requested, then – at the discretion of the testing laboratory – it is not necessary to repeat those tests for performance characteristics that are not affected by the design change.

6.1.2 If the filter does not possess the mandatory features listed in IEC 61260-1:2014, such as overload indicator or means to check that the power supply is adequate for battery powered instruments which contain the filter, the filter does not conform to the specifications of IEC 61260-1:2014, and no pattern-evaluation tests shall be performed.

6.1.3 For all pattern-evaluation tests, the configuration of the filter shall be as specified in the instruction manual for one of the normal modes of operation, including required accessories. All configurations of the filter that are stated in the instruction manual as conforming to the requirements of IEC 61260-1:2014 shall be tested.

6.1.4 If the instruction manual states that the filter conforms to the specifications of IEC 61260-1:2014 with optional facilities installed, the combination with the optional facilities installed shall also be tested to verify conformance to the relevant specifications.

6.1.5 If the filter is enclosed in an instrument containing a level detector and a display device for displaying the level of the filtered signal with a resolution of at least 0,1 dB, the displayed value from this display device shall be used for testing, if appropriate. If an electrical output is provided corresponding to the displayed value and the testing laboratory intends to utilize the electrical output instead of the display device, the laboratory shall verify that changes in the levels of applied electrical input signals produce corresponding changes in the signal levels indicated on the display device and at the electrical output that are in accordance with the specifications of IEC 61260-1:2014.

6.1.6 For bandpass filters that are designed to operate with measuring devices that comply with the requirements for sound level meters as specified in IEC 61672-1, the display indicator of this device shall be used to measure the level of the output signal from the filter set.

6.1.7 For filter sets with digital readout devices, or with output that is available in a manufacturer-specified digital format (for example over a digital interface connection), the level of the output should be determined from the numeric readout or via the digital output to a suitable display or recording device. Where multiple outputs are present, if an output is specified in the instruction manual for testing, this output shall be used for the pattern-evaluation tests.

6.1.8 If the instruction manual specifies a procedure for adjusting the filter, e.g. sensitivity adjustment, this procedure shall be followed before any measurements are performed.

6.1.9 For all tests, the filter shall be powered from its preferred supply. If the instruction manual specifies requirements for the internal batteries, such batteries shall be installed for the pattern-evaluation tests.

6.1.10 The filter shall be allowed to reach equilibrium with the prevailing environmental conditions before switching on the power to perform a test.

6.1.11 If the filter has more than one signal-processing channel, pattern-evaluation tests shall be performed for each channel that utilizes unique signal processing techniques. For multi-channel systems with the same functional equivalence in all channels, the number of channels to be tested may be less than the total number of channels, at the discretion of the testing laboratory.

6.1.12 Conformance to a performance specification is demonstrated when the following criteria are both satisfied:

- a) the measured deviation from the design goal does not exceed the applicable acceptance limit and;
- b) the corresponding uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty of measurement given in IEC 61260-1:2014 for the same coverage probability of 95 %.

IEC 61260-1:2014 gives example assessments of conformance using these criteria.

6.1.13 Laboratories performing pattern-evaluation tests shall calculate all uncertainties of measurements in accordance with the guidelines given in the ISO/IEC Guide 98-3. Actual measurement uncertainties shall be calculated for a coverage probability of 95 %. Calculation of the actual measurement uncertainty for a particular test should consider at least the following components, as applicable:

- the uncertainty attributed to calibration of the individual instruments and equipment used to perform the test;
- the uncertainty resulting from environmental effects;
- the uncertainty resulting from errors that may be present in the applied signals;
- the uncertainty attributed to effects associated with the repeatability of the results of the measurements. When a laboratory is only required to perform a single measurement, it is necessary for the laboratory to make an estimate of the contribution of random effects to the total uncertainty. The estimate should be determined from an evaluation of several measurement results previously obtained for a similar filter and parameter;
- the uncertainty associated with the resolution of the display device used to display the response from the filter. For digital display devices that indicate signal levels with a resolution of 0,1 dB, the uncertainty component should be taken as a rectangular distribution with semi-range of 0,05 dB.

6.1.14 If the uncertainty of measurement exceeds the maximum-permitted uncertainty of measurement, the result of the test shall not be used to demonstrate conformance to a specification, and pattern approval shall not be granted.

6.1.15 As appropriate, the laboratory shall utilize the recommendations given in the instruction manual for performing the pattern-evaluation tests.

6.2 Test instruments

6.2.1 The laboratory shall use instruments with valid calibrations for the appropriate quantities. The calibrations shall be traceable to national standards, as required.

6.2.2 Most of the required tests utilize steady sinusoidal signals of various frequencies and signal levels. Sinusoidal signals for test of filter attenuation shall have a total distortion of not

more than 0,01 % for class 1 filters and not more than 0,03 % for class 2 filters. The total distortion for sinusoidal signals for other tests shall not exceed 0,1 %.

6.2.3 Tests for time invariant operation use a constant amplitude sinusoidal signal the frequency of which is varied, or swept, at an exponential rate. The effect on the deviation of the measured time-averaged output signal level from the uncertainty in the amplitude and sweep-rate for the determination of time-invariant operation shall be determined. The expanded uncertainty shall not exceed the values given in IEC 61260-1:2014, Annex B.

NOTE The informative Annex A gives examples of how such uncertainties may be obtained.

6.2.4 Instruments for measuring the environmental conditions during the tests shall have an expanded uncertainty not exceeding 0,5°C for temperature and 3 % for humidity.

7 Tests at reference conditions

7.1 General

7.1.1 All tests at reference conditions except test for electromagnetic and electrostatic compatibility shall be made within the temperature range 20 °C to 26 °C and within the range for relative humidity 35 % to 65 %.

7.1.2 The filter shall be permitted to acclimatize at the reference environmental condition for at least 6 h.

7.1.3 The measured values of temperature and humidity shall be extended with the actual expanded uncertainty of measurement and shall not exceed the specified range. It is assumed that the influence from changes in the atmospheric pressure is insignificant compared to the sensitivity to other environmental parameters. If this is not the case, the observation shall be reported.

7.2 Relative attenuation, effective bandwidth deviation and summation of output signals

7.2.1 General

7.2.1.1 The measurement of relative attenuation, effective bandwidth deviation and summation of output signals are made by the same set of measurements using the response to constant amplitude sinusoidal signals at various frequencies.

7.2.1.2 The measurement shall be performed on the reference level range. The level of the input signals shall be $(1 \pm 0,1)$ dB below the specified upper boundary of the linear operating range.

7.2.1.3 With the input and output of the instrument terminated, if appropriate, with the impedances specified by the manufacturer, a steady sinusoidal signal is applied to the input of the filter set. The relative attenuation at appropriate frequencies is measured.

7.2.1.4 The frequencies of the sinusoidal test signal for one filter are spaced at equal intervals on a logarithmic scale centred on the exact midband frequency. If S is the number of test frequencies per filter bandwidth, the normalized frequency Ω_i of the i -th test signal is determined from:

$$\Omega_i = G^{\frac{i}{b \cdot S}} \quad (1)$$