

INTERNATIONAL STANDARD

EXTENDED VERSION

This full version of IEC 60704-2-19:2026 includes the content of the references made to IEC 60704-1:2021

**Household and similar electrical appliances - Test code for the determination of airborne acoustical noise -
Part 2-19: Particular requirements for air cleaners**

get full document from standards.iteh.ai



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2026 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.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables 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 It also gives information on projects, replaced and withdrawn publications.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 online and once a month by email.

IEC 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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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

CONTENTS

FOREWORD	3
INTRODUCTION to IEC 60704-1:2021	5
INTRODUCTION to IEC 60704-2-19:2026	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Measurement methods and acoustical environments	8
4.1 General	8
4.2 Direct method	9
4.3 Comparison method	9
4.4 Acoustical environments	10
4.4.1 General requirements and criterion for adequacy of the test environment	10
4.4.2 Criterion for background noise level	10
4.4.3 Environmental conditions	11
4.5 Measurement uncertainties	11
4.5.1 General	11
4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification	11
5 Instrumentation	12
5.1 Instrumentation for measuring acoustical data	12
5.2 Instrumentation for measuring climatic conditions	12
5.3 Instrumentation for measuring operating conditions	12
6 Operation and location of appliances under test	12
6.1 Equipping and pre-conditioning of appliances	12
6.2 Supply of electric energy and of water or gas	13
6.3 Climatic conditions	13
6.4 Loading and operating of appliances during tests	14
6.5 Location and mounting of appliances	14
7 Measurement of sound pressure levels	15
7.1 Microphone array, measurement surface and RSS location for essentially free field conditions over reflecting plane(s)	15
7.2 Microphone array and RSS location in hard-walled test rooms	19
7.3 Microphone array and RSS location in special reverberation test rooms	19
7.4 Measurements	19
8 Calculation of sound pressure and sound power levels	20
8.1 General	20
8.2 Corrections for background noise levels	20
8.3 Corrections for the test environment	21
8.4 Calculation of sound pressure level averaged over the microphone positions	21
8.5 Calculation of sound power levels with the comparison method	22
8.6 Calculation of sound power levels in free field conditions over a reflecting plane	22
8.7 Calculation of A-weighted sound power level with the direct method in special reverberation test rooms	23
9 Information to be recorded	23
9.1 General data	23

9.2	Description of appliance under test	23
9.3	Measurement method	24
9.4	Acoustical test environment	24
9.5	Instrumentation	24
9.6	Equipment and pre-conditioning of appliance under test	24
9.7	Electric supply, water supply, etc.	24
9.8	Climatic conditions	24
9.9	Operation of the appliance under test	25
9.10	Location and mounting of the appliance under test	25
9.11	Microphone array	25
9.12	Measurement data	25
9.13	Calculated sound pressure and sound power levels	26
9.14	Reporting	26
10	Information to be reported	26
10.1	General data	26
10.2	Appliance under test	26
10.3	Test conditions for the appliance	26
10.4	Acoustical data	27
Annex A	(normative) Standard test table	28
Annex B	(normative) Test enclosure	29
Annex C	(informative) Guidelines for the design of simple test rooms with essentially free field conditions	30
Bibliography	31
Figure 1	– Measurement surface – parallelepiped – with key microphone positions, for floor free-standing appliances	16
Figure 2	– Measurement surface – parallelepiped – with key microphone positions, for floor standing appliances placed against a wall	17
Figure 3	– Deleted	
Figure 4	– Measurement surface – hemisphere – with key microphone positions, for hand-held, table type and floor-treatment appliances	18
Figure 5	– Deleted	
Figure A.1	– Example of standard test table	28
Figure B.1	– Test enclosure	29
Table 1	– Standard deviations of sound power levels	11
Table 2	– Standard deviations for declaration and verification	11

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Household and similar electrical appliances -
Test code for the determination of airborne acoustical noise -
Part 2-19: Particular requirements for air cleaners**

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This extended version (EXV) of the official IEC Standard provides the user with the full content of the Standard.

