UL 498D

STANDARD FOR SAFETY

Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

UL Standard for Safety for Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts, UL 498D

First Edition, Dated July 29, 2020

SUMMARY OF TOPICS

This revision of ANSI/UL 498D dated August 15, 2023 is a clarification of requirements for receptacle grounding terminal; 26.1.4

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated April 21, 2023 and June 23, 2023.

No Text on This Page

JULY 29, 2020
(Title Page Reprinted: August 15, 2023)

ANSI/UL 498D-2023

UL 498D

Standard for Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

First Edition

July 29, 2020

This ANSI/UL Standard for Safety consists of the First Edition including revisions through August 15, 2023.

The most recent designation of ANSI/UL 498D as an American National Standard (ANSI) occurred on August 15, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

No Text on This Page

CONTENTS

INTRODUCTION

CONSTRUCTION

ATTACHMENT PLUGS AND INLETS

CORD CONNECTORS

RECEPTACLES

PERFORMANCE

GENERAL

ALL DEVICES

ATTACHMENT PLUGS

INLETS

CORD CONNECTORS

RECEPTACLES

INTRODUCTION

1 Scope

1.1 These requirements cover attachment plugs, receptacles, cord connectors, and inlets, with arcuate contacts (locking-type configurations), rated 20 or 30 of the non-grounding type or devices rated 15, 50 or 60 A grounding or non-grounding type. All intended for connection to a branch circuit for use in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 These requirements do not cover plugs, socket outlets (receptacles), cord connectors, and inlets with arcuate contacts (locking-type configurations) rated 20 and 30 A grounding type, refer to the Standard for Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts, UL 498F.

1.3 These requirements do not cover devices rated at more than 200 A or for more than 600 V. See 6.1.

1.4 This Standard does not directly apply to, but supplements the following standards:

a) Straight-blade attachment plugs, receptacles, cord connectors, and inlets, covered by the Standard for Attachment Plugs and Receptacles, UL 498;

b) Attachment plugs, receptacles, cord connectors, and inlets with arcuate contacts (locking-type configurations) – Enclosure Types for Environmental Protection, UL 498E;

c) Inlets with arcuate contacts (locking-type configurations) – Marine Shore Power Inlets, UL 498M;

d) Devices produced integrally with flexible cord or cable, covered by the Standard for Cord Sets and Power-Supply Cords, UL 817;

e) Current taps and adapters not provided with wiring terminals for flexible cord covered by the Standard for Current Taps and Adapters, UL 498A;

f) Devices employing male or female screwshells, covered by the Standard for Lampholders, UL 496;

g) Devices solely intended for direct connection to the branch circuit in accordance with the National Electrical Code, ANSI/NFPA 70, that are provided with contacts of the pin and sleeve type, covered by the Standard for Plugs, Receptacles and Cable Connectors of the Pin-and-Sleeve Type, UL 1682;

h) Single and multipole connectors intended for factory assembly to copper or copper alloy conductors or printed wiring boards for use in data, signal, control and power applications within and between electrical equipment, covered by the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977;

i) Devices intended for installation and use in hazardous (classified) locations in accordance with the National Electrical Code, ANSI/NFPA 70, covered by the Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, UL 1203;

j) Devices intended for use with telecommunications networks, covered by the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, or the Standard for Communications Circuit Accessories, UL 1863;

k) Devices incorporating ground-fault circuit interruption circuitry, covered by the Standard for Ground-Fault Circuit Interrupters, UL 943;

l) Single- or two-outlet direct plug-in devices incorporating transient voltage surge suppression circuitry, covered by the Standard for Surge Protective Devices, UL 1449;

m) Single- or two-outlet direct plug-in devices incorporating electromagnetic interference filter circuitry, covered by the Standard for Electromagnetic Interference Filters, UL 1283;

n) Cord-connected, relocatable power taps intended only for indoor use as a temporary extension of a grounding alternating-current branch circuit for general use, covered by the Standard for Relocatable Power Taps, UL 1363; or

o) Single pole locking-type separable connectors, covered by the Standard for Single Pole Locking-Type Separable Connectors, UL 1691.

2 Components

2.1 A component of a product covered by this Standard shall:

a) Comply with the requirements for that component as specified in this Standard;

b) Be used in accordance with its rating(s) established for the intended conditions of use; and

c) Be used within its established use limitations or conditions of acceptability.

2.2 A component of a product covered by this Standard is not required to comply with a specific component requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product;

b) Is superseded by a requirement in this Standard; or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

2.3 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.

2.4 A component that is also intended to perform other functions such as overcurrent protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable UL standard(s) that cover devices that provide those functions.

3 Units of Measurement

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

4 Referenced Publications

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.

