

UL 283

Air Fresheners and Deodorizers



Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Air Fresheners and Deodorizers, UL 283

First Edition, Dated March 31, 2004

Revisions: This Standard contains revisions through and including October 31, 2007.

Summary of Topics

This revision to ANSI/UL 283 includes a change of effective date for paragraph 24.7. This requirement is effective upon publication, October 31, 2007.

Text that has been changed in any manner is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The following table lists the future effective dates with corresponding reference.

Future Effective Dates	References
October 17, 2009	1.7, 24.5, 45.2, 66.1.1, and Sections 60 and 65

The revisions dated October 31, 2007 include a reprinted title page (page1) for this Standard.

The revisions dated May 19, 2006 editorially replace all references to UL 1020 with the reference to UL 60691.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net/ulforeword.html>

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

UL's Standards for Safety are copyrighted by UL. Neither a printed copy of a Standard, nor the distribution diskette for a Standard-on-Diskette and the file for the Standard on the distribution diskette 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.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

UL will attempt to answer support requests concerning electronic versions of its Standards. However, this support service is offered on a reasonable efforts basis only, and UL may not be able to resolve every support request. UL supports the electronic versions of its Standards only if they are used under the conditions and operating systems for which it is intended. UL's support policies may change from time-to-time without notification.

UL reserves the right to change the format, presentation, file types and formats, delivery methods and formats, and the like of both its printed and electronic Standards without prior notice.

Purchasers of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgement (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

If a single-user version electronic Standard was purchased, one copy of this Standard may be stored on the hard disk of a single personal computer, or on a single LAN file-server or the permanent storage device of a multiple-user computer in such a manner that this Standard may only be accessed by one user at a time and for which there is no possibility of multiple concurrent access.

If a multiple-user version electronic Standard was purchased, one copy of the Standard may be stored on a single LAN file-server, or on the permanent storage device of a multiple-user computer, or on an Intranet server. The number of concurrent users shall not exceed the number of users authorized.

Electronic Standards are intended for on-line use, such as for viewing the requirements of a Standard, conducting a word search, and the like. Only one copy of the Standard may be printed from each single-user version of an electronic Standard. Only one copy of the Standard may be printed for each authorized user of a multiple-user version of an electronic Standard. Because of differences in the computer/software/printer setup used by UL and those of electronic Standards purchasers, the printed copy obtained by a purchaser may not look exactly like the on-line screen view or the printed Standard.

An employee of an organization purchasing a UL Standard can make a copy of the page or pages being viewed for their own fair and/or practical internal use.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if

the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listed and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

Copyright © 2007 Underwriters Laboratories Inc.

This Standard consists of pages dated as shown in the following checklist:

Page	Date
1	October 31, 2007
2-3	October 17, 2007
4	April 15, 2005
5-10B	October 17, 2007
11-13	March 31, 2004
14	October 17, 2007
15-24	March 31, 2004
25-26B	October 17, 2007
27-36	March 31, 2004
37-39	October 17, 2007
40	October 31, 2007
41-44B	October 17, 2007
45-52	March 31, 2004
53-54	October 17, 2007
55-62	March 31, 2004
63	October 17, 2007
64-75	March 31, 2004
76	October 17, 2007
77	March 31, 2004
78-79	October 17, 2007
80-82	March 31, 2004
82A-96	October 17, 2007
A1-A2	October 17, 2007
SR1	October 31, 2007
SR2	October 17, 2007

No Text on This Page



MARCH 31, 2004
(Title Page Reprinted: October 31, 2007)



ANSI/UL 283-2007

1

UL 283

Standard for Air Fresheners and Deodorizers

First Edition

March 31, 2004

The most recent designation of ANSI/UL 283 as an American National Standard (ANSI) occurred on October 4, 2007. The ANSI approval for this standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

This ANSI/UL Standard for Safety consists of the First edition including revisions through October 31, 2007.

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>.

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.

COPYRIGHT © 2007 UNDERWRITERS LABORATORIES INC.

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

No Text on This Page



CONTENTS

INTRODUCTION

1 Scope	6
2 Components	6
3 Units of Measurement	7
4 Undated References	7
5 Glossary	7

CONSTRUCTION

6 General	9
7 Frame and Enclosure	9
7.1 General	9
7.2 Non-metallic parts other than enclosures	14
8 Mechanical Assembly	15
9 Protection Against Corrosion	16
10 Accessibility of Uninsulated Current-Carrying Parts, Film-Coated Wire, and Moving Parts ..	16
11 Supply Connections	21
11.1 Cord-connected appliances	21
11.2 Direct plug-in type appliances	25
12 Current-Carrying Parts	28
13 Insulating Material	29
14 Internal Wiring – Electrical Connections	29
14.1 Mechanical protection	29
14.2 Splices and connections	30
15 Separation of Circuits	31
16 Capacitors	31
17 Grounding	32
17.1 General	32
17.2 Grounding identification	33
18 Heating Elements	33
19 Lampholders	33
20 Motors	34
20.1 Construction	34
20.2 Brush wear out	34
20.3 Overload protection	34
21 Overload- or Thermal-Protective Devices	37
22 Receptacles	38
23 Switches and Controls	38
24 Spacings	39
25 Seals and Gaskets	41
26 Consumables	41
27 Fragrances	42
28 Transformers	42
29 Secondary Circuits	42
29.1 General	42
29.2 Difference between the level of testing required within each type of secondary circuit	43
29.3 Class 2 circuit requirements	44
29.4 Limited voltage/current circuit requirements	44
29.5 Limited energy circuit requirements	45

29.6 Limiting impedance circuit requirements	45
30 Printed-Wiring Boards	46
31 Electronic Circuits	46

PROTECTION AGAINST INJURY TO PERSONS

32 General	47
33 Sharp Edges	47
34 Enclosures and Guards	48
35 Rotating or Moving Members	51
36 Switches, Controls, and Interlocks	52
37 Hot Liquids	53

PERFORMANCE

38 General	53
39 Leakage-Current Test	53
40 Test of Insulation Resistance and Leakage-Current as a Result of Moisture	57
41 Humidity Conditioning Test	58
42 <i>Reserved</i>	58
43 Input Test	58
44 Temperature Tests	59
44.1 All appliances	59
44.2 Surface temperature	63
45 Dielectric Voltage-Withstand Test	63
46 Flooding of Current-Carrying Parts Test	65
47 Test for Deterioration of Parts Subject to Flexing	65
48 Test for Reliability of Parts Not Subject to Flexing	65
49 Grounding Continuity Test	66
50 Tests on Switches and Controls	67
51 Strain-Relief Test	67
52 Abnormal Operation Test	68
53 Operational Test	70
54 Permanence of Marking Test	71
55 Stability Test	72
56 Tip-Over Test	73
57 Consumables	73
57.1 Flash point test	73
57.2 Flame ignition test	73
58 Impeller Ignition Test	75
59 Unguarded Impeller Test	75
60 Overlamping Test	76
61 Blade Security Test	76
62 Endurance Test	77
63 Mold Stress-Relief Distortion Test	77
64 Cap Pull Test	78
65 Lamp Cavity Separation Test	78
66 Impact Test	79
66.1 General	79
66.2 Ball impact test	79
66.2A Drop impact on direct plug-in units	82A
66.3 Drop impact test	82A
66.4 Rod pressure on direct plug-in units	82B