IEC 60704-2-19:2026 EXV includes the content of IEC 60704-2-19:2026 and the references made to IEC 60704-1:2021.

The specific content of IEC 60704-2-19:2026 is displayed on a blue background.

IEC 60704-2-19 has been prepared by subcommittee 59N: Electrical air cleaners for household and similar purposes, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
59N/87/FDIS	59N/89/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

This Part 2-19 is intended to be used in conjunction with IEC 60704-1:2021, *Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 1: General requirements*.

The relevant text of IEC 60704-1:2021 as amended by this publication establishes the test code for air cleaners.

This Part 2-19 supplements or modifies the corresponding clauses in IEC 60704-1:2021. When a particular subclause of IEC 60704-1:2021 is not mentioned in this document, that subclause is applicable as far as reasonable. Where this standard states "addition", "modification", "replacement" or "deletion", the relevant requirements, test specifications or explanatory matter in IEC 60704-1 should be adapted accordingly.

Subclauses and tables that are additional to those in IEC 60704-1 are numbered starting from 101.

Unless notes are in a new subclause or involve notes in IEC 60704-1, they are numbered starting from 101, including those in a replaced clause or subclause.

In this standard, the following print types are used:

- terms defined in Clause 3: **bold type**.

A list of all the parts in the IEC 60704 series, under the general title *Household and similar electrical appliances - Test code for the determination of airborne acoustical noise*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION to IEC 60704-1:2021

Although the noise emitted by household appliances does not generally present a hazard to the hearing of the operator and other exposed persons, the need for standardization procedures for the determination of the noise emitted has been recognized for a long time. Such procedures should be specified, not only for special types of appliances, but also the principles should be applicable to the majority of appliances in general use.

Generally, the determination of noise levels is only part of a comprehensive testing procedure covering many aspects of the properties and performances of the appliance. It is therefore important that the requirements for noise measurements (such as test environment, instrumentation, and amount of labour involved) be kept at a modest level.

The results of noise measurements are used for many purposes, for example for noise declaration, as well as for comparing the noise emitted by a specific appliance to the noise emitted by other appliances of the same family. In other cases, the results are taken as a basis for engineering action in the development stages of new pieces of equipment, or in deciding on means for sound insulation. For all purposes, it is important to specify procedures with known accuracy so that the results of measurements taken by different laboratories can be compared.

These conditions have, as far as possible, been taken into account in the preparation of this test code. The acoustic measuring methods are based on those described in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

The adoption of these methods permits the use of hemi-anechoic rooms, special reverberation test rooms and hard-walled test rooms. The result of the measurements is the sound power level of the appliance. Within the measuring uncertainty specific to these methods, the results from the determination under free field conditions over a reflecting plane are equal to those obtained in reverberant fields.

The use of intensity methods as described in ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 is applicable under special conditions, which are described in specific parts of the IEC 60704-2 series.

This test code is concerned with airborne noise only. In some cases, structure-borne noise, for example transmitted to the adjoining room, can be of importance.

INTRODUCTION to IEC 60704-2-19:2026

The measuring conditions specified in this document provide for sufficient steadiness in the noise emitted and reproducibility in different laboratories, whilst simulating as far as possible the practical use of **air cleaners**.

It is recommended to consider the determination of noise levels as part of a comprehensive testing procedure covering many aspects of the properties and performance of **air cleaners**.

NOTE As stated in the introduction to IEC 60704-1, this test code is concerned with airborne noise only.

1 Scope

This part of IEC 60704 applies to stationary freestanding and wall-mounted **air cleaners** for domestic and similar use, supplied from mains, d.c. voltage not exceeding 48 V or batteries.

This document includes **combination products**, where air cleaning is combined with for example humidification, but can be used only for the air cleaning function.

