



## Electrostatic air cleaners



# Legal Notice for Standards

Canadian Standards Association (operating as “CSA Group”) develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

## Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document’s fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party’s intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document’s compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

## Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group’s and/or others’ intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by treaty or by law, CSA Group reserves all intellectual property rights in this document.

## Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

## Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF form.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way, or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



# ***Standards Update Service***

*CSA C22.2 No. 187:20*  
*January 2020*

**Title:** *Electrostatic air cleaners*

To register for e-mail notification about any updates to this publication

- go to [store.csagroup.org](https://store.csagroup.org)
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **24280-2**

If you require assistance, please e-mail [techsupport@csagroup.org](mailto:techsupport@csagroup.org) or call 416-747-2233.

Visit CSA Group's policy on privacy at [www.csagroup.org/legal](https://www.csagroup.org/legal) to find out how we protect your personal information.

**Canadian Standards Association (operating as “CSA Group”)**, under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users — including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

Individuals, companies, and associations across Canada indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work and supporting CSA Group’s objectives through sustaining memberships. The more than 7000 committee volunteers and the 2000 sustaining memberships together form CSA Group’s total membership from which its Directors are chosen. Sustaining memberships represent a major source of income for CSA Group’s standards development activities.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in eight countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to  
CSA Group  
178 Rexdale Boulevard  
Toronto, Ontario, M9W 1R3  
Canada



A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at [www.scc.ca](http://www.scc.ca).

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at [www.scc.ca](http://www.scc.ca).

Standards Council of Canada  
600-55 Metcalfe Street  
Ottawa, Ontario, K1P 6L5  
Canada



**Standards Council of Canada**  
**Conseil canadien des normes**

Cette Norme Nationale du Canada n'est disponible qu'en anglais.

*Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users to judge its suitability for their particular purpose.*

*\*A trademark of the Canadian Standards Association, operating as “CSA Group”*

# *National Standard of Canada*

## *CSA C22.2 No. 187:20* *Electrostatic air cleaners*



*®A trademark of the Canadian Standards Association,  
operating as "CSA Group."*



*Published in January 2020 by CSA Group  
A not-for-profit private sector organization  
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3*

*To purchase standards and related publications, visit our Online Store at [store.csagroup.org](https://store.csagroup.org)  
or call toll-free 1-800-463-6727 or 416-747-4044.*

*ICS 13.040  
ISBN 978-1-4883-2583-0*

*© 2020 Canadian Standards Association  
All rights reserved. No part of this publication may be reproduced in any form whatsoever  
without the prior permission of the publisher.*

# Contents

Technical Committee on Consumer and Commercial Products	4
Subcommittee on Electrostatic Air Cleaners	6
Preface	7
<b>1 Scope</b>	<b>9</b>
<b>2 Reference publications</b>	<b>10</b>
<b>3 Definitions</b>	<b>12</b>
<b>4 General requirements</b>	<b>14</b>
<b>5 Construction</b>	<b>14</b>
5.1 General	14
5.2 Frame and enclosure	16
5.2.1 Sheet metal enclosures for live parts	16
5.2.2 Corrosion protection	16
5.2.3 Cast-metal enclosures	16
5.2.4 Duct-mounted air cleaners	16
5.2.5 Properties of nonmetallic enclosures and supports	16
5.2.6 Openings in enclosures	17
5.3 Mechanical assembly	18
5.4 Supply connections	18
5.4.1 Permanently-connected equipment	18
5.4.2 Cord-connected equipment	19
5.4.3 Strain relief	19
5.5 Bushings and insulators	19
5.6 Terminal parts	20
5.7 Current-carrying parts	20
5.8 Internal wiring	21
5.9 Separation of circuits	21
5.10 Capacitors	22
5.11 Electromagnetic interference (EMI) filters	22
5.12 Switches, relays, and interlocks	22
5.13 Motors	22
5.14 High-voltage power supplies	23
5.15 Spacings	24
5.15.1 Low-voltage circuits	24
5.15.2 High-voltage circuits	26
5.16 Insulating material	26
5.17 Maximum output current	26
5.18 Grounding and bonding	26
5.19 Access to high-voltage bare live parts	27
5.20 Fan blade guards	27
5.21 Washing	28

