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EXTENDED VERSION

This full version of IEC 60704-2-7:2026 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 2-7: Particular requirements for fans

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CONTENTS

FOREWORD 3
INTRODUCTION to IEC 60704-1:2021 6
INTRODUCTION to IEC 60704-2-7:2026 6
1 Scope 7
2 Normative references 8
3 Terms and definitions 8
4 Measurement methods and acoustical environments 10
4.1 General 10
4.2 Direct method 11
4.3 Comparison method 11
4.4 Acoustical environments 12
4.4.1 General requirements and criterion for adequacy of the test environment 12
4.4.2 Criterion for background noise level 12
4.4.3 Environmental conditions 12
4.5 Measurement uncertainties 12
4.5.1 General 12
4.5.2 Standard deviations on repeatability and reproducibility and standard deviations related to declaration and verification 13
5 Instrumentation 13
5.1 Instrumentation for measuring acoustical data 13
5.2 Instrumentation for measuring climatic conditions 14
5.3 Instrumentation for measuring operating conditions 14
6 Operation and location of appliances under test 14
6.1 Equipping and pre-conditioning of appliances 14
6.2 Supply of electric energy and of water or gas 14
6.3 Climatic conditions 15
6.4 Loading and operating of appliances during tests 15
6.5 Location and mounting of appliances 16
7 Measurement of sound pressure levels 17
7.1 Microphone array, measurement surface and RSS location for essentially free field conditions over reflecting plane(s) 17
7.2 Microphone array and RSS location in hard-walled test rooms 21
7.3 Microphone array and RSS location in special reverberation test rooms 21
7.4 Measurements 22
8 Calculation of sound pressure and sound power levels 23
8.1 General 23
8.2 Corrections for background noise levels 23
8.3 Corrections for the test environment 23
8.4 Calculation of sound pressure level averaged over the microphone positions 24
8.5 Calculation of sound power levels with the comparison method 24
8.6 Calculation of sound power levels in free field conditions over a reflecting plane 25
8.7 Calculation of A-weighted sound power level with the direct method in special reverberation test rooms 25
9 Information to be recorded 25
9.1 General data 25

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9.2 Description of appliance under test 26
9.3 Measurement method 26
9.4 Acoustical test environment 26
9.5 Instrumentation 26
9.6 Equipment and pre-conditioning of appliance under test 27
9.7 Electric supply, water supply, etc. 27
9.8 Climatic conditions 27
9.9 Operation of the appliance under test 27
9.10 Location and mounting of the appliance under test 27
9.11 Microphone array 27
9.12 Measurement data 28
9.13 Calculated sound pressure and sound power levels 28
9.14 Reporting 28
10 Information to be reported 28
10.1 General data 28
10.2 Appliance under test 28
10.3 Test conditions for the appliance 29
10.4 Acoustical data 29
Annex A (normative) Standard test table 30
Annex B (normative) Not applicable 31
Annex C (informative) Guidelines for the design of simple test rooms with essentially free field conditions 32
Bibliography 33

Figure 1 – Measurement surface – parallelepiped – with key microphone positions, for floor free-standing appliances 18
Figure 4 – Measurement surface – hemisphere – with key microphone positions, for hand-held, table type and floor-treatment appliances 19
Figure 101 – Measurement surface – hemisphere – with 10 microphone positions, for wall bracket fans 21
Figure A.1 – Example of standard test table 30

Table 1 – Standard deviations of sound power levels 13
Table 2 – Standard deviations for declaration and verification 13

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Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 2-7: Particular requirements for fans

FOREWORD

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

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IEC 60704-2-7 has been prepared by subcommittee 59L: Small household appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

This third edition cancels and replaces the second edition published in 2020. This edition constitutes a technical revision.

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

a) alignment with IEC 60704-1:2021;
b) scope has been expanded to handheld, neckband and embedded fans;
c) positioning and mounting have been reworked;
d) test concept of partition ventilating fans has changed to measure both inlet and outlet side together.

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

Draft	Report on voting
59L/322/FDIS	59L/324/RVD

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

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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.

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This Part 2-7 is 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 standard establishes the test code for fans.

This Part 2-7 supplements or modifies the corresponding clauses in IEC 60704-1:2021, so as to establish the test code for fans. When a particular subclause of IEC 60704-1:2021 is not mentioned in this Part 2-7, that subclause is applicable as far as reasonable. Where this standard states "addition", "modification" or "replacement", the relevant requirements, test specifications or explanatory matter in IEC 60704-1:2021 shall be adapted accordingly.

Subclauses, tables and figures that are numbered starting from 101 are additional to those in IEC 60704-1:2021.

Unless notes are in a new subclause or involve notes in IEC 60704-1:2021, they are numbered starting from 101, including those in a replaced clause or subclause.

Additional annexes are lettered AA, BB, etc.

In this standard, the following print types are used:

– terms defined in Clause 3: bold type.

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A list of all parts in the IEC 60704 series, published 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

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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.