4.2 The following publications are referenced in this Standard:

ANSI/NEMA WD6, *Standard are in accordance with Wiring Devices – Dimensional Specifications*
ANSI/NFPA 70, *National Electrical Code*

ASTM A90, *Standard Test Method for Weight (Mass) of Coating on Iron or Steel Articles with Zinc or Zinc-Alloy Coatings*
ASTM A653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*
ASTM E28, *Standard Test Methods for Softening Point of Resins Derived from Pine Chemicals and Hydrocarbons, by Ring-and-Ball Apparatus*
ASTM G151, *Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources*
ASTM G153, *Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials*
ASTM G155, *Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials*
UL 20, *Standard for General-Use Snap Switches*
UL 94, *Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*
UL 98, *Standard for Enclosed and Dead-Front Switches*
UL 486A-486B, *Standard for Wire Connectors*
UL 486E, *Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*
UL 496, *Standard for Lampholders*
UL 498, *Standard for Attachment Plugs and Receptacles*
UL 498A, *Standard for Current Taps and Adapters*
UL 498E, *Standard for Attachment Plugs, Cord Connectors and Receptacles – Enclosure Types for Environmental Protection*
UL 498F, *Standard for Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts*
UL 498M, *Standard for Marine Shore Power Inlets*
UL 514A, *Standard for Metallic Outlet Boxes*
UL 514B, *Standard for Conduit, Tubing, and Cable Fittings*
UL 514C, *Standard for Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*
UL 746A, *Standard for Polymeric Materials – Short Term Property Evaluations*
UL 746B, *Standard for Polymeric Materials – Long Term Property Evaluations*
UL 746C, *Standard for Polymeric Materials – Use in Electrical Equipment Evaluations*
UL 746D, *Standard for Polymeric Materials – Fabricated Parts*
UL 796, *Standard for Printed-Wiring Boards*
UL 817, *Standard for Cord Sets and Power-Supply Cords*
UL 943, *Standard for Ground-Fault Circuit Interrupters*
UL 969, *Standard for Marking and Labeling Systems*
UL 1203, *Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations*
UL 1283, *Standard for Electromagnetic Interference Filters*
UL 1449, *Standard for Surge Protective Devices*
UL 1681, *Standard for Wiring Device Configurations*
UL 1682, *Standard for Plugs, Receptacles and Cable Connectors of the Pin-and-Sleeve Type*
UL 1863, *Standard for Communications Circuit Accessories*
UL 1691, *Standard for Single Pole Locking-Type Separable Connectors*
UL 1977, *Standard for Component Connectors for Use in Data, Signal, Control and Power Applications*
UL 4248-1, *Standard for Fuseholders – Part 1: General Requirements*
UL 4248-4, *Standard for Fuseholders – Part 4: Class CC*
UL 4248-5, *Standard for Fuseholders – Part 5: Class G*
UL 4248-6, *Standard for Fuseholders – Part 6: Class H*
UL 4248-8, *Standard for Fuseholders – Part 8: Class J*
UL 4248-9, *Standard for Fuseholders – Part 9: Class K*
UL 4248-11, *Standard for Fuseholders – Part 11: Type C (Edison Base) and Type S Plug Fuse*
UL 4248-12, *Standard for Fuseholders – Part 12: Class R*
UL 4248-15, *Standard for Fuseholders – Part 15: Class T*
UL 60950-1, *Standard for Information Technology Equipment – Safety – Part 1: General Requirements*
UL 61058-1, *Standard for Switches for Appliances – Part 1: General Requirements*

5 Glossary

5.1 For the purposes of this standard the following definitions apply.

5.2 APPLIANCE COUPLER – A single-outlet, female contact device for attachment to a flexible cord as part of a detachable power-supply cord to be connected to an inlet (motor attachment plug).

5.3 ATTACHMENT PLUG – A male contact device for the temporary connection of a flexible cord or cable to a receptacle, cord connector, flanged equipment power outlet, or other outlet device.

5.4 BULK SHIPMENT – Any packaging container having more than one receptacle not provided with a unit container.

5.5 CONFIGURATION, LOCKING – A device having a configuration that requires a motion other than a straight push or pull to connect or separate it when used with its mating part.

5.6 CORD CONNECTOR – A female contact device to be wired on flexible cord for use as an extension from an outlet to make a detachable electrical connection to an attachment plug or, as an appliance coupler, to an equipment inlet.

5.7 ELECTRICAL (FUNCTIONAL) INSULATION – The insulation necessary for the proper functioning of the product and for basic protection against electrical shock. This includes all parts relied upon to support live parts in place, all internal barriers necessary to maintain spacings, and the outlet face portion of all female devices.