66.5 Resistance to crushing on direct plug-in units	.82B
67 Resistance to Deterioration Test	.82B
68 Push Back Relief Test	.83
69 Overspeed Test	.84
70 Secondary Circuit Voltage and Current Measurement Test	.84

MANUFACTURING AND PRODUCTION TESTS

71 Dielectric Voltage-Withstand Test	.85
71A Liquid Tight Tests for Containers Employing Wicks	.87
72 Grounding Continuity Test	.87

RATINGS

73 Details	.88
------------------	-----

MARKINGS

74 Details	.88
74.1 General	.88
74.2 Cord-connected appliances	.90

INSTRUCTIONS

75 Details	.91
------------------	-----

APPENDIX A

Standards for Components	A1
--------------------------------	----

INTRODUCTION

1 Scope

1.1 These requirements cover household and commercial air fresheners and deodorizers, rated 250 volts or less for use in ordinary locations in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 These requirements cover air fresheners and deodorizers for deodorizing or scenting air, or both, by the dispersal of chemicals, fragrances, or both. Air fresheners and deodorizers employing heating elements, electronic circuits, motor-operated fans (or a combination thereof), and mechanical filters are also covered by these requirements.

1.3 These requirements are intended to evaluate these appliances with respect to the risk of fire, electric shock, injury to persons, and explosiveness of atmosphere. The physiological effects of the operation of these appliances, beneficial or otherwise, are not covered by this Standard. The assigned ratings do not cover other potential risks, including the physiological effects of these appliances, in any form, nor do they indicate the efficiency or effectiveness of the intended uses of these appliances.

1.4 These requirements do not cover insect-repellent dispensers, air sterilizing appliances, air cleaning products, air filters, room ionizers, smoke scrubbers, or ultraviolet filters.

1.5 These requirements do not cover permanently-connected appliances.

1.6 These requirements do not cover direct plug-in appliances with open reservoirs for the addition of either a liquid or a substance that when heated becomes a liquid.

Added 1.6 effective July 15, 2005

1.7 Direct plug-in air fresheners and deodorizers provided with illumination shall be additionally evaluated to the Standard for Direct Plug-In Nightlights, UL 1786.

Added 1.7 effective October 17, 2009

2 Components

2.1 Except as indicated in 2.2, a component of an appliance covered by this Standard shall comply with the requirements for that component. See Appendix A for a list of Standards covering components generally used in the appliances covered by this Standard.

2.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5 Glossary

5.1 For the purpose of this Standard, the following definitions apply.

5.2 AIR DEODORIZER – An appliance that is intended to treat the air in a relatively small area by the dispersal of chemicals, fragrances, or both. Some appliances employ a mechanical filter.

5.3 AIR FRESHENER – An appliance that is intended to scent the air in a relatively small area by the dispersal of chemicals, fragrances, or both. Some appliances employ a mechanical filter.

5.4 ASKAREL – A generic term for a group of nonflammable synthetic chlorinated hydrocarbons used as electrical insulating media. Askarels of various compositional types are used. Under arcing conditions the gases produced, while consisting predominantly of noncombustible hydrogen chloride, can include varying amounts of combustible gases depending upon the askarel type.

5.5 AUTOMATICALLY CONTROLLED APPLIANCE – An appliance is considered to be automatically controlled if:

- a) The repeated starting of the appliance, beyond one complete predetermined cycle of operation to the point where some form of limit switch opens the circuit, is independent of any manual control;
- b) During any single predetermined cycle of operation, the motor is caused to stop and restart one or more times;
- c) Upon energizing the appliance, the initial starting of the motor is capable of being intentionally delayed beyond normal, conventional starting; or
- d) During any single predetermined cycle of operation, automatic changing of the mechanical load is capable of reducing the motor speed to the degree required to reestablish starting-winding connections to the supply circuit.

5.6 CONSUMABLE – A chemical or fragrance that is depletable, disposable, or both, in any form that remains or transforms through operation into pellets, gel, or liquid, that either functions in conjunction with an accessory that attaches to the appliance (that is, deodorizer or air freshener), or is directly inserted into the appliance. The material is not required to be provided with the appliance.

5.6 revised October 17, 2007

5.6.1 CONTAINER – A vessel that retains a liquid to prevent leaking.

5.6.1 added October 17, 2007

5.7 DIRECT PLUG-IN APPLIANCE – An appliance that has integral blades for direct insertion into a receptacle rated either 15 or 20 A, 125 V. Some appliances are provided with a polarized, parallel blade receptacle.

5.8 ENCLOSURE – That part of the appliance that:

- a) Renders inaccessible all or any parts of the appliance that present a risk of electric shock or injury to persons due to total or partial collapse with a resulting reduction of spacings, loosening or displacement of parts, or serious defects, or
- b) Retards propagation of flame initiated by electrical disturbances occurring within, or
- c) Both (a) and (b).

5.9 FAN BLADE – A component of an impeller.

5.10 FLASH POINT – The minimum temperature of a liquid at which vapor is evolved in a large enough quantity to form a flammable mixture with air.

5.11 FRAGRANCE – Any consumable chemical or substance that is designed to emit a vapor that has an odor.

5.12 IMPELLER – An assembly of blades about an integral hub.

5.12.1 LOW VOLTAGE – Not greater than 30 Vrms or 42.4 V peak or 42.4 V dc.

5.12.1 added October 17, 2007

5.13 MOUNTING MEANS – Hardware to mount the appliance to the building structure or to an outlet box.

5.14 PORTABLE APPLIANCE – A direct plug-in appliance or an appliance provided with a power-supply cord for connection to the supply circuit, that is capable of being easily moved by hand from place to place.

5.14.1 RESERVOIR – A container that holds the consumable. For some appliances, this is a refillable container while for others, it is disposable.

5.14.1 added October 17, 2007

5.15 RISK OF ELECTRIC SHOCK – A risk of electric shock exists at any part when:

- a) The potential between the path and earth ground or any other accessible part is more than 30 V rms (42.4 V peak); and
- b) The continuous current flow through a 1500 ohm resistor connected across the potential exceeds 0.5 mA.

5.15.1 SEAL – A component made of elastomers, composite gasket material, flexible cellular material, thermoplastics, and thermoplastic elastomers that exclude or hold within an enclosure consumables that are liquid, solid, or vapor.

5.15.1 added October 17, 2007

5.16 STATIONARY APPLIANCE – A direct plug-in appliance or an appliance provided with a power-supply cord for connection to the supply circuit, that is intended to be fastened in place or located in a dedicated place.

5.17 USER SERVICING – Any form of servicing, such as routine cleaning and replacement of a fuse, lamp, or a consumable, that is performed by personnel other than those trained to maintain the appliance.

CONSTRUCTION

6 General

6.1 An appliance shall employ materials that are intended for the application.

6.2 Thermoplastic material used for a part of an appliance having any dimension (length, width or height) greater than 305 mm (12 inches) shall be classified minimum HB.