Fresh-air air cleaners and air cleaners that change their physical location autonomously without user intervention, are excluded from this document.

By similar use is understood the use in hotels, hospitals, shops, offices, etc.

For determining and verifying noise emission values declared in product specifications, see IEC 60704-3.

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 60704-2 (all parts), *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise*

IEC 60704-3:2019, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 3: Procedure for determining and verifying declared noise emission values*

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

IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO 3741:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for reverberation test rooms*

ISO 3743-1:2010, *Acoustics – Determination of sound power levels of noise sources – Engineering methods for small, movable sources in reverberant fields – Part 1: Comparison method for hard-walled test rooms*

ISO 3743-2:2018, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering methods for small, movable sources in reverberant fields – Part 2: Methods for special reverberation test rooms*

ISO 3744:2010, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

ISO 9614-1:1993, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

ISO 9614-2:1996, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*

ISO 9614-3:2002, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 3: Precision method for measurement by scanning*

ISO 6926:2016, *Acoustics – Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

ISO 12001:1996, *Acoustics – Noise emitted by machinery and equipment – Rules for the drafting and presentation of a noise test code*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms and definitions pertinent to the determination of sound power levels can be found in ISO 3743-1:2010, ISO 3743-2:2018 and ISO 3744:2010.

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 measurement time interval

portion or a multiple of an operational period or operational cycle for which the sound power levels are determined

3.2 operational period

interval of time during which a specified process is accomplished by the appliance under test (for example, washing or rinsing or drying for a dishwasher)

3.3 operational cycle

specific sequence of operational periods occurring while the appliance under test performs a complete work cycle

Note 1 to entry: During the operational cycle, each operational period is associated with a specific process that can occur only once, or can be repeated (for example, washing and rinsing and drying for a dishwasher).

3.4 time history

continuous recording of the sound pressure level (for a distinct microphone position) as a function of time, which is obtained during one or more operational periods of an operational cycle

3.5 reference

hypothetical right parallelepiped terminating on the reflecting plane(s) on which the noise source under test is located, that just encloses the source including all the significant sound radiating components and any test table on which the source is mounted

box

[SOURCE: ISO 3744:2010, 3.10, modified – The note has been omitted.]

3.6 test enclosure

enclosure used for simulating the typical acoustic built-in or/and mounting conditions

3.101**air cleaner**

electrically powered household, or similar, appliance that employs one or multiple technologies to reduce one or more types of indoor air pollutants

[SOURCE: IEC 63086-1:2020, 3.1]

3.102**fresh-air air cleaner**

air cleaner connected to the external environment, which provides pollutant-reduced outdoor air into an indoor space

Note 1 to entry: The **fresh-air air cleaner** can also include other auxiliary functions, such as heat exchange.

[SOURCE: IEC 63086-1:2020, 3.3]

3.103**combination products**

air cleaner that includes a secondary function besides air cleaning within the same housing, such as humidifying, dehumidifying, heating, or air conditioning

[SOURCE: IEC 63086-1:2020, 3.4]

3.104**manual operation mode**

setting of the device under test chosen by the user which is not influenced by further external operator interaction, air quality sensor data, and/or timers throughout the duration of the test

[SOURCE: IEC 63086-1:2020, 3.11, modified – "DUT" has been changed to "device under test", "that" has been changed to "which".]

3.105**maximum performance operation mode**

manual operation mode where the device under test is set to the highest flow rate with all air cleaning functions switched on

[SOURCE: IEC 63086-1:2020, 3.12, modified – "DUT" has been changed to "device under test", "and set to maximum, where applicable" and the notes to entry have been deleted.]

4 Measurement methods and acoustical environments

4.1 General

This document is concerned with objective methods of engineering accuracy grade 2 in accordance with ISO 12001:1996 for determining sound power levels L_W , expressed in decibels (dB), with reference to a sound power of one picowatt (1 pW), of airborne acoustical noise within the specified frequency range of interest (generally including the octave-bands with centre frequencies from 125 Hz to 8 000 Hz), and for prescribed operating conditions of the appliance to be measured.

