

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Household and similar electrical air cleaning appliances – Methods for measuring the performance –
Part 2-1: Particular requirements for determination of particle reduction**

**Appareils d'épuration d'air électriques domestiques et appareils similaires –
Méthodes de mesure de l'aptitude à la fonction –
Partie 2-1: Exigences particulières pour la détermination de la réduction des
particules**

<https://standards.iteh.ai/catalog/standards/iso/78d4c02f-6752-4bc7-a74f-03960bdc9968/iec-63086-2-1-2024>





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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 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.

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.

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.

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 63086-2-1:2024](https://standards.iteh.ai/catalog/standards/iso/78d4c02f-6752-4bc7-a74f-03960bdc9968/iec-63086-2-1-2024)

<https://standards.iteh.ai/catalog/standards/iso/78d4c02f-6752-4bc7-a74f-03960bdc9968/iec-63086-2-1-2024>

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch



INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Household and similar electrical air cleaning appliances – Methods for measuring the performance –
Part 2-1: Particular requirements for determination of particle reduction**

**Appareils d'épuration d'air électriques domestiques et appareils similaires –
Méthodes de mesure de l'aptitude à la fonction –
Partie 2-1: Exigences particulières pour la détermination de la réduction des
particules**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions.....	7
3.2 Abbreviated terms.....	8
4 Aerosol measurement instruments.....	8
4.1 General.....	8
4.2 Aerosol transport	9
4.3 Condensation particle counter.....	9
4.4 Optical particle counter	9
4.5 Aerodynamic particle sizer	9
5 Aerosol generation	9
5.1 Salt aerosol	9
5.2 Smoke aerosol.....	10
5.2.1 Type of cigarettes	10
5.2.2 Smoke aerosol generation	10
5.3 Dust aerosol	11
5.3.1 Type of dust	11
5.3.2 Dust aerosol generation.....	11
5.4 Pollen aerosol.....	12
5.4.1 Type of pollen.....	12
5.4.2 Pollen aerosol generation.....	12
6 Measurement of the CADR in maximum performance operation mode	13
6.1 Test methods	13
6.2 General.....	13
6.3 Natural decay	13
6.3.1 Test preparation	13
6.3.2 Background particle number concentration	13
6.3.3 Test chamber conditions.....	14
6.3.4 Aerosol generation	14
6.3.5 Mixing and homogenization of the test aerosol	14
6.3.6 Measurement of the natural decay	15
6.3.7 Calculation of the natural decay rate.....	15
6.3.8 Acceptability of the run	15
6.4 Total decay	16
6.4.1 Test preparation	16
6.4.2 Placement of the DUT	16
6.4.3 Background particle number concentration	16
6.4.4 Test chamber conditions.....	16
6.4.5 Aerosol generation	16
6.4.6 Mixing and homogenization of the test aerosol	16
6.4.7 Operation of the DUT.....	16
6.4.8 Measurement of the total decay	16
6.4.9 Calculation of the total decay rate.....	16
6.4.10 Acceptability of the run	17

6.5	Calculation of the clean air delivery rate	17
7	Calculation procedures	17
7.1	Criteria for the acceptance of data points	17
7.1.1	Outliers from the regression line	17
7.1.2	Particle number concentration below 1 % of the value at $t = 0$	17
7.2	Calculation of decay constants	17
7.3	Sample standard deviation of the slope of the regression line	18
7.4	Calculation of the clean air delivery rate	19
7.5	Sample standard deviation of the clean air delivery rate	19
Annex A	(normative) Limits of measurability	20
A.1	General	20
A.2	Maximum clean air delivery rate	20
A.3	Minimum clean air delivery rate	20
Annex B	(informative) Long-term storage of the target pollutants	21
B.1	Salt	21
B.2	Cigarettes	21
B.3	Dust	21
B.4	Pollen	21
Annex C	(informative) Test report information	22
C.1	General	22
C.2	General data	22
C.3	Description of the DUT	22
C.4	Test chamber	22
C.5	Aerosol generation	22
C.6	Particle measurement instrumentation	22
C.7	Test conditions	22
C.8	Test execution	23
C.9	Results	23
Annex D	(normative) Derivation of the effective room size	24
D.1	Effective room size	24
D.2	Basic indoor air model for particle number concentrations	24
Annex E	(informative) Schematic representation of a CADR measurement	27
Annex F	(informative) Cleaning procedures for the test chamber	28
F.1	Daily start-up cleaning procedure	28
F.2	Comprehensive test chamber cleaning procedure	28
F.2.1	General	28
F.2.2	Equipment	28
F.2.3	Procedure	28
Annex G	(normative) Measurement of the average power in maximum performance operation mode	29
G.1	General	29
G.2	Setup of the DUT	29
G.3	Measurement procedure	29
G.4	Calculation of the average operating power	29
Annex H	(informative) Calculation of the 99 % prediction interval of the regression line	31
Annex I	(normative) Alternative fine particle size range	33
I.1	General	33
I.2	Optical particle counter	33

I.3	Measurement of the CADR in maximum performance operation mode	33
I.4	Derivation of the effective room size	34
	Bibliography.....	35
Figure 1	– Schematic of a Laskin atomizer (a) and a Collison atomizer (b).....	10
Figure 2	– Schematic of two possible methods to generate the smoke aerosol.....	11
Figure 3	– Schematic of two possible methods to generate the dust aerosol	12
Figure 4	– Schematic of two possible methods to generate the pollen aerosol.....	12
Figure E.1	– Schematic representation of the CADR measurement in accordance with Clause 6	27
Table 1	– Measurement instruments, test aerosols and maximum background particle number concentrations for the different particle size ranges.....	14
Table 2	– Test aerosols and initial particle number concentrations for different particle size ranges	14
Table 3	– Test aerosols, mixing and homogenization time for different particle size ranges	15
Table 4	– Test aerosols, test duration and minimum number of data points for different particle size ranges.....	15
Table 5	– Limits for the sample standard deviation of the slope of the regression line for the natural decay	15
Table 6	– Limits for the sample standard deviation of the slope of the regression line for the total decay	17
Table H.1	– Values of the Student t-distribution with $n - 2$ degrees of freedom for different numbers of data points n	32
Table I.1	– Measurement instrument, test aerosols and maximum background particle number concentration for the alternative fine particle size range	33
Table I.2	– Test aerosols and initial particle number concentrations for the alternative fine particle size range.....	34

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HOUSEHOLD AND SIMILAR ELECTRICAL AIR CLEANING APPLIANCES –
METHODS FOR MEASURING THE PERFORMANCE –****Part 2-1: Particular requirements for determination of particle reduction**

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.

IEC 63086-2-1 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, in co-operation with ISO technical committee 142: Cleaning equipment for air and other gases. It is an International Standard.

It is published as a double logo International Standard.