7 Frame and Enclosure

7.1 General

7.1.1 An appliance shall be formed and assembled so that it will have the strength and rigidity required to resist the abuses to which it is able to be subjected, without increasing the risk of fire, electric shock or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

7.1.2 For unreinforced, flat surfaces in general, cast metal shall not be less than 1/8 inch (3.2 mm) thick, except that malleable iron not less than 2.4 mm (3/32 inch) and die cast metal not less than 2.0 mm (5/64 inch) thick each meet the intent of the requirement. Corresponding thicknesses of not less than 2.4 mm (3/32 inch), 1.6 mm (1/16 inch), and 1.2 mm (3/64 inch), respectively, are able to be used when the surface under consideration is curved, ribbed, or otherwise reinforced, or when the shape or size, or both, of the surface is such that the required mechanical strength is provided.

7.1.3 An enclosure of sheet metal shall be judged with respect to its size, shape, thickness of metal, and its application, considering the intended use of the complete appliance. Sheet steel having a thickness of less than 0.66 mm (0.026 inch) if uncoated or 0.74 mm (0.029 inch) if galvanized or of nonferrous sheet metal having a thickness of less than 0.91 mm (0.036 inch) shall not be used, except for relatively small areas or for surfaces that are curved or otherwise reinforced.

7.1.4 Deleted October 17, 2007

7.1.5 A non-metallic enclosure shall comply with the applicable mechanical and electrical property considerations, flammability, and thermal requirements as specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. A force as detailed in Table 66.1 shall apply to the appliance when determining the impact resistance of polymeric enclosures.

Exception No. 1: A polymeric grille used in a fan is not required to comply with the flammability requirements of UL 746C when:

- a) The material has a minimum flame class rating of HB;*
- b) It is used as an enclosure of insulated current-carrying parts and the insulation thickness is 0.71 mm (0.028 inch) or greater; and*
- c) The grille is completely external when installed as intended.*

Exception No. 2: A polymeric grille used in a fan intended to be mounted at least 2.1 m (7 feet) above the floor is not required to comply with the Resistance to Impact Test of UL 746C.

7.1.6 Among the factors that shall be taken into consideration when judging a nonmetallic enclosure or an enclosure of magnesium are resistance to:

- a) Mechanical damage;
- b) Impact;
- c) Moisture-absorption;
- d) Combustion;
- e) Distortion at temperatures to which the material is able to be subjected under conditions of normal or abnormal use; and
- f) Resistance to arcing.

7.1.7 The enclosure of a remotely or automatically controlled appliance shall reduce the risk of molten metal, burning insulation, flaming particles, or other ignited material from falling on combustible materials, including the surface upon which the appliance is supported.

7.1.8 The requirements in 7.1.7 necessitate the use of a barrier or material having a zero flame spread rating when tested as described in the Standard for Tests for Surface Burning Characteristics of Building Materials, UL 723:

- a) Under a motor unless:
 - 1) The structural parts of the motor or of the appliance provide the equivalent of such a barrier;
 - 2) The protection provided with the motor is such that no burning insulation or molten material falls to the surface that supports the appliance when the motor is energized under each of the following fault conditions:
 - i) Open main winding;

- ii) Open starting winding;
- iii) Starting switch short-circuited; and
- iv) Capacitor of permanent-split capacitor motor short-circuited (the short circuit is to be applied before the motor is energized, and the rotor is to be locked);

3) The motor is provided with a thermal motor protector (a protective device that is sensitive to temperature and current) that reduces the risk of the temperature of the motor windings from exceeding 125°C (257°F) under the maximum load under which the motor runs without causing the protector to cycle and from exceeding 150°C (302°F) with the rotor of the motor locked; or

Exception: A direct drive fan motor is required to only be subjected to the locked rotor test.

No Text on This Page

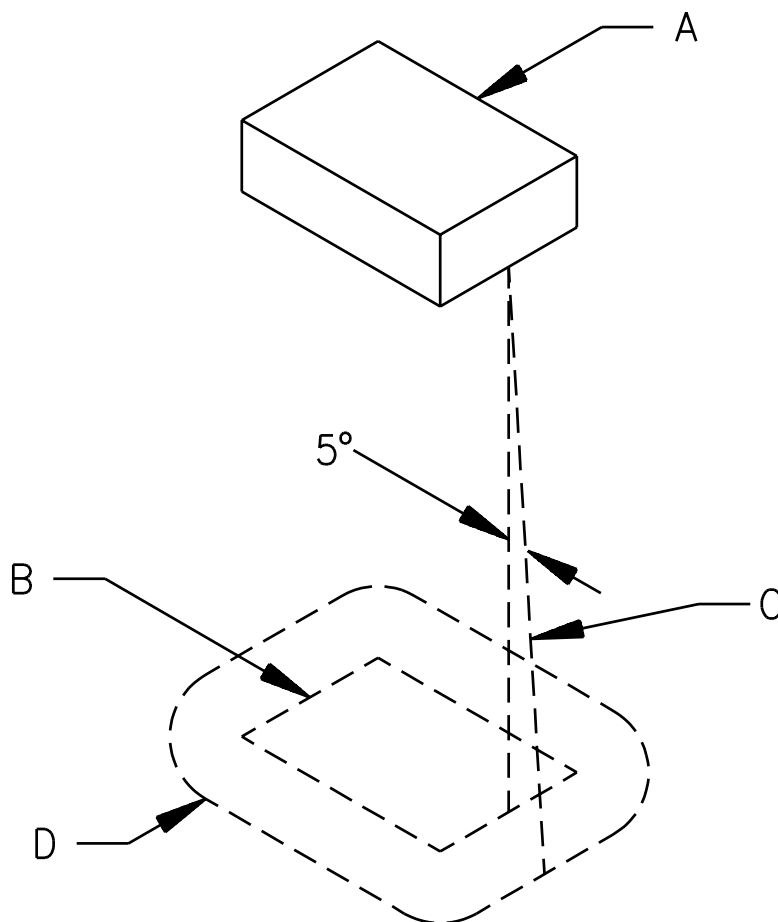


- 4) The motor complies with the requirements in the Standard for Overheating Protection for Motors, UL 2111, and the temperature of the motor winding does not exceed 150°C during the first 72 hours of operation with the rotor of the motor locked.
- b) Under the wire, unless the wire:
 - 1) Is thermoplastic insulated, such as wire marked VW-1; or
 - 2) Has at least equivalent characteristics as determined in the flame tests specified in the Standard for Thermoplastic-Insulated Wires and Cables, UL 83.
- c) Under a switch, relay, solenoid, or similar component unless:
 - 1) A short circuit or overload in the component does not result in a risk of fire; or
 - 2) There are no openings in the enclosure through which molten metal, burning insulation, flaming particles, or other ignited material can fall.

Exception: A terminal is not required to have a barrier.

7.1.9 The barrier mentioned in 7.1.8 shall be horizontal, shall be located as illustrated in Figure 7.1, and shall not have an area less than that described in the figure. The use of openings for drainage, ventilation, and similar purposes in the barrier meets the intent of the requirement, when molten metal, burning insulation, or other ignited material are not able to come into contact with combustible material through these openings.

