

# Humidifiers



# Legal Notice for Standards

Canadian Standards Association (CSA) standards are developed 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 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 does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA, 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 HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA 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 accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA is a private not-for-profit company that publishes voluntary standards and related documents. CSA 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 and the users of this document (whether it be in printed or electronic form), CSA 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's and/or others' intellectual property and may give rise to a right in CSA and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA 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 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 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 format.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by CSA 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; 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.

# ***Update No. 1***

## ***C22.2 No. 104-11***

### ***April 2016***

**Note:** For information about the **Standards Update Service**, go to **shop.csa.ca** or e-mail **techsupport@csagroup.org**.

**Title:** *Humidifiers* — originally published April 2011

The following revisions have been formally approved and are marked by a vertical line in the margin on the attached replacement pages:

<b>Revised</b>	Title page, copyright page, and Preface, Clauses 3.2.1, 5.2.5, 5.3.2, 19.14, 25.5, 31.2.2, 36.1.1, 36.2.2, 36.2.3, 36.2.11, and 56.1, Supplement SA, and Annex A
<b>New</b>	Clause 25.7 and Figure 8A
<b>Deleted</b>	None

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.





CSA Group  
CSA C22.2 No. 104-11  
Fourth Edition



Underwriters Laboratories Inc.  
UL 998  
Fifth Edition

## Humidifiers

April 25, 2011

(Title Page Reprinted: April 4, 2016)



ANSI/UL 998-2016

## **Commitment for Amendments**

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”), and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

---

## **ISBN 978-1-55491-623-8 © 2016 CSA Group**

All rights reserved. No part of this publication may be reproduced in any form whatsoever without the prior permission of the publisher.

This Standard is subject to review five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to [inquires@csagroup.org](mailto:inquires@csagroup.org) and include “Proposal for change” in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

To purchase CSA Group Standards and related publications, visit CSA Group’s Online Store at [shop.csa.ca](http://shop.csa.ca) or call toll-free 1-800-463-6727 or 416-747-4044.

---

## **Copyright © 2016 Underwriters Laboratories Inc.**

UL’s Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL’s Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

This ANSI/UL Standard for Safety consists of the Fifth Edition including revisions through April 4, 2016. The most recent designation of ANSI/UL 998 as an American National Standard (ANSI) occurred on April 4, 2016. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL’s On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

To purchase UL Standards, visit Comm 2000 at [http://www.comm-2000.com/help/how\\_to\\_order.aspx](http://www.comm-2000.com/help/how_to_order.aspx) or call toll-free 1-888-853-3503.

---

## CONTENTS

PREFACE .....	6
---------------	---

## INTRODUCTION

1 Scope .....	7
2 Definitions .....	7
3 General .....	9
3.1 Components .....	9
3.2 Reference publications .....	10
3.3 Units of measurement .....	10B
3.4 Terminology .....	11

## CONSTRUCTION

4 General .....	11
5 Enclosures .....	11
5.1 General .....	11
5.2 Nonmetallic materials .....	13
5.3 Enclosure integrity .....	14
6 Doors and Covers .....	15
7 Accessibility of Uninsulated Hazardous Voltage Live Parts and Film-Coated Wire .....	16
8 Protection Against Risk of Injury to Persons – Mechanical Protection .....	17
9 Protection Against Risk of Injury to Persons – Materials .....	18
10 Protection Against Risk of Injury to Persons – Switches, Controls, and Interlocks .....	18
11 Protection Against Risk of Injury to Persons – Surface Temperatures .....	20
12 Stability .....	20
13 Strength of Handles .....	20
14 Strength of Mounting .....	20
15 Mechanical Assembly .....	21
16 Liquid-Containing Parts .....	21
17 Protection Against Corrosion .....	22
18 Cord-Connected Products .....	22
19 Permanently Connected Products .....	23
20 Leads and Terminals .....	24
21 Flexible Cords .....	26
22 Strain Relief .....	27
23 Bushings .....	28
24 Current-Carrying Parts .....	28A
25 Internal Wiring .....	28A
26 Protection of Wiring .....	28B
27 Wiring Connections .....	28B
28 Electrical Insulation .....	29
29 Separation of Circuits .....	31
30 Secondary Circuits .....	33
30.1 General .....	33
30.2 Extra-low-voltage circuits .....	33
31 Grounding .....	34
31.1 General .....	34
31.2 Permanently connected products .....	35
31.3 Cord-connected products .....	36

31.4 Bonding of internal parts .....	36
32 Bonding Means .....	37
33 Capacitors .....	38
34 Coil Windings .....	38
35 Heating Elements .....	39
36 Motors .....	39
36.1 General .....	39
36.2 Motor overload protection .....	40
36.3 Short circuit protection .....	42
37 Overcurrent Protection .....	42
38 Protection Against Overheating .....	43
39 Receptacles .....	45
40 Switches and Controllers .....	45
41 Electrically Operated Valves and Solenoids .....	46
42 Spacings .....	46
43 Thermal Insulation .....	47
44 Wetting Live Parts .....	48
45 Internal Plumbing .....	48
46 Filters .....	48
47 Pressure Vessels and Parts Subjected to Pressure .....	48
48 Protection of Service Personnel .....	50
48.1 General .....	50
48.2 Construction .....	51
49 Duct- and Plenum-Mounted Products .....	53
50 Construction of Duct- and Plenum-Mounted Products .....	53
50.1 Installation .....	53
50.2 Polymeric material .....	53
50.3 Evaporation pad .....	54
50.4 Supply cord .....	54