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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 60704-2-7:2026

The measuring conditions specified in this document provide for sufficient accuracy in determining the noise emitted and the comparison of the results of measurements taken by different laboratories, whilst simulating as far as possible the practical use of household fans.

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 household fans.

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

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1 Scope

This part of IEC 60704 applies to electric appliances (including their accessories or components) for household and similar use, supplied from mains or from batteries.

By "similar use" is understood the use in conditions similar to those found in households, for example in inns, coffee houses, tea rooms, hotels, barber or hairdresser shops, launderettes, etc., if not otherwise specified in the IEC 60704-2 series.

This document does not apply to

– appliances, equipment, or machines designed exclusively for industrial or professional purposes;
– appliances that are integrated parts of a building or its installations, such as equipment for air conditioning, heating and ventilating (except household fans, cooker hoods, free-standing heating appliances, dehumidifiers, air cleaners, and stand-alone water heaters), oil burners for central heating, pumps for water supply and for sewage systems;
– separate motors or generators and
– appliances exclusively for outdoor use.

For determining and verifying noise emission values declared in product specifications, see IEC 60704-3:2019.

This part of IEC 60704 applies to electrical fans (including their accessories and their component parts) for household and similar use, designed for AC or DC supply.

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The motor, the impeller and their housing, if any, form a single unit.

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These particular requirements apply to:

– **comfort fans** (conventional and bladeless),
– table fans,
– pedestal fans,
– ceiling fans,
– **wall bracket fans**,
– **ceiling bracket fans**,
– louvre fans,
– tower fans,
– **handheld fans**,
– **neckband fans**,
– embedded fans,
– **ventilating fans**.

This document does not apply to:

– fans that are part of a central ventilation system,
– fans that are part of an appliance (for example cooling fans),
– fans with additional functions (for example heating, humidifying).

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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 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*

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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*

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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

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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 box
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

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

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3.6
test enclosure
enclosure used for simulating the typical acoustic built-in or/and mounting conditions

3.101
comfort fan
fan primarily designed for creating air movement around or on part of a human body for personal cooling comfort, including fans that can perform additional functionalities such as lighting

[SOURCE: IEC 60879:2019, 3.1, modified - Note to entry has been deleted.]

3.102
wall bracket fan
comfort fan for mounting on the wall

[SOURCE: IEC 60879:2019, 3.8]

3.103
ceiling bracket fan
comfort fan for mounting on the ceiling

Note 1 to entry: Ceiling fans and embedded fans are considered a kind of **ceiling bracket fans** in the sense of this document.

[SOURCE: IEC 60879:2019, 3.9, modified - Note to entry has been added.]

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3.104
handheld fan
portable **comfort fan** held in the hand during normal use, with the diameter of the fan wheel (impeller or propeller) not larger than 150 mm

3.105
neckband fan
portable **comfort fan** designed to be worn around the user's neck for use

3.106
ventilating fan
fan intended to displace air either from one side of a partition to the other, or within a duct installed either on the fan inlet or on the fan outlet, or both

[SOURCE: IEC 60665:2018, 3.2]

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.

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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.

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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.

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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.

If audible discrete tones 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, such as those specified in ISO 3743-2.

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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.

If audible discrete tones 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, such as those specified in ISO 3743-1 or ISO 3743-2.

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4.4 Acoustical environments

4.4.1 General requirements and criterion for adequacy of the test environment

They are given in the following clauses:

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

A classification of different types of noise is given in ISO 12001:1996. The method specified in ISO 3744:2010 is suitable for measurements of all types of noise emitted by household appliances. The methods specified in ISO 3743-1:2010 and ISO 3743-2:2018 are suitable for all types of noise, except for sources of impulsive noise consisting of short-duration noise bursts. This will be taken into account in the preparation of parts of the IEC 60704-2 series.

The method specified in ISO 3744:2010 is applicable to noise sources of any size. Limitations for the size of the source are given in 4.2 of ISO 3743-1:2010 and in Clause 5 of ISO 3743-2:2018. This will be taken into account in the preparation of parts of the IEC 60704-2 series.

The methods specified in ISO 3743-1, ISO 3743-2 and ISO 3744 can be used for measuring noise emitted by fans.

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

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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.

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

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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 in accordance with this document are given in Table 1:

Table 1 – Standard deviations of sound power levels

Standard deviation (dB)	
σ_r (repeatability)	σ_R (reproducibility)
0,4	1,0

For the purpose of determining and verifying declared noise emission values in accordance with IEC 60704-3, the values in Table 2 apply:

Sample Document

Table 2 – Standard deviations for declaration and verification

Standard deviation dB		
σ_P (production)	σ_t (total)	σ_M (reference)
0,5 to 1,0	1,0 to 1,4	1,5
NOTE The standard deviation of repeatability, reproducibility and production and the total standard deviation have not been verified recently. Because of technical development of the appliances, it is possible that these values are not correct anymore.		

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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 a windscreen is mandatory, and necessary corrections for changes in the microphone sensitivity shall be added to the observed sound pressure levels.

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