Figure 7.1
Location and extent of barrier



SA0604-1

NOTES –

A – Region to be shielded by barrier. This consists of the entire component if it is not otherwise shielded and includes the unshielded portion of a component that is partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line that traces out minimum area of barrier. The line is always:

- 1) tangent to the component;
- 2) 5 degrees from the vertical; and
- 3) oriented so that the area traced out on a horizontal plane is maximum.

D – Location (horizontal) and minimum area for barrier. The area is that included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents

Document Sharing Hub

7.1.10 The enclosure of an air freshener or deodorizer shall be such as to reduce the risk of liquid from contacting uninsulated current-carrying parts when the appliance is tested as described in the Flooding of Current-Carrying Parts Test, Section 46, as applicable.

7.1.11 A door or a cover of an enclosure that provides access to any overload protective device that requires resetting or renewal shall be hinged or otherwise attached in an equivalent manner. If the opening of such a door or cover exposes the user to accessible current-carrying parts, other than the screw shell or clips of a fuseholder, the door or cover shall not be capable of being opened without the use of a tool.

7.1.12 Means shall be provided for holding the door or cover over a fuseholder in a closed position. The door or cover shall be tight-fitting, and shall not be capable of being opened without the use of a tool if the opening of such a door or cover exposes the user to accessible current-carrying parts other than the screw shell or clips.

7.1.13 A cord-connected appliance that is provided with keyhole slots, notches, hanger holes, or similar means, for hanging on a wall shall be constructed in such a manner that the hanging means is not accessible without removing the appliance from the supporting means.

7.1.14 To determine whether an appliance complies with the requirement in 7.1.13, any part of the enclosure or barrier that is able to be removed without the use of tools to gain access to the hanging means is to be removed.

7.1.15 An opening in the appliance provided for hanging shall be located or guarded so that a nail, hook, or similar fasteners do not displace a part that creates a risk of fire or electric shock, and does not contact one of the following:

- a) An uninsulated current-carrying part.
- b) Magnet wire.
- c) Internal wiring.
- d) Moving parts.
- e) Any other part able to create a risk of fire or electric shock.

7.1.16 An enclosure, frame, guard, handle, or other part of the appliance that is exposed to contact during intended operation shall not be sharp enough to constitute a risk of injury to persons, as determined by the Standard for Tests for Sharpness of Edges on Equipment, UL 1439.

7.2 Non-metallic parts other than enclosures

7.2.1 The material of a reservoir, the breakage of which is capable of resulting in risk of fire or electric shock, shall have such properties as to meet the conditions anticipated in use.

7.2.2 A reservoir, when installed in the appliance as directed by the manufacturer's instructions, shall withstand the applicable requirements in the Impact Test, Section 66, without cracking, breaking, or sustaining other damage that causes leaking of the liquid it is intended to contain.

Exception: Current-carrying parts are not required to be so located or protected from unintended exposure to the liquid contained in the reservoir if the reservoir:

- a) Is resistant to deterioration from the liquid intended for use in it, as determined by the Resistance to Deterioration Test, Section 67; and*
- b) Complies with the requirement in the Impact Test, Section 66.*

7.2.2 revised October 17, 2007

7.2.3 Polymeric material used to enclose a metal housing that encloses insulated or uninsulated current-carrying parts, or used as a decorative part, shall be classed either 5VA, 5VB, V-0, V-1, V-2, or HB by the burning tests described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

Exception No. 1: Decorative parts are not required to be made of a material classed 5VA, 5VB, V-0, V-1, V-2, or HB when the part does not occupy a volume greater than 2 cubic centimeters (0.122 cubic inch), does not have any dimension greater than 3 cm (1.18 inch), and is located so it does not propagate flame from one area to another or bridge between a possible source of ignition and other ignitable parts.

Exception No. 2: A material is determined to be equivalent when it complies with the 12-mm (0.47 inch) flame test, the 19-mm (0.75-inch) flame test, or 127-mm (5-inch) flame test of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, when flame tested as used in the equipment. A flame-retardant coating applied to the inside of a polymeric enclosure shall not be used unless the coating/material interface is determined to be equivalent by separate investigation.

7.2.4 An impeller of polymeric material outside a motor shall not be located within 25.4 mm (1 inch) of an opening in the motor housing.

Exception: An impeller is not prohibited from being within 25.4 mm of an opening in the motor housing when:

- a) The material is classed as V-2, V-1, V-0, 5VA, or 5VB in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94; or*
- b) The material complies with the requirements for enclosure flammability using a 19-mm (3/4-inch) flame, in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C; or*
- c) No motor opening within 25.4 mm of the blade has a dimension more than 6.75 mm (17/64 inch) or an area more than 35.48 mm² (0.055 square inch), and no more than six such openings are provided; or*
- d) In a skeleton or open frame type motor:*

- 1) *The impeller is of material classed HB or less flammable in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94;*
- 2) *The coil is completely wrapped with insulation at least 0.8 mm (1/32 inch) thick; and*
- 3) *The space between the coil wrap and bobbin does not exceed 0.8 mm; or*
- e) *The material has a hot wire ignition rating of at least 7 seconds as described in the Standard Test Method for Ignition of Materials by Hot Wire Sources, ASTM D3874; or*
- f) *The appliance employs a thermally protected motor to drive the impeller and complies with the Impeller Ignition Test, Section 58.*

7.2.5 Foamed thermoplastic shall be classed HF-2 or HF-1.

7.2.6 A thermoplastic part that is not decorative and that does not serve as an enclosure shall be classed HB, 5VA, 5VB, V-2, V-1, or V-0.

8 Mechanical Assembly

8.1 An appliance shall be assembled so that the vibration of normal operation does not adversely affect it. Brush caps shall be tightly threaded or otherwise constructed to reduce the risk of loosening.

8.2 A switch other than a through-cord switch, a lampholder, an attachment-plug receptacle, a motor-attachment plug, or similar component shall be securely mounted and shall be kept from turning. See 8.4.

Exception No. 1: A switch is not required to be kept from turning when:

- a) *The switch:*
 - i) *Is of a plunger or other type that does not tend to rotate when operated. A toggle switch is considered to be subject to forces that tend to turn the switch during normal operation of the switch; and*
 - ii) *The means for mounting the switch greatly reduces the probability that operation of the switch will loosen it.*

OR

- b) *The switch:*
 - i) *Rotates and spacings are not reduced below the minimum required values; and*
 - ii) *The normal operation of the switch is by mechanical means rather than by direct contact by persons.*

Exception No. 2: A lampholder of the type in which the lamp is unable to be replaced, such as a neon pilot or indicator light in which the lamp is sealed in a nonremovable jewel, is not required to keep from turning when rotation is unable to reduce spacings below the minimum required values.

8.3 Uninsulated current-carrying parts shall be secured to the base or mounting surface so that they are restricted from turning or shifting in position, if such motion results in a reduction of spacings below the minimum required values.

8.4 The means for keeping the switch and current-carrying parts mentioned in 8.2 and 8.3 from turning or shifting is to consist of more than friction between surfaces. For example, a properly applied lock washer employed to keep a small stem-mounted switch (or other device having a single-hole mounting means) from turning meets the intent of the requirement.

9 Protection Against Corrosion

9.1 Iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means, if corrosion of such unprotected parts results in a risk of fire, electric shock, or injury to persons.

