

INTERNATIONAL STANDARD



Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-1: Particular requirements for dry vacuum cleaners

Document Preview

[IEC 60704-2-1:2020](#)

<https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 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 Central Office
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 It also gives information on projects, replaced and withdrawn publications.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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

[IEC 60704-2-1:2020](https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020)

<https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020>



IEC 60704-2-1

Edition 4.0 2020-10
REDLINE VERSION

INTERNATIONAL STANDARD



Household and similar electrical appliances – Test code for the determination
of airborne acoustical noise –
Part 2-1: Particular requirements for dry vacuum cleaners

Document Preview

[IEC 60704-2-1:2020](https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020)

<https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 17.140.20; 97.080

ISBN 978-2-8322-9020-0

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

CONTENTS

FOREWORD	3
INTRODUCTION	6
1 Scope and object	7
1.1 Scope	7
1.1.1 General	7
1.1.2 Types of noise	7
1.1.3 Size of the source	7
1.2 Object	7
1.3 Measurement uncertainty	8
2 Normative references	9
3 Terms and definitions	9
4 Measurement methods and acoustical environments	10
5 Instrumentation	11
5.1 Instrumentation for measuring acoustical data	11
6 Operation and location of appliances under test	11
6.1 Equipping and pre-conditioning of appliances	11
6.2 Supply of electric energy and of water or gas	13
7 Measurement of sound pressure levels	16
8 Calculation of sound pressure and sound power levels	17
9 Information to be recorded	17
10 Information to be reported	17
Annexes	22
Annex A (normative) Standard test table	22
Bibliography	23
Figure 101 – Appliance with cleaning head connected directly	19
Figure 102 – Appliance with the cleaning head connected by hose and connecting tube	21
Table 101 – Standard deviations of sound power levels determined on carpets	8
Table 102 – Standard deviations of sound power levels determined on hard floors	8
Table 103 – Standard deviations for declaration and verification for vacuum cleaners for carpets	8
Table 104 – Standard deviations for declaration and verification for vacuum cleaners for hard floors	9
Table 105 – Wilton type carpet specifications

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
TEST CODE FOR THE DETERMINATION
OF AIRBORNE ACOUSTICAL NOISE –****Part 2-1: Particular requirements for dry vacuum 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) 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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60704-2-1 has been prepared by subcommittee 59F: Surface cleaning appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

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

- a) product scope is extended to cordless and similar vacuum cleaners;
- b) definitions of "cleaning head", "active nozzle" and "standard Wilton test carpet" have been added;
- c) specification of standard Wilton test carpet has been removed; reference is made to IEC TS 62885-1;
- d) specific requirements on equipping and pre-conditioning have been added;
- e) topic ageing of test carpet is addressed.

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

FDIS	Report on voting
59F/399/FDIS	59F/408/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

This Part 2-1 is intended to be used in conjunction with IEC 60704-1:2010, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 1: General requirements*.

NOTE When "Part 1" is mentioned in this standard, it refers to IEC 60704-1:2010.

The relevant text of Part 1 as amended by this document establishes the test code for vacuum cleaners.

This Part 2-1 supplements or modifies the corresponding clauses in IEC 60704-1:2010. When a particular subclause of Part 1 is not mentioned in this Part 2-1, 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 Part 1 should be adapted accordingly.

Subclauses, tables, and figures that are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered AA, BB, etc.

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

A list of all the 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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60704-2-1:2020](#)

<https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020>

INTRODUCTION

The measuring conditions specified in this part of IEC 60704 provide for sufficient accuracy in determining the noise emitted and comparing the results of measurements taken by different laboratories, whilst simulating as far as possible the practical use of vacuum cleaners.

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

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

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60704-2-1:2020](https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020)

<https://standards.iteh.ai/catalog/standards/iec/d4d6bc34-5f59-4cb1-828d-b6bb6b50ce1e/iec-60704-2-1-2020>

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – TEST CODE FOR THE DETERMINATION OF AIRBORNE ACOUSTICAL NOISE –

Part 2-1: Particular requirements for **dry** vacuum cleaners

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1 Scope

1.1.1 General

Replacement:

~~These particular requirements apply to electrical vacuum cleaners (including their accessories and their component parts) for household use in or under conditions similar to those in households.~~

~~This part of IEC 60704 applies as it is to electrical vacuum cleaners operating in dry conditions. Some additions and modifications for vacuum cleaners operating in wet conditions are under consideration. How to test robotic vacuum cleaners is under consideration for a future edition.~~

This part of IEC 60704 is applicable for the determination of airborne acoustical noise of mains operated and cordless dry vacuum cleaners for household use or under conditions similar to those in households.

This part of IEC 60704 does not apply to vacuum cleaners for industrial or professional purposes.

NOTE Particular requirements for dry cleaning robots are specified in IEC 60704-2-17.

1.1.2 Types of noise

Replacement:

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

1.1.3 Size of the source

Replacement:

The method specified in ISO 3744 is applicable to noise sources of any size. When applying ISO 3743-1 and ISO 3743-2, ~~care should be taken that~~ the maximum size of the appliance under test ~~fulfils~~ should fulfil the requirements specified in 1.2 of ISO 3743-1:2010 and 1.3 of ISO 3743-2:1994.