5.22	Safety functions	28
5.23	Thermal links	28
5.24	Temperature controls	28
5.25	Power supply	29
5.26	Optical isolators and similar devices	29
<b>6</b>	<b>Tests</b>	<b>29</b>
6.1	Rating	29
6.2	Temperature — Normal	29
6.3	Temperature — Abnormal	30
6.3.1	Cheesecloth	30
6.3.2	Single-fault condition	30
6.3.3	Requirements	30
6.3.4	Additional requirements	30
6.3.5	Test duration	30
6.4	Maximum output voltage and current	30
6.5	Dielectric withstand	31
6.6	Voltage decay	32
6.7	Interlock	32
6.8	Leakage current	33
6.9	Strain relief	34
6.10	High-voltage insulating materials	34
6.11	Strength of enclosures and grills	34
6.12	Access to moving parts	34
6.13	Flame test for nonmetallic enclosures of live parts	35
6.14	Moisture-absorption test	35
6.15	Evaluation of coatings on printed circuit wiring boards	35
6.15.1	General	35
6.15.2	Dielectric strength on printed wiring boards	35
6.15.3	Dielectric strength after temperature conditioning	35
6.15.4	Dielectric strength after humidity conditioning	36
<b>7</b>	<b>Ozone</b>	<b>36</b>
7.1	General	36
7.2	Requirements	36
7.3	Markings	37
7.4	Tests	37
7.4.1	General	37
7.4.2	Normal conditions	37
7.4.3	Endurance test	38
7.4.4	Additional requirements	39
7.5	Electrostatic in duct-type air cleaners for residential use	39
7.5.1	General requirements	39
7.5.2	Duct test fixture	39
7.5.4	Test equipment accuracy requirements	41
7.5.5	Test method	42
7.5.6	Reporting requirements	43
7.5.7	Labelling	43
7.6	UVC in duct-type air purifiers for residential use	44

7.6.1	UVC in duct-type	44
7.6.2	Test duct fixture	44
7.6.3	Test requirements	44
7.6.4	Background ozone measurement	45
7.6.5	Reporting requirements	45
7.6.6	Labelling	45
7.7	Commercial ozone generator designed exclusively for use in temporarily unoccupied spaces	46
7.7.1	General	46
7.7.2	Commercial-use ozone generators	46
7.7.3	Instruction manual	46
7.7.4	Additional markings	46
7.7.5	Installation and operating instructions	46
7.7.6	Special precautions	47
7.7.7	Requirements	47
7.7.8	Ozone detector test	48

---

**8 Markings** 49

---

Annex A (informative)	— The time-weighted average (TWA) sample calculation	63
Annex B (informative)	— Checklist for ozone treatment technician inspecting the ozone generator for temporary unoccupied space	64

# Technical Committee on Consumer and Commercial Products

<b>S. Lawrence</b>	Synamedia Vividtec Canada ULC, Scarborough, Ontario, Canada <i>Category: Producer Interest</i>	<i>Chair</i>
<b>F. LaRicca</b>	Health Canada, Ottawa, Ontario, Canada <i>Category: Regulatory Authority</i>	<i>Vice-Chair</i>
<b>G. Benjamin</b>	ABB Installation Products Ltd., Dorval, Québec, Canada <i>Category: Producer Interest</i>	
<b>D. Brière</b>	CSA Group, Toronto, Ontario, Canada <i>Category: General Interest</i>	
<b>W. J. Burr</b>	Burr and Associates, Campbell River, British Columbia, Canada <i>Category: User Interest</i>	
<b>J. Clements</b>	Dallas, Texas, USA <i>Category: General Interest</i>	
<b>J. E. Evans</b>	Evans Regulatory Certification, Jasper, Ontario, Canada <i>Category: User Interest</i>	
<b>N. Hanna</b>	Electrical Safety Authority, Mississauga, Ontario, Canada <i>Category: Regulatory Authority</i>	
<b>W. Hansen</b>	Trane Ingersoll Rand, La Crosse, Wisconsin, USA <i>Category: Producer Interest</i>	
<b>J. A. Izzar</b>	Consumers Council of Canada, Victoria, British Columbia, Canada <i>Category: User Interest</i>	
<b>R. J. Kelly</b>	Ingleside, Ontario, Canada <i>Category: User Interest</i>	

<b>B. K. Lowe</b>	Vancouver, British Columbia, Canada <i>Category: General Interest</i>	
<b>S. Mercier</b>	Régie du bâtiment du Québec, Montréal, Québec, Canada <i>Category: Regulatory Authority</i>	
<b>J. C. Potts</b>	Dept. of Community & Government Services, Government of Nunavut, Iqaluit, Nunavut, Canada <i>Category: Regulatory Authority</i>	
<b>A. Z. Tsisserev</b>	AES Engineering Ltd., Vancouver, British Columbia, Canada <i>Category: General Interest</i>	
<b>M. B. Williams</b>	Association of Home Appliance Manufacturers (AHAM), Washington, District of Columbia, USA <i>Category: Producer Interest</i>	
<b>A. Andronescu</b>	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