Exception No. 1: Surfaces of sheet-steel and cast-iron parts within an enclosure are not required to be protected against corrosion if the oxidation of the metal due to the exposure to air and moisture is not appreciable. The thickness of metal and temperature are also to be taken into account as part of such a decision.

Exception No. 2: This requirement does not apply to bearings, laminations, or minor parts of iron or steel, such as washers, screws, and similar fasteners.

9.2 If deterioration of a liquid container provided as a part of an appliance results in a risk of fire or electric shock, the container shall be of a material that is resistant to corrosion by the liquid intended to be used therein.

10 Accessibility of Uninsulated Current-Carrying Parts, Film-Coated Wire, and Moving Parts

10.1 To reduce the risk of electric shock from unintentional contact with an uninsulated current-carrying part or film-coated wire, or injury to persons from a moving part, an opening in an enclosure shall comply with either item (a) or (b).

- a) For an opening that has a minor dimension (see 10.5) less than 25.4 mm (1 inch), such a part or wire shall not be contacted by the probe illustrated in Figure 10.1.
- b) For an opening that has a minor dimension of 25.4 mm (1 inch) or more, such a part or wire shall be spaced from the opening as specified in Table 10.1.

Exception: A motor, other than one used in either a hand-held appliance or a hand-supported portion of an appliance, is not required to comply with these requirements if it complies with the requirements in 10.2.

10.2 With respect to a part or wire as mentioned in 10.1, in an integral enclosure of a motor as mentioned in the exception to 10.1:

- a) An opening that has a minor dimension (see 10.5) less than 19.1 mm (3/4 inch) meets the intent of the requirement if:
 - 1) A moving part is unable to be contacted by the probe illustrated in Figure 10.1;
 - 2) Film-coated wire is unable to be contacted by the probe illustrated in Figure 10.3;

3) In a directly accessible motor (see 10.6), an uninsulated current-carrying part is unable to be contacted by the probe illustrated in Figure 10.4; and

4) In an indirectly accessible motor (see 10.6), an uninsulated current-carrying part is unable to be contacted by the probe illustrated in Figure 10.2.

b) An opening that has a minor dimension of 19.1 mm (3/4 inch) or more meets the intent of the requirement if a part or wire is spaced from the opening as specified in Table 10.1.

Table 10.1
Minimum distance from an opening to a part that involves a risk of electric shock

Minimum dimension ^a of opening, mm ^b (inches)		Minimum distance from opening to part, mm ^b (inches)	
19.1	(3/4) ^c	114	(4-1/2)
25.4	(1) ^c	165	(6-1/2)
31.8	(1-1/4)	190	(7-1/2)
38.1	(1-1/2)	318	(12-1/2)
47.5	(1-7/8)	394	(15-1/2)
54.0	(2-1/8)	444	(17-1/2)
d		762	(30)

^a See 10.5.

^b Between 19 and 54 mm (3/4 and 2-1/8 inches), interpolation is to be used to determine a value between values specified in the table.

^c Any dimension less than 1 inch applies to a motor only.

^d More than 54 mm (2-1/8 inches) but not more than 152 mm (6 inches).

Figure 10.2
Probe for moving parts and uninsulated current-carrying parts

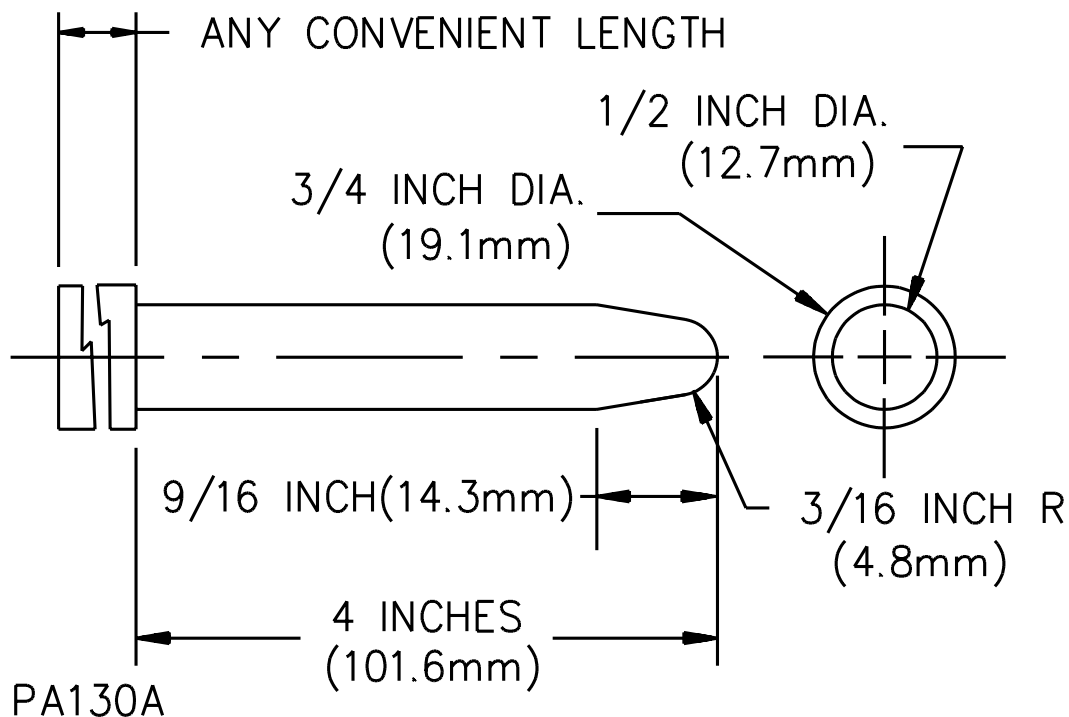
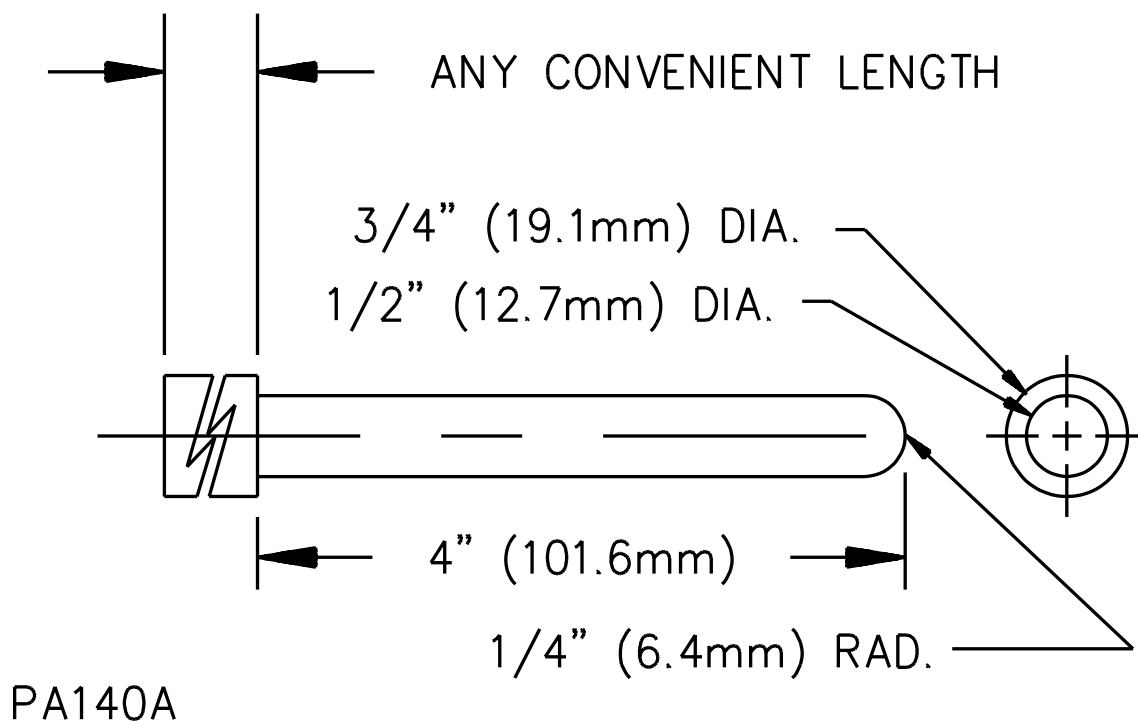