1.2 Object

Addition:

This part of IEC 60704 describes the determination of the noise emission of vacuum cleaners under normal operating conditions on carpet and hard floor in accordance with 4.6 of ~~IEC 60312-1:2010~~ IEC 62885-2.

NOTE 101 For determining and verifying noise emission values declared in product specifications, see IEC 60704-3.

~~NOTE 102—If a boost position is incorporated, this is not taken into account.~~

~~NOTE 103—A boost position is a setting of a control for occasional use which results in a higher temporary fan speed.~~

1.3 Measurement uncertainty

Replacement:

For vacuum cleaners designed for cleaning carpets the estimated values of standard deviations of sound power levels determined in accordance with this part of IEC 60704 are provided in Table 101.

Table 101 – Standard deviations of sound power levels determined on carpets

Standard deviation (dB)	
σ_r (repeatability)	σ_R (reproducibility)
0,3	0,8

For vacuum cleaners designed for cleaning hard floors the estimated values of standard deviations of sound power levels determined in accordance with this part of IEC 60704 are provided in Table 102.

Table 102 – Standard deviations of sound power levels determined on hard floors

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

NOTE 101 The values in Table 101 and Table 102 are derived from the results of a round robin test (RRT) conducted in 2010/2011 with 4 different vacuum cleaners (passive and active) in 8 participating laboratories.

Addition:

1.101 Standard deviation for declaration and verification

For the purpose of determining and verifying declared noise emission values for vacuum cleaners designed for cleaning carpets, in accordance with IEC 60704-3, the following values provided in Table 103 apply:

Table 103 – Standard deviations for declaration and verification for vacuum cleaners for carpets

Standard deviation (dB)		
σ_P (production)	σ_t (total)	σ_M (reference)
0,5 to 1,0	0,9 to 1,3	1,5

For the purpose of determining and verifying declared noise emission values for vacuum cleaners designed for cleaning hard floors, in accordance with IEC 60704-3, the following values provided in Table 104 apply:

Table 104 – Standard deviations for declaration and verification for vacuum cleaners for hard floors

Standard deviation (dB)		
σ_P (production)	σ_t (total)	σ_M (reference)
0,5 to 1,0	0,8 to 1,2	1,5

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

~~IEC 60312-1:2010, Vacuum cleaners for household use – Part 1: Dry vacuum cleaners – Methods for measuring the performance~~

IEC TS 62885-1, Surface cleaning appliances – Part 1: General requirements on test material and test equipment

ISO 3743-1:2010, Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for small movable sources in reverberant fields – Part 1: Comparison method for a hard-walled test room

ISO 3744:2010, Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

Addition:

3.101

cleaning head

plain nozzle or brush attached to a connecting tube, or a power nozzle, separate or part of the cleaner housing, and ~~the~~ that part of a dry vacuum cleaner which is applied to ~~the~~ a surface to be cleaned

[SOURCE: ~~IEC 60312-1:2010~~ IEC 62885-2:2016, 3.3]

3.102

nozzle

active nozzle

cleaning head provided with a driven agitation device to assist dirt removal

Note 1 to entry: The agitation device ~~may~~ can be driven by an incorporated electric motor (motorized nozzle), an incorporated turbine powered by the air flow (air-turbine nozzle) or an incorporated friction or gear mechanism actuated by moving the cleaning head over the surface to be cleaned (mechanical nozzle).

[SOURCE: ~~IEC 60312-1:2010~~ IEC 62885-2:2016, 3.4]

3.103

standard Wilton test carpet

~~Wilton type carpet according to the typical specification provided in Table 105 used for testing~~

~~**Table 105 – Wilton type carpet specifications**~~

Type	Wilton
Pile composition wool	8,6/2 x 2
Method of manufacturing	Wilton fabric
Colour	dark, one colour
Backing	jute and cotton with latex
Type	cut-pile
Total height	7,5 mm, see also tolerances
Pile height	6,4 mm, see also tolerances
Total weight/m ²	2 100 g/m ² , see also tolerances
Pile weight/m ²	1 500 g/m ² , see also tolerances
Number of knots/m ²	96 000 knots/m ² , see also tolerances
Reed	320 reed /m
Shots	300 shots/m
Standard width	400 cm
Tolerances	±5 %

Note 1 to entry: — For acoustical reasons, the size of the carpet used is 1 m × 1 m.