Methods for determining sound power levels with precision accuracy grade 1 in accordance with ISO 12001:1996, as specified for example in ISO 3741 and ISO 3745, are not included in this document. They may, however, be applied if the appropriate test environment and instrumentation are available.

NOTE 1 The noise values obtained under the described conditions of this document will not necessarily correspond to the noise experienced under the operational conditions of practical use.

NOTE 2 For quality control during production etc., simplified methods can be appropriate. For noise reduction purposes, other measurement methods employing, for example, narrow-band analysis or intensity techniques usually have to be applied. These methods are not covered by this document.

The total noise emitted by machinery or equipment and radiated in all directions to the space surrounding the machine can be characterized by the sound power of the machine. Within the accuracy range of this document, the sound power of a machine is basically independent of the environment in which the machine is installed

Therefore, the concept of sound power level has been chosen for expressing the noise emission of appliances for household and similar purposes.

The preferred noise emission quantity is the A-weighted sound power level, L_{WA} , in dB (re 1 pW).

According to this document, two principal methods exist, the direct method and the comparison method, as described in 4.2 and 4.3. These two methods can be used alternatively.

Different types of environments, as described in 4.4, may be used. A part of the IEC 60704-2 series may, if necessary, exclude one or several combinations among those available.

4.2 Direct method

The direct method can be used only for measurements in qualified test environments in accordance with ISO 3744:2010 for free field conditions over reflecting plane(s), and in accordance with ISO 3743-2:2018 for special reverberation test rooms.

With this method, the sound power level is determined

- in free field conditions over reflecting plane(s), from time-averaged sound pressure levels (on a mean-square basis) over the measurement surface and from the area of the measurement surface, S , or
- in reverberation and special reverberation test rooms, from averaged sound pressure levels, and from the reverberation time and the volume of the test room.

If for a measurement in a free field, reverberation or special reverberation room is not possible because the appliance cannot be placed or operated in such an environment, the intensity method in accordance with ISO 9614-1:1993, ISO 9614-2:1996, and ISO 9614-3:2002 shall be applied. For the intensity method, the standard deviations given in the parts of the IEC 60704-2 series and IEC 60704-3:2019 are not applicable unless stated explicitly.

These methods yield results expressed in A-weighted sound power levels (and in octave- or 1/3 octave-band sound power levels, if required) that are calculated directly from measured sound pressure levels.

NOTE This method can also be used in conjunction with more precise methods, such as those given in ISO 3741 and ISO 3745.

Air cleaners can produce pure tones. If pure tone components are present in the noise emitted by the source, the estimated standard deviation of the measured sound pressure levels in the special reverberation room can increase. In such cases, additional microphone positions or source positions can be necessary, as specified in ISO 3743-2.

4.3 Comparison method

The comparison method for measurement is explicitly described in ISO 3743-1:2010 and in ISO 3743-2:2018.

NOTE The term "comparison method" is not explicitly given in ISO 3744:2010, but when applying the "absolute comparison test" for the determination of the environmental correction given in A.3 of ISO 3744:2010, by using a reference sound source, the procedure is, in fact, a comparison method.

With this method, the sound power level is determined by comparing the averaged values (on a mean-square basis) of the sound pressure levels produced by the source in the test room to the averaged values of the sound pressure levels produced in the same room by a calibrated reference sound source (RSS) of known sound power output, complying with the requirements of ISO 6926:2016. The difference in sound pressure levels is equal to the difference in sound power levels when conditions are the same for both sets of measurements.

This method yields results expressed in octave- or 1/3 octave-band sound power levels, and the A-weighted sound power level is calculated from the octave- or 1/3 octave-band sound power levels.

To check whether there is a systematic difference between results obtained in different environments, the use of the comparison method is recommended.