Figure 10.3
Probe for film-coated wire



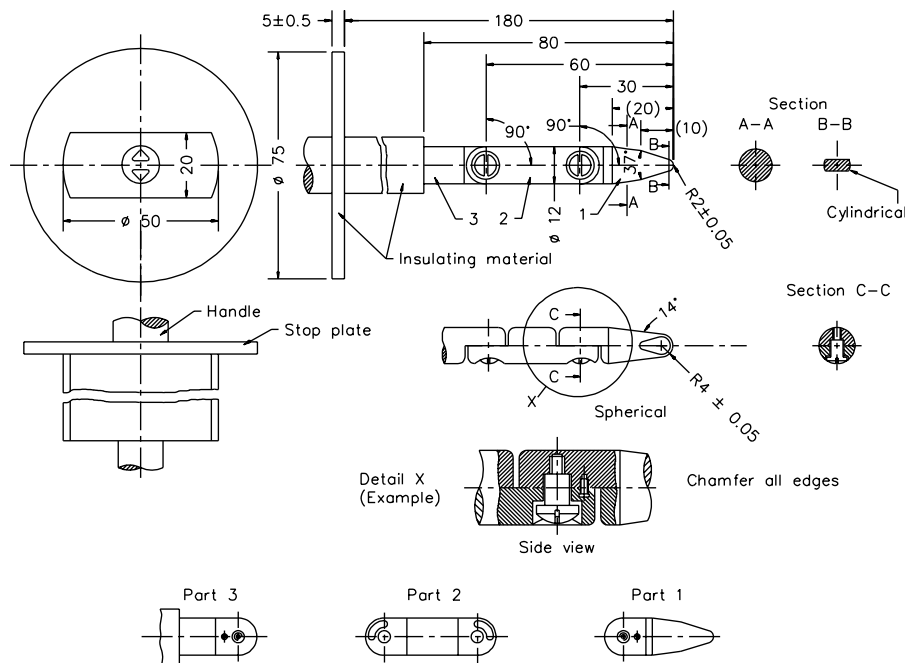
UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents

Document Sharing Hub

Figure 10.4
IEC articulate probe



SA1788A

10.3 The probes mentioned in 10.1 and 10.2 and illustrated in Figures 10.1 – 10.4 shall be applied to any depth achievable within the opening, and shall be rotated or angled before, during, and after insertion through the opening to any position, as required, in order to examine the enclosure.

10.4 The probes mentioned in 10.3 and 10.5 shall be used as measuring instruments to judge the accessibility provided by an opening, and not as instruments to judge the strength of a material; they shall be applied with the minimum force intended to determine accessibility.

10.5 With reference to the requirements in 10.1 and 10.2, the minor dimension of an opening is the diameter of the largest cylindrical probe having a hemispherical tip that is able to be inserted through the opening.

10.6 With reference to the requirements in 10.2, an indirectly accessible motor is a motor that is accessible only by opening or removing a part of the outer enclosure, such as a guard or panel, that is able to be opened or removed without using a tool, or that is located at such a height or is otherwise guarded or enclosed so that contact does not occur. A directly accessible motor is a motor that can be contacted without opening or removing any part or that is located so as to be accessible to contact.

10.7 During the examination of an appliance to determine whether it complies with the requirements in 10.1 or 10.2, a part of the enclosure that is able to be opened or removed by the user without a tool (that is, to attach an accessory, to make an operating adjustment, or for other reasons) is to be opened or removed.

10.8 With reference to the requirements in 10.1 and 10.2, insulated brush caps are not required to be additionally enclosed.

11 Supply Connections

11.1 Cord-connected appliances

11.1.1 Cords and plugs

11.1.1.1 A cord-connected appliance shall be provided with a length of attached flexible cord and an attachment plug for connection to the supply circuit, in accordance with Table 11.1 or of a type equally serviceable for the application, or shall have male pin terminals that accommodate a detachable power-supply cord. The length of a detachable power-supply cord, when provided with an appliance, shall be in accordance with Table 11.1. The length of cord external to the appliance shall be measured from the face of the attachment plug to the point of attachment or entry into the enclosure.

Table 11.1
Cords for appliances

Appliance	Type of cord	Length, m (ft)
1. Motor-operated appliance type not intended to rest directly on floor when in use.	SP-1, SPT-1	1.5 – 3.0 (5 – 10)
2. Motor-operated appliance type that rests directly on floor when in use.	SP-2, SPT-2	1.5 – 3.0 (5 – 10)
3. Portable appliance employing a general-use convenience receptacle	SJ, SJE, SJO, SJT, SJTO, or equivalent	0.5 – 7.6 (1.5 – 25)
4. Counter-top or table-top heater type appliance intended for household use.	HPD, HPN, HSJ, HSJO, SP-2, SPE-2, SPT-2, SV, SVO, SVE, SVOO, SVT, SVTO, SVTOO, SJ, SJO, SJE, SJOO, SJT, SJTO, or SJTOO	0.6 – 2.1 (2.0 – 7.0) ^a
5. All heater-type appliances not covered from above.	[See item 4]	1.8 (6.0)
^a See 74.2.2 when cord length is less than 1.4 m (4.5 ft).		

