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Household and similar electrical air cleaning appliances — Methods for measuring the performance —

Part 3-1:
Particular requirements for reduction of microorganisms

Appareils électrodomestiques et analogues de purification de l'air — Méthodes de mesure de la performance —

Partie 3-1: Exigences particulières pour la réduction des microorganismes

This draft is submitted to a parallel vote in ISO and in IEC.

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International Electrotechnical Commission

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FOREWORD

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IEC PAS 63086-3-1 has been prepared by the Association of Home Appliance Manufacturers (AHAM) and processed by IEC technical committee 59, Subcommittee 59N: Performance of household and similar electrical appliances. It is based on ANSI/AHAM AC-5-2022.

The text of this PAS is based on the following document

59N/XXX/DPAS

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Report on voting

59N/XXX/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned will transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

INTRODUCTION

This Publicly Available Specification (PAS) contains test procedures for measuring the reduction by the air cleaner of micro-organisms suspended in the air in the specified test chamber. It also prescribes a method for measuring the operating power and stand-by power of the air cleaner. The test procedures may be applied to any brand or model of household and similar electrical air cleaners within the stated confines of the standard's limits of measurability for measuring performance.

The annexes to this PAS are included for informative purposes only unless the annexes are noted as normative.

Warning—The tests given in this document shall be performed by expert staff trained to handle microorganism-related techniques and in properly equipped laboratories under the supervision of a skilled microbiologist. Some of the test micro-organisms might be facultative pathogens for humans, animals and plants and requires a laboratory of an appropriate bio-safety level. National and international safety procedures for working with infectious biomaterials shall be followed to prevent any contamination of laboratory staff, apparatus, working place or environment in compliance with national standards or regulations. This document does not purport to address all of the safety aspects, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and ensure compliance with any national, regional or international regulatory conditions.

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International Electrotechnical Commission

Method for Assessing the Reduction Rate of Key Bioaerosols by Portable Air Cleaners Using an Aerobiology Test Chamber

INTRODUCTION

Indoor air free of harmful microbes is important to the health of occupants. This is particularly relevant with regard to increased time spent indoors.

Air cleaners are used to reduce the concentrations of microorganisms in indoor air.

The efficiency of such air cleaners to reduce airborne microorganisms can be assessed in test chambers at controlled air temperature and relative air humidity.

1. SCOPE

This document specifies a method to evaluate the capability of portable household air cleaners to reduce the concentration and viability of key experimentally generated bioaerosols in a specified chamber.

The test is applicable to portable air cleaners commonly used in single room spaces such as those based on mechanical filtration, ultraviolet (UV), ionizers, photocatalytic oxidation, and ozone generators in-unit technology.

If the air cleaner does not claim to have the function of reducing microorganisms, this standard may not be applicable unless it is being used to simply evaluate the performance.

This document deals with measurement procedures regarding the reduction of the microbial contamination related to electrical air cleaner appliances for household and similar use.

This document does not apply to appliances intended to be used in medical, veterinary, or pharmaceutical applications.

This document does not address sanitization, disinfection, or sterilization measures.

This document does not support, by itself any health-related claims or conclusions about prevention or treatment of a disease or health improvement.

Note: IEC 63086-3-1 is created for Household and Similar Electrical Air Cleaners and is not intended to conflict with or replace standards for commercial or industrial consumers.

Note: In this standard, we do not suggest performance test methods that measure the by-products of either the interaction between microbes or between the air cleaner and the microbes tested in this standard. The formation of by-products is an important subject. The subject of measuring by-products is under study, and AHAM will address this in future documents.

Note: This standard does not apply to appliances intended for use in medical treatment locations, such as surgical suites, laboratories, medical treatment rooms, etc.

2. NORMATIVE REFERENCES

The following documents are referred to in the text so that some or all of their content constitutes the requirements of this document. Only the edition cited applies for dated references, and the latest edition of the referenced document (including any amendments) applies for undated references.

ASTM E741-11(2017): *Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution*

ASTM E3273-21*: Standard Practice to Assess Microbial Decontamination of Indoor Air using an Aerobiology Chamber*

GB21551.3-2010: *Antibacterial and cleaning function for household and similar electrical appliances – Particular requirements for air cleaner*

ISO 3696: *Water for analytical laboratory use — Specification and test methods*

ISO 16000-9: Indoor air — *Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

ISO 16000-36*: Standard method for assessing the reduction rate of culturable airborne bacteria by air cleaners using a test chamber*

JEMA 1467-2015: *Appendix D - Evaluation test for removing performance of floating virus*

JEMA 1467-2015: *Appendix E - Evaluation test for restraining performance of indoor adhered virus*