Air cleaners can produce pure tones. If pure tone components are present in the noise emitted by the source, the estimated standard deviation of the measured sound pressure levels in the hard-walled test room or in the special reverberation room can increase. In such cases, additional microphone positions or source positions can be necessary, as specified in ISO 3741, ISO 3743-1 or ISO 3743-2.

4.4 Acoustical environments

4.4.1 General requirements and criterion for adequacy of the test environment

They are given in the following clauses:

- ISO 3743-1:2010, Clause 4 for hard-walled test rooms,
- ISO 3741:2010, Clause 5 for reverberant rooms,
- ISO 3743-2:2018, Clause 6 for special reverberation test rooms, and
- ISO 3744:2010, Clause 4 for free-field conditions over a reflecting plane.

The methods specified in ISO 3741, ISO 3743-2 and ISO 3744 can be used for measuring noise emitted by **air cleaners**. The hard-walled test room specified in ISO 3743-1 is under consideration.

The method specified in ISO 3744 is applicable to noise sources of any size. When applying ISO 3743-2, it shall be ensured that the maximum size of the appliance under test fulfils the requirements specified in ISO 3743-2:2018, Clause 5.

NOTE 101 For free-field conditions over a reflecting plane, the absolute comparison test for the qualification of the environment, described in ISO 3744:2010, Clause A.2 is preferred.

Guidelines for the design of simple test rooms with free-field conditions are given in Annex C.

Guidelines for the design of a suitable special reverberation test room are given in ISO 3743-2:2018, Annex B.

4.4.2 Criterion for background noise level

Requirements for the background noise level are given in 4.5 of ISO 3743-1:2010, in 6.5 of ISO 3743-2:2018 and in 4.2 of ISO 3744:2010. Averaged over the microphone positions, the background noise level shall be at least 6 dB below, and preferably more than 15 dB below, the sound pressure level to be measured.

NOTE If the difference between the sound pressure levels of the background noise and the appliance noise is less than 6 dB, see 8.2.

NOTE 101 **Air cleaners** can generate very low sound pressure levels. An appropriate background noise level criterion is considered.

4.4.3 Environmental conditions

Environmental conditions having an adverse effect on the microphone used for the measurements (for example, strong electric or magnetic fields, wind, impingement of air discharge from the equipment being tested, high or low temperatures) shall be avoided by proper selection or positioning of the microphone.

The instructions of the manufacturers of the measurement instruments regarding adverse environmental conditions shall be followed. The microphone shall always be oriented in such a way that the angle of incidence of the sound waves is that for which the microphone is calibrated.

4.5 Measurement uncertainties

4.5.1 General

The estimated values of the standard deviations of reproducibility of sound power levels determined in accordance with this document are given in 9.1 of ISO 3743-1:2010, in 11.1 of ISO 3743-2:2018 and in 9.1 of ISO 3744:2010. But for a particular family of appliances of similar size with similar operating conditions, the standard deviations of reproducibility can be smaller than these values. Hence, in the IEC 60704-2 series, standard deviations smaller than those listed in ISO standards can be stated if substantiation is available from the results of suitable interlaboratory tests.

In the case of discrepancies between the measurements where the results normally remain inside the foreseen standard deviation, it can be helpful to perform measurements according to the upper grade of accuracy: grade 1, laboratory or precision, as described in ISO 3741 or ISO 3745.

4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification

The estimated values of standard deviations of sound power levels determined according to this document are given in Table 1.

Table 1 – Standard deviations of sound power levels

Standard deviation dB	
σ_r (repeatability)	σ_R (reproducibility)
0,2	0,6

For the purpose of determining and verifying declared noise emission values according to IEC 60704-3, the values in Table 2 apply.

Table 2 – Standard deviations for declaration and verification

Standard deviation dB		
σ_p (production)	σ_t (total)	σ_M (reference)
0,3 to 1,1	0,7 to 1,3	1,5

5 Instrumentation

5.1 Instrumentation for measuring acoustical data

Requirements for the instrumentation system and for its calibration are given in Clause 5 of ISO 3743-1:2010, in Clause 7 of ISO 3743-2:2018 and in Clause 5 of ISO 3744:2010.