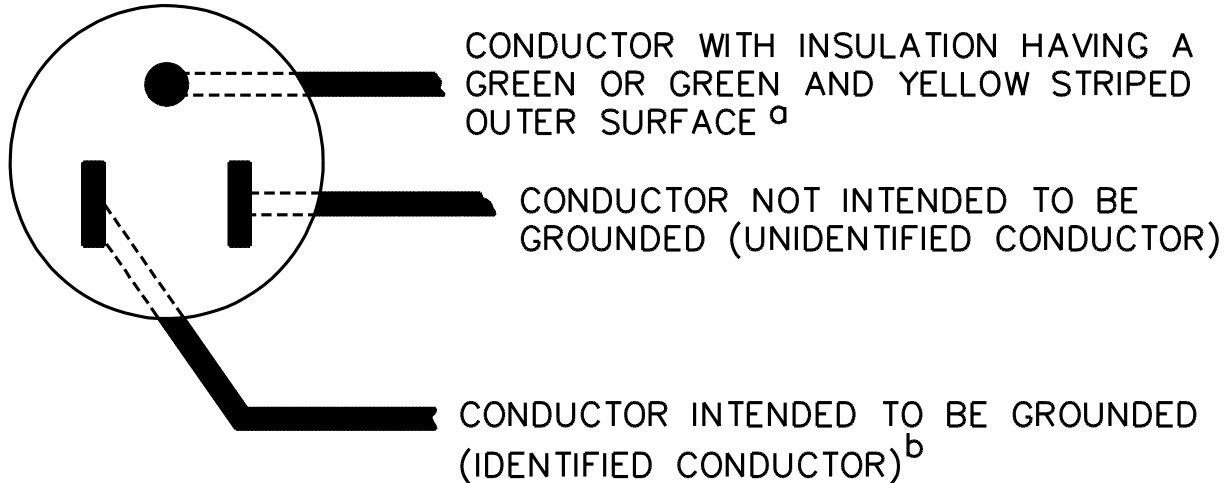
11.1.1.2 The flexible cord shall have a voltage rating not less than the rated voltage of the appliance, and shall have an ampacity that is not less than the current rating of the appliance.

11.1.1.3 The attachment plug shall have an ampacity not less than the rated current of the appliance, or the input current under maximum normal load conditions, whichever is greater, and a voltage rating equal to the rated voltage of the appliance.

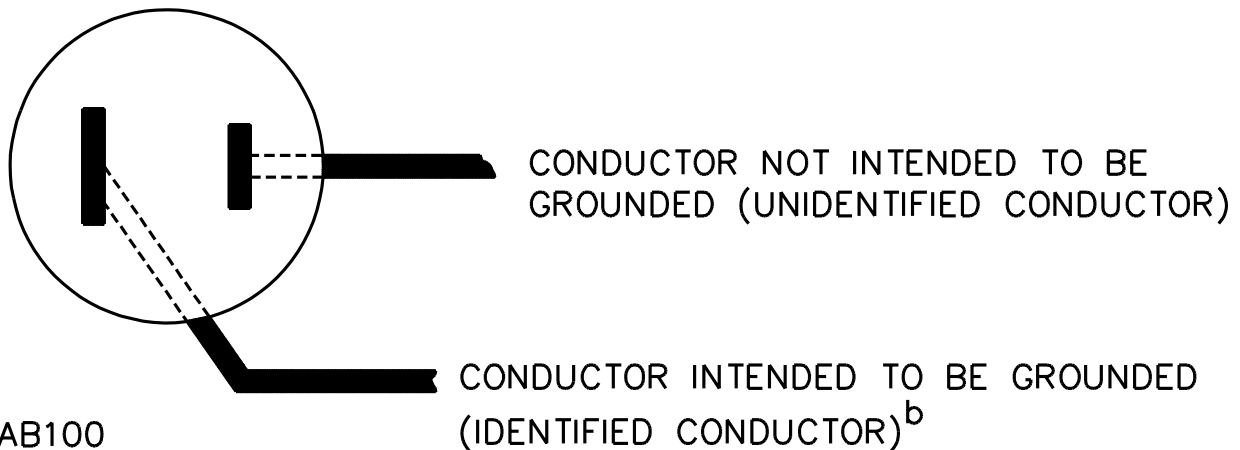
11.1.1.4 The attachment plug of an appliance intended to be connected to a nominal 120 volt circuit, and employing devices required to be connected to a specific supply conductor as specified in 19.2 and 23.3 shall be a polarized type. The connections to the attachment plug shall be in accordance with Figure 11.1. The polarity identification of the supply cord shall be in accordance with Table 11.2. See 74.2.1.

Figure 11.1
Connections to attachment plugs

CONNECTIONS OF CORD CONDUCTORS TO GROUNDING – TYPE ATTACHMENT PLUG (FACE OF PLUG REPRESENTED)



CONNECTIONS OF CORD CONDUCTORS TO POLARIZED ATTACHMENT PLUG (FACE OF PLUG REPRESENTED)



NOTES –

^a In the above illustration, connection of the green conductor to a blade which has a U-shape instead of a circular cross section meets the intent of the requirement.

^b Signifies a conductor identified in accordance with Table 11.2.

Table 11.2
Polarity identification of flexible cords

Method of identification	Acceptable conditions	
	Wire intended to be grounded ^a – wire to be connected to the screw shells of lampholders	All other wires ^a
Color of braids on individual conductors	Solid white or grey – without tracer Color other than white, or grey, with tracer in braid	Solid color other than white or grey – without tracer Solid color other than white or grey – without tracer
Color of insulation on individual conductors	Solid white or grey ^b Light blue ^c	Solid color other than white or grey Solid color other than light blue, white or grey
Color of separators	White or grey ^c	Color other than white, or grey
Other means	Tin or other white metal on all strands of the conductor ^d	No tin or other white metal on the strands of the conductor
	A stripe, ridge, or groove on the exterior surface of the cord ^d	
^a A wire finished to show a green color with or without one or more yellow stripes or tracers is to be used only as an equipment-grounding conductor. See 17.2.1 and Figure 11.1. ^b Only for cords (other than types SP-1, SP-2, SPT-1, or SPT-2) having no braid on any individual conductor. ^c For jacketed cords. ^d Only for types SP-1, SP-2, SPT-1, and SPT-2 cords.		

11.1.1.5 An appliance that is required to employ a polarized attachment plug as specified in 11.1.1.4, and that is provided with a separate or detachable cord set as specified in 11.1.1.6, shall also employ an appliance connector of the polarized type.

11.1.1.6 A household appliance intended for use with a detachable cord set shall not be provided with terminal pins that accommodate an appliance plug.

11.1.2 Strain relief

11.1.2.1 Strain relief shall be provided so that the mechanical stress on the flexible cord is not transmitted to terminals, splices, or internal wiring. See 51.1.

11.1.2.2 A metal strain-relief clamp or metal band is capable of being used without supplementary protection on a Type SJ, SJO, SJT, SJTO, S, SO, ST, STO, SV, or SVO cord.

11.1.2.3 A metal strain-relief clamp or metal band shall not be used on Type SP-2 or lighter rubber-insulated cord or on Type SPT-1, SPT-2, SVT, or SVTO cord unless such a cord is protected by varnished cloth tubing or the equivalent under the clamp, and the construction complies with the requirements specified in 51.4.

11.1.2.4 Means shall be provided to inhibit the supply cord or lead from being pushed into the enclosure of an appliance through the cord-entry hole when such displacement results in:

- a) Subjecting the supply cord or lead to mechanical damage;
- b) Exposing the supply cord or lead to a temperature higher than that for which it is rated;

- c) Reducing spacings (such as to a metal strain-relief clamp) below the minimum required values; or
- d) Damaging internal connections or components.

To determine compliance, the supply cord or lead shall be tested in accordance with the Push Back Relief Test, Section 68.

11.1.2.5 When a knot in a flexible cord serves as the strain relief, the surfaces that the knot touches shall be free from projections, sharp edges, burrs, fins, or similar edges that damage the conductors.