## PERFORMANCE

51 General Test Parameters .....	54
51.1 General .....	54
51.2 Voltage .....	55
51.3 Ambient temperatures .....	55
52 Leakage-Current Test .....	55
53 Humidity-Conditioning Test .....	56
54 Operation Test .....	57
55 Starting Test .....	57
56 Input Test .....	57
57 Normal-Temperature Test .....	58
57.1 All products .....	58
57.2 Duct- or plenum-mounted products .....	61
58 Disassembly and Reassembly Test .....	61
59 Impact .....	61
60 Rotating Members .....	62
61 Dielectric Voltage-Withstand Test .....	62
62 Strain-Relief Test .....	63
62.1 General .....	63
62.2 Through-cord switch .....	63
63 Power-Supply Cord Push-Back Relief Test .....	63
64 Cable-Clamp Test .....	63

65	Abnormal Operation Test .....	64
65.1	General .....	64
66	Thermal Cutoff Test .....	64
67	Gasket Test .....	64
68	Liquid-Container Test .....	65
69	Flooding of Live Parts Test .....	65
70	Backflow Test .....	66
71	Bonding-Conductor Test .....	67
72	Tests on Parts Subject to Pressure .....	67
73	Mold Stress-Relief Test .....	68

## RATINGS

74	Electrical Ratings .....	69
----	--------------------------	----

## MARKING AND INSTRUCTIONS

75	Identification and Ratings .....	69
76	Informational and Instructional Markings .....	73
77	Operating Instructions .....	73
78	Field Wiring .....	74

## TABLES AND FIGURES

Tables .....	76
Figures .....	87

## SUPPLEMENT SA - SMART ENABLED HUMIDIFIERS

SA1	Scope .....	97
SA2	Construction .....	98
SA2.1	Controls .....	98
SA2.2	Separation of circuits .....	99
SA2.3	Communication and display devices .....	99
SA2.4	Communication conductors and cables .....	100
SA2.5	Communication connectors .....	100
SA2.6	Smart enabled or remote operation .....	100
SA3	Functional Safety .....	101
SA4	Resistance to Electro Magnetic Phenomena (Immunity) .....	101
SA5	Markings and Instructions .....	102

## Annex A Standards for components

## Annex B French translations and markings

## Annex C Manufacturing and Production Tests

## PREFACE

This is the harmonized CSA Group and UL Standard for Humidifiers. It is the fourth edition of CSA-C22.2 No. 104 and the fifth edition of UL 998. This harmonized standard has been jointly revised on April 4, 2016. For this purpose, CSA Group and UL are issuing revision pages dated April 4, 2016.

This harmonized Standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Air Conditioning and Refrigeration Institute (ARI) and the Heating, Refrigerating and Air Conditioning Institute of Canada (HRAI) are gratefully acknowledged.

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

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

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

### Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is considered a minimum quantity.

Note: 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.

### Level of Harmonization

This standard uses the IEC format but is not based on, nor is it considered equivalent to, an IEC standard.

This standard is published as an identical standard for CSA Group and UL.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

### Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

# HUMIDIFIERS

## INTRODUCTION

### 1 Scope

1.1 These requirements cover humidifiers rated 600 V or less, and intended to be used in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, and the Rules of the Canadian Electrical Code (CEC), Part I, C22.1.

1.2 These requirements cover humidifiers intended for residential and commercial use. This includes humidifiers of the centrifugal atomizing type, evaporative-media type, water-injection type, steam type, and the like. The humidifiers may be for installation in a room, mounted on a wall or a ceiling, or for duct or plenum mounting.

1.3 These requirements apply to equipment that includes an electric heating element to heat air or water, or both.

1.4 These requirements do not apply to evaporative coolers that are also intended to be used for cooling.

1.5 These requirements do not apply to portable, electrode-type products, such as vaporizers, which are covered by the Standard for Electric Heating Appliances, UL 499, and the CSA Standard for Household Cooking and Liquid-Heating Appliances, CAN/CSA-C22.2 No. 64.

### 2 Definitions

2.1 The following definitions apply in this Standard:

**Circuit, extra-low-voltage** – A circuit that has an ac potential of not more than 30 V (42.4 peak), and power of 100 VA or less; or 30 V dc supplied by a primary battery; or supplied by a Class 2 transformer; or supplied by a combination of a transformer and fixed impedance that, as a unit, complies with all the performance requirements for a Class 2 transformer. A circuit that is derived from a circuit which exceeds 30 V by connecting resistance or impedance, or both, in series with the supply circuit to limit the voltage and current, is not considered to be an extra-low-voltage circuit.

**Circuit, hazardous voltage** – A circuit having characteristics in excess of those of an extra-low-voltage circuit.

**Combination temperature-regulating and temperature-limiting thermostat** – A thermostat whose function is to regulate the temperature under normal conditions of use, and that also serves to prevent a hazard that might result from conditions of abnormal operation of the heater.

**Enclosure** – The enclosure that houses the electrical components, live parts and/or moving parts. It may be an integral part of the component, a separate item, part of the ultimate enclosure, or the ultimate enclosure (e.g., the outer cabinet).

**Heater element** – A complete or partial assembly of a heating element, an electrical insulation (e.g., refractory, mica), a metal sheath, a glass or quartz envelope or panel, thermal insulation, and a frame or adaptor for holding the assembly together and fastening it in the heater; and leads or terminal connections, or both, which may or may not include bolts and nuts.