The instrumentation system shall meet the requirements for a type 1 instrument laid down in IEC 61672-1:2013, in accordance with the basic standard used. For measurements in octave- and 1/3 octave-bands, the instrumentation system shall meet the requirements of IEC 61260-1:2014.

RSS shall meet the requirements of ISO 6926:2016, and shall be calibrated annually.

The use of windscreens is recommended. If necessary, the observed sound pressure levels shall be corrected for changes in the microphone sensitivity, in accordance with instructions accompanying the instrumentation.

5.2 Instrumentation for measuring climatic conditions

5.2.1 The temperature is determined with instruments having an accuracy of ± 1 °C.

5.2.2 The relative humidity is determined with instruments having an absolute accuracy of ± 2 % within the measuring range.

5.2.3 The absolute air pressure is determined with instruments having an accuracy of $\pm 0,5$ kPa.

5.3 Instrumentation for measuring operating conditions

5.3.1 The voltage at the plug of the cable or cord of mains-powered appliances is measured with voltmeters having an accuracy of class 0,5 instruments.

5.3.2 The voltage at the battery terminals of battery-powered appliances is measured with voltmeters having an accuracy of class 0,5 instruments.

5.3.3 The rotational speed of motors, attachments, etc. is measured, if necessary, with speed indicators having an accuracy of ± 1 % of full scale.

6 Operation and location of appliances under test

6.1 Equipping and pre-conditioning of appliances

6.1.1 The appliance is equipped with attachments, accessories, etc. as delivered by the manufacturer for air cleaning.

For noise measurements, clean air filters shall be used.

6.1.2 Care shall be taken to ensure that any auxiliary equipment (such as electrical conduits or cables, piping for water supply or drainage, air ducts, etc.) necessary for the operation of the appliance, does not radiate a significant amount of sound into the test environment or change the sound output of the appliance. Guidelines are given in 6.2 of ISO 3743-1:2010, in 8.4 of ISO 3743-2:2018 and in 6.2 ISO 3744:2010.

6.1.3 Prior to noise measurements, the **air cleaner** shall have run in for at least 15 min at the highest speed.

6.1.4 Immediately before each series of noise measurements, the **air cleaner** shall run for at least 60 s to stabilise.

6.2 Supply of electric energy and of water or gas

6.2.1 Appliances with mains powered electric motor(s) are supplied at rated voltage and at rated frequency. Appliances designed for DC only are supplied with DC. If a voltage range and/or a frequency range are indicated, then the supply voltage and/or frequency shall be the nominal system voltage and/or system frequency of the country in which the appliance is intended to be used. Tolerances shall not exceed $\pm 2\%$ for voltage and $\pm 1\%$ for frequency throughout the test.

The nominal system voltage and its values are defined in IEC 60038:2009.

If the rated voltage of a mains supplied appliance differs from the nominal system voltage as common in the country of use, measurements should be carried out at the nominal voltage as common in the country of use.

The supply voltage is measured at the plug of a non-detachable cable or cord, or at the appliance inlet if a detachable cable is provided, but in no case at the entrance of extension cables or cords.

6.2.2 Appliances with battery-powered electric motor(s) are started, for noise measurements, with full-charged batteries as specified by the manufacturer. Verify if the device after the measurement can still run for at least 9 times the test time from start of the device until end of the measurement. If this is not possible, the measurement fails.

6.2.3 Any heating function shall be switched off during the test, if possible.

6.2.4 Not applicable.

6.3 Climatic conditions

In general, household appliances (unless otherwise specified for a special family) are operated under the following climatic conditions:

ambient temperature	18 °C to 28 °C
relative humidity	25 % to 70 %
atmospheric pressure	86 kPa to 106 kPa