JEMA 1467-2015*: Appendix F - Evaluation test for restraining performance of virus caught by the filter*

98 # 3. TERMS AND DEFINITIONS

99 ## 3.1 Air Cleaner

100 electrically powered household or similar, appliance that employs one or multiple
101 technologies to reduce, destroy, and/or inactivate one or more types of indoor air
102 pollutants [Source: IEC 63086-1 modified]

103 **Note to entry:** the term **Air Purifier is** defined as an Electrically powered
104 device that is basically built of a fan and a set of components possessing
105 the ability to capture and/or (partially or totally) destroy air pollutants
106 [Source: ISO 16000-36] but PAS 63086-3-1 has chosen to not use this
107 term in this document as it may not be possible to totally destroy an air
108 pollutant.]

109 ## 3.2 Background Concentration

110 quantity of **microbes** in the chamber after the chamber has undergone cleaning
111 and prior to any testing or addition of **microbes** via nebulization

112 ## 3.3 Bacteria

113 prokaryotic, single-celled, microscopic organism with peptidoglycan cell wall

114 ## 3.4 Bacteriophage or phage

115 group of **viruses** that infect **bacteria** or **fungi**

116 ## 3.5 Bioaerosol

117 airborne particle that is composed of or derived from biological matter (such as a
118 bacterial cell, fungal or bacteria spore, **virus**, or endotoxin)

119 ## 3.6 Biological Safety Levels (BSL)

120 series of protections relegated to autoclave-related activities that take place in
121 particular biological labs

122 Note to entry: This includes individual safeguards designed to protect laboratory
123 personnel, as well as the surrounding environment and community. For BSL
124 level expectations, a lab should follow the most recent version of the WHO
125 Laboratory Biosafety Manual, the CDC Biosafety in Microbiological and
126 Biomedical Laboratories (BMBL) or the Canadian Biosafety Standards and
127 Guidelines.

128 ## 3.7 CADR (Clean Air Delivery Rate)

129 measure of **air cleaner** performance by this test procedure
130

Note to entry: Clean Air Delivery Rate (CADR) is defined as the measure of the delivery of contaminant-free air, within the defined particle size range, by an **air cleaner**, expressed in cubic feet per minute (cfm) or cubic meters per hour. Clean Air Delivery Rates are the rates of contaminant reduction in the test chamber when the **air cleaner** is turned on, minus the rate of **natural decay** when the **air cleaner** is not running, multiplied by the volume of the test chamber as measured in cubic feet or cubic meters (see Section 8.5). CADRs values are always the measurement of an **air cleaner** performance as a complete system, and they have no linear relationship to air movement per se or to the characteristics of any particular particle removal methodology.

Note to entry: For this standard we use the designation of m-CADR which is the clean air delivery rate for microbes.

3.8 Colony Forming Units (CFU) for bacteria and fungi

unit of measurement by which the number of culturable **microbes** (***Bacteria*** *and* ***fungi)*** is expressed

3.9 Device Under Test (DUT)

test sample of the **air cleaner** undergoing examination

3.10 Fungi

multicellular eukaryotic organisms without chlorophyll and with cell walls

3.11 Impaction

sampling of the airborne **microbe** by inertial separation on a semisolid agar surface

3.12 Impinger method

glass or plastic device for the collection of air samples into a liquid medium through a scrubbing action.

Note to entry: The liquid volume is subsequently utilized for dilution and inoculation of counting plates.

3.13 Initial Concentration

concentration of **microbes** inside the chamber immediately at the start time of sampling of either the **natural decay** or the total decay

3.14 Maximum Performance Mode

through manual operation the DUT is set to the highest flow rate with all air cleaning functions switched on, set to maximum, where applicable, and with all filters in place

Note to entry: If the DUT has zero flow rate, the m-CADR is measured with all air cleaning functions switched on.

3.15 Microbes (also known as Microorganisms)

microscopic living beings that cannot be seen with the naked eye, including **bacteria**, protozoa, **viruses** and **some fungi**/fungal components

Note to entry: They are common in the environment as well as in/on our own bodies.

3.16 Microbial Reduction

reduction rate of viable **microbe** is measured by comparing the concentration of the **microbe** after nebulizing a microbial suspension inside the chamber with the concentration determined after a defined running time (testing time) of the **air cleaner**

Note to entry: The microbial reduction rate is expressed as natural log reduction over time.

3.17 Natural Decay

rate of reduction of the airborne concentration of viable microbiological contaminants as measured without an air-cleaning device operating in an aerobiology chamber

Note to entry: The **natural decay** rate is expressed as natural log reduction over time.

3.18 Plaque Forming Units (PFU)

Unit of measurement by which the number of viable **viruses** is expressed

3.19 Virus