# ***Subcommittee on Electrostatic Air Cleaners***

<b>G. Nilsson</b>	NRC-Construction Portfolio, Ottawa, Ontario, Canada	<i>Chair</i>
<b>R. Larocque</b>	Ozocan Corporation, Scarborough, Ontario, Canada	<i>Vice-Chair</i>
<b>A. Bal</b>	Toronto, Ontario, Canada	
<b>B. Crowe</b>	Toronto, Ontario, Canada	
<b>E. Fernando</b>	Brampton, Ontario, Canada	
<b>M. Gottfried</b>	Dynamic Air Quality Solution, Princeton, New Jersey, USA	
<b>A. J. Heffler</b>	Ottawa, Ontario, Canada	
<b>R. Jakhu</b>	CSA Group, Toronto, Ontario, Canada	
<b>B. Terlson</b>	Honeywell Inc., Golden Valley, Minnesota, USA	
<b>J. Waldner</b>	Better Air Manufacturing Limited, MacGregor, Manitoba, Canada	
<b>J. Williams</b>	California Air Resources Board, Sacramento, California, USA	
<b>A. Wilson</b>	Health Canada, Ottawa, Ontario, Canada	
<b>A. Andronesu</b>	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

# Preface

This is the fifth edition of CSA C22.2 No. 187, *Electrostatic air cleaners*, one of a series of Standards issued by CSA Group under Part II of the *Canadian Electrical Code*. It supersedes the previous editions, published in 2015, 2009, 1986, and 1982.

The major changes to this edition include

- a) scope revision to clarify the Standard coverage of duct-mounted type electrostatic air cleaners, air ionizers, and other similar ionizing equipment intended for general indoor residential use;
- b) addition of safety function requirements and power supply requirements;
- c) revision of ozone requirements; and
- d) addition of requirements for coatings and spacings on printed circuit boards.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Electrostatic Air Cleaners, under the jurisdiction of the Technical Committee on Consumer and Commercial Products and the Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

**Interpretations:** The Strategic Steering Committee on Requirements for Electrical Safety has provided the following direction for the interpretation of standards under its jurisdiction: “The literal text shall be used in judging compliance of products with the safety requirements of this Standard. When the literal text cannot be applied to the product, such as for new materials or construction, and when a relevant CSA committee interpretation has not already been published, CSA Group’s procedures for interpretation shall be followed to determine the intended safety principle”.

**Notes:**

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Request for interpretation” in the subject line:*
  - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
  - b) *provide an explanation of circumstances surrounding the actual field condition; and*
  - c) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

*Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at [standardsactivities.csa.ca](http://standardsactivities.csa.ca).*
- 5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Proposal for change” in the subject line:*
  - a) *Standard designation (number);*
  - b) *relevant clause, table, and/or figure number;*

- c) *wording of the proposed change; and*
- d) *rationale for the change.*

# CSA C22.2 No. 187:20

## ***Electrostatic air cleaners***

### **1 Scope**

#### **1.1**

This Standard applies to

- a) electrostatic air cleaners intended to remove dust and dirt from the air and intended for general indoor residential and commercial use;
- b) air ionizer type air cleaners;
- c) other similar ionizing equipment; and
- d) duct-mounted type electrostatic air cleaners, air ionizers, and other similar ionizing equipment intended for general indoor residential use.

#### **1.2**

This Standard applies to equipment for commercial use that intentionally produces ozone in a temporarily unoccupied space.

#### **1.3**

This Standard applies to cord-connected and permanently-connected equipment operating at nominal supply voltages up to 600 V, single-phase or polyphase, that is intended to be installed or used in accordance with CSA C22.1, *Canadian Electrical Code, Part I*.

#### **1.4**

This Standard applies to portable and duct-mounted air-cleaning devices that incorporate a UV (ultraviolet) lamp that emits UV radiation between 100 and 280 nm (UVC).

#### **1.5**

This Standard does not apply to electrostatic air cleaners for use in hazardous locations or in atmospheres defined as hazardous by the *Canadian Electrical Code, Part I*.

#### **1.6**

This Standard does not apply to air cleaners designed to remove particles other than dust and dirt normally found in heating and ventilating systems.

#### **1.7**

This Standard does not specify requirements for the effectiveness of air cleaners with respect to the removal of airborne particles.

#### **1.8**

This Standard does not apply to electrostatic air cleaners intended for industrial use.