Note 2 to entry: — ~~Carpets conforming to previous editions of this standard do not conform with this definition.~~

Wilton carpet on which the vacuum cleaner and its cleaning head is placed for the measurement

~~https://standards.iteh.ai/IEC 60704-2-1-2020~~ Note 1 to entry: The specification of the standard Wilton test carpet can be found in IEC TS 62885-1.60704-2-1-2020

3.104

standard hard floor

~~part of the floor of at least 1 m by 1 m on which the vacuum cleaner and its nozzle is placed for the measurement, with a sound absorption coefficient lower than 0,1 and an areal density of at least 50 kg/m²~~

Note 1 to entry: — ~~Scratches and other irregularities of the surface roughness shall be below 0,5 mm to prevent turbulence noise generated by these irregularities.~~

part of the floor on which the vacuum cleaner and its cleaning head is placed for the measurement

4 Measurement methods and acoustical environments

This clause of Part 1 is applicable except as follows:

4.2 Direct method

Addition:

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 may increase. In such cases additional microphone positions or source positions may be necessary, as specified in ISO 3743-2.

4.3 Comparison method

Addition:

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 may increase. In such cases additional microphone positions or source positions may be necessary, as specified in ISO 3743-1 or ISO 3743-2.

5 Instrumentation

This clause of Part 1 is applicable except as follows:

5.1 Instrumentation for measuring acoustical data

Addition:

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

6 Operation and location of appliances under test

This clause of Part 1 is applicable except as follows:

6.1 Equipping and pre-conditioning of appliances

6.1.1

Replacement:

IEC 60704-2-1:2020

~~The appliance is equipped with the ordinary cleaning head intended for dust removal from carpets or hard floors respectively and the necessary attachments, for example hoses and connecting tubes.~~

~~The vacuum cleaner and its attachments shall be used and adjusted in accordance with the manufacturer's instructions for normal operation for the test to be carried out. Height adjustment controls for the cleaning head shall be set as appropriate for the surface to be cleaned and the position noted.~~

~~NOTE 101—Additional measurements can be made for other settings (for instance: "boost" position, minimum speed). A boost position is a setting of a control for occasional use, which results in a higher temporary motor speed.~~

~~The tube grip of cleaners with suction hose or the handle of other cleaners shall be held as or normal operation at a height of (800 ± 50) mm above the test floor.~~

~~If the vacuum cleaner is designed to be used with disposable dust receptacles, it shall, prior to each measurement, be equipped with a new dust receptacle of the type recommended or supplied by the manufacturer of the vacuum cleaner.~~

~~If the vacuum cleaner is provided with a reusable dust receptacle (as the sole original dust receptacle or as an enclosure for disposable dust receptacles), the dust receptacle and any additional filters removable without the aid of tools shall, prior to each measurement, be cleaned according to manufacturer's instructions until its weight is within 1 % or 2 g of its original weight whichever is lower.~~

The tube grip of cleaners with suction hose or the handle of other cleaners shall be held at a height of (800 ± 50) mm above the test surface. Any telescopic suction tubes or sticks shall be extended to maximum length. For nozzles without pivoting connectors, it shall be ensured that the bottom of the cleaning head be made parallel with the test surface by adjusting the handle height within the tolerances. If this is not possible, the length of a telescopic tube or stick may be adjusted. Any adjustment shall be reported.

For declaration and compliance purposes, related tests conducted on a surface type (carpet or hard surface with or without crevice) shall be conducted with the same dry vacuum cleaner setting configurations such as power, cleaning head and cleaning head setting.

Unless otherwise specified, the dry vacuum cleaner setting configurations, such as cleaning head and cleaning head setting, shall be used and adjusted in accordance with the manufacturer's instructions for the surface to be cleaned (e.g. carpet or hard floor) for the test to be carried out.

In the absence of unambiguous instructions within the manufacturer's instructions, the product shall be tested with settings that are in accordance with any explicitly clear text, symbol or pictogram that is identifiable on the product.

If, after following the above order of checks, the tester believes the device under test to be in a configuration that is ambiguous, or that multiple configurations are possible with no way to clearly determine which is the most suitable for a given task, then the manufacturer shall be contacted for additional guidance.

If all of the above-mentioned measures to get information regarding the correct setting fail, the setting for maximum continuous airflow shall be used.

Complete details of the settings used for each cleaning task shall be recorded in the test documentation.

If the dry vacuum cleaner is designed to be used with disposable dust receptacles, it shall, prior to each measurement, be equipped with a new dust receptacle of the type recommended or supplied by the manufacturer of the dry vacuum cleaner.

If the dry vacuum cleaner is provided with a reusable dust receptacle (as the sole original dust receptacle or as an enclosure for disposable dust receptacles), the dust receptacle and any additional filters removable without the aid of tools shall, prior to each measurement, be cleaned in accordance with the manufacturer's instructions until its mass is within 1 % or 2 g of its original mass, whichever is the lower.

Each test of a cordless dry vacuum cleaner is started with a fully charged sample. For tests where more than one repeat is needed, testing should be carried out on one full charge. This document does not currently address changing performance throughout the whole run time of some appliances. Results at different states of battery charge can vary. However, if the device becomes fully discharged during a repeat, that repeat is annulled, and the product is fully charged.

If the manufacturer provides no instructions on determination of fully charged battery, a charging time of 24 h shall be used.

After a full charge, the cordless cleaner shall not be tested until 30 min have elapsed, and before 48 h have elapsed. The cleaner shall be disconnected from the charger during this period.

Make a note in the report if it is not possible to test owing to a short runtime.