11.1.3 Bushings

11.1.3.1 A bushing or the equivalent shall be provided at a point where a flexible cord passes through an opening in a wall, barrier, or enclosing case. The bushing shall be substantial, secured in place, and shall have a smooth, well-rounded surface which is capable of handling for incidental contact against the cord without damage to the cord. An insulating bushing shall be provided when:

- a) The cord is Type SP-1, SPT-1, SP-2, or SPT-2, or other type lighter than Type SV;
- b) The wall or barrier is of metal; and
- c) The construction is such that the cord is subjected to stress or motion.

Exception: For a cord hole in wood, porcelain, phenolic composition, or other nonconductive material, a smoothly rounded surface is the equivalent of a bushing.

11.1.3.2 Ceramic materials and some molded compositions are capable of being used as insulating bushings.

11.1.3.3 Vulcanized fiber is a usable alternative material not prohibited from being employed when the bushing is not less than 1.2 mm (3/64 inch) thick, and when formed and secured in place so that it is not damaged by conditions of ordinary moisture. To determine if this type of bushing is capable of being damaged by ordinary moisture, it is to be subjected to the Humidity Conditioning Test, Section 41.

11.1.3.4 A separate soft-rubber, neoprene, or polyvinyl chloride bushing is usable in an appliance, or in the frame of a motor, or in the enclosure of a capacitor attached to a motor of an evaporative cooler, or a room-type filter unit if the bushing is:

- a) Not less than 1.2 mm (3/64 inch) thick; and
- b) Located so that it is not exposed to oil, grease, oily vapor, or other substances that deteriorate the compound employed.

11.1.3.5 A bushing of a material mentioned in 11.1.3.4 shall not be employed in an appliance unless used in conjunction with a type of cord for which an insulating bushing is not required.

11.1.3.6 When a bushing of a material mentioned in 11.1.3.4 is used, the hole in which the bushing is mounted shall be smooth and free from sharp edges.

11.1.3.7 A bushing comprised of the same material as, and molded integrally with, the supply cord is usable on a Type SP-1 or heavier cord, only when the built-up section is not less than 1.6 mm (1/16 inch) thick at the point where the cord passes through the enclosure.

11.1.3.8 An insulated metal grommet is capable of being used in place of an insulating bushing when the insulating material is not less than 0.8 mm (1/32 inch) thick and completely fills the space between the grommet and the metal in which it is mounted.

11.2 Direct plug-in type appliances

11.2.1 Size and weight

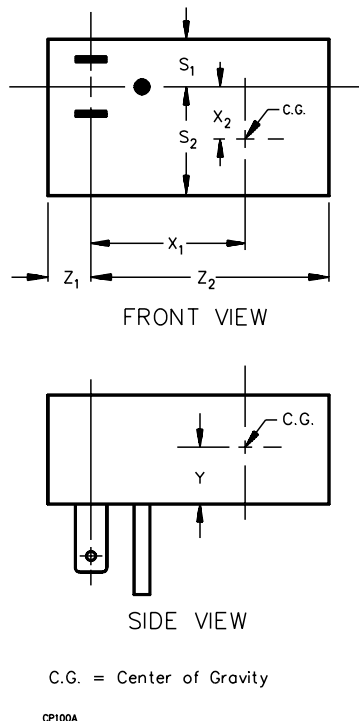
11.2.1.1 When evaluated in accordance with 11.2.1.2, an air-freshener or deodorizer having integral blades for direct insertion into a receptacle shall comply with the specifications in Table 11.3.

Table 11.3
Size and weight specifications for direct plug-in type appliance

Table 11.3 revised October 17, 2007

Algebraic quantity	Maximum acceptable value	
W	794 g	(28 oz)
WY/Z	1361 g	(48 oz)
WY/S	1361 g	(48 oz)
WX	0.56 N·m	(80 oz-in)
In this table the variables are defined as follows: W = the weight of the direct plug-in type appliance in g (oz) as measured on a scale or balance. Y = the distance, in mm (inches), illustrated in Figure 11.2. Z = the shorter distance, in mm (inches), of Z1 or Z2 illustrated in Figure 11.2. S = the shorter distance, in mm (inches), of S1 or S2 illustrated in Figure 11.2. X = the longer distance, in mm (inches), of X1 or X2 illustrated in Figure 11.2.		

Figure 11.2
Dimensions of a typical direct plug-in type appliance



11.2.1.2 The limits specified in Table 11.3 shall be determined as follows:

- a) A directly-mounted accessory is to be in place.
- b) A removable part is to be in place.
- c) A mounting tab is not to be included in the measurement of linear dimensions for the purpose of determining moments unless:
 - 1) There is no deformation of the tab and enclosure after being subjected to the impact described in the Impact Test, Section 66, and
 - 2) For a polymeric-enclosed, direct plug-in type appliance having an integral tab, no distortion shall occur at temperatures that the polymeric material encounters under conditions of normal and abnormal use, as determined by subjecting the direct plug-in type appliance to the Mold Stress-Relief Distortion Test, Section 63.

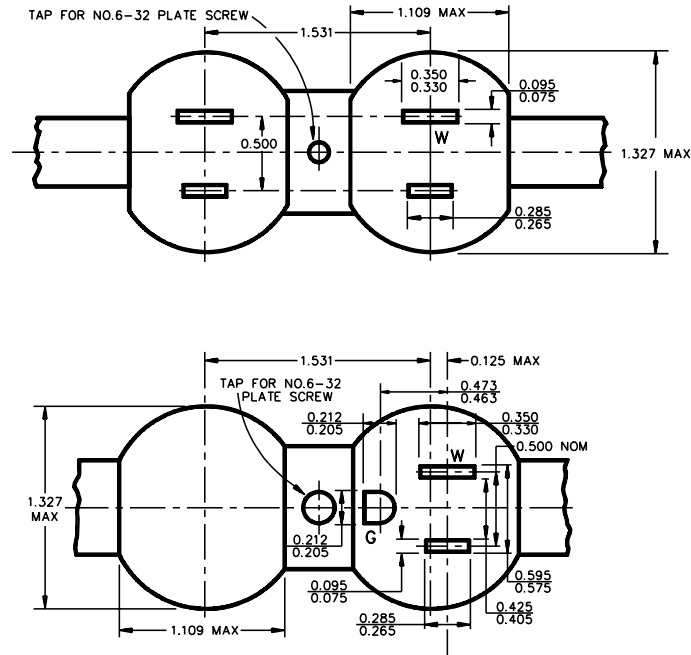
11.2.1.3 When inserted in a duplex receptacle, no part of a direct plug-in type appliance shall interfere with full insertion of an attachment plug, with dimensions as indicated by Figure 11.3, into the adjacent receptacle. See Figure 11.2A and Figure 11.2B. Compliance shall be determined with the duplex receptacle in both the vertical and horizontal orientations unless otherwise specified in the user

instructions. Consideration shall be given to the orientation of the ground pin (above and below blades) for products which are grounded. A product is considered to comply if, in at least one orientation, the adjacent receptacle is completely open.

11.2.1.3 revised October 17, 2007

Figure 11.2A
125V, 15A Duplex receptacle

Figure 11.2A added October 17, 2007



S2863A