5.8 ENCLOSURE – That part of the device that renders inaccessible all or any parts of the device that may otherwise present a risk of electric shock, retards propagation of flame initiated by electrical disturbances occurring within, or both.

5.9 FIXTURE, EQUIPMENT, OR APPLIANCE OUTLET – A receptacle outlet device for mounting on utilization equipment.

5.10 GROUNDING-CONDUCTOR PATH – A path between the grounding pin, blade, or contact and the grounding terminal or, if the device has no grounding terminal, the point at which the path makes contact with a part of the metal raceway system, such as a box, box cover, or the raceway itself.

5.11 GROUNDING DEVICE – A device having a L5-15, L6-15, TT-R, or ML-2R configuration, the standard configuration illustrated in the Hospital Use Only 2-Pole, 3-Wire Grounding-Type Locking Devices Rated 20 A, 125 V, Figure C1.1, of UL 1681, or a nonstandard configuration that employs one blade, pin, or contact exclusively for grounding.

5.12 HOUSING ADAPTER, ANGLE – A part that is intended to replace a portion of an attachment plug or cord connector housing so that the flexible cord exits the strain relief in the same plane as the face of the device.

5.13 HOUSING ADAPTER, SHROUD – A part that is intended to be assembled onto an attachment plug or cord connector to extend the housing beyond the plane of the face of the device.

5.14 INLET – (Motor Attachment Plug) A male contact device to be mounted on utilization equipment to provide an integral blade configuration for the connection of an appliance coupler or cord connector.

5.15 POLARIZED DEVICE – A device constructed for connection to a mating device only in the position that connects related poles of an electrical circuit.

5.16 RECEPTACLE, DUPLEX – A receptacle having two contact devices on a single mounting yoke for flush mounting in a plane surface.

5.17 RECEPTACLE, FLUSH – A receptacle which is intended for mounting in or on an outlet box, an outlet-box cover, or a flush-device cover plate for fixed installation on a branch circuit.

5.18 RECEPTACLE, ISOLATED GROUND – A receptacle having the grounding terminal electrically isolated from the system ground when installed in a metallic outlet box or raceway system.

5.19 RECEPTACLE, LIGHTED – A receptacle employing an integral lens (jewel) and electrical or electronic components that produce light. Two basic types:

a) Power Indicator type – Illuminates to indicate power is on.

b) Illuminated/Nightlight – Illuminates when power is on and may not when controlled by a photoelectric sensor.

5.20 RECEPTACLE, PENDANT – Pendant receptacles include an enclosure with cover plate and strain relief means, intended to be assembled at the end of flexible cord, for use in branch circuit applications.

5.21 RECEPTACLE, SELF-GROUNDING – A receptacle which includes a spring clip or other part to provide for electrical continuity between the grounded device yoke and the mounting screw.

5.22 RECEPTACLE, SPLIT – A duplex receptacle having line terminals which are capable of being electrically separated.

5.23 RECEPTACLE, SURFACE-MOUNT – A receptacle which includes an enclosure and mounting means intended for surface mounting without the use of a separate outlet box in accordance with ANSI/NFPA 70.

5.24 TERMINAL, PRESSURE-WIRE – A terminal which establishes a connection between one or more conductors and a terminal plate by means of mechanical pressure without the use of solder. A pressure-wire terminal may be either of the following types:

a) Clamp-Type – A pressure-wire terminal in which the conductor is held under a pressure plate or saddle clamp by one or more screws. This type of terminal may be provided in combination with a wire-binding screw terminal.

b) Setscrew-Type – A pressure-wire terminal in which the pressure is applied by the end of the screw bearing on the conductor, either directly or through a wire-protecting pad.

c) Combination Wire Binding/Pressure-Type – A wire binding screw with an integrally machined pressure ring. Pressure ring terminals accept both single and multiple conductors that are captured under the machine formed pressure ring. These terminals may be wired with a single conductor using the conventional 3/4 loop around the wire-binding screw.

5.25 TERMINAL, SPRING ACTION CLAMP – A terminal where the stripped end of a conductor is inserted into the terminal and a manually operated integral lever applies clamping pressure to a spring mechanism, without the use of screws.

5.26 TERMINAL, WIRE-BINDING SCREW – A terminal in which the conductor is bent around the screw and is clamped directly under the head of the screw when it is tightened.

5.27 TERMINAL ASSEMBLY, SEPARABLE – A two-piece terminal assembly provided with an integral mechanical latching mechanism(s). It consists of permanently attached pins or tabs located on the body of

the receptacle and is capable of receiving a special purpose connector with leads for connection to the branch circuit.

5.28 THROUGH-WIRING – A wiring method which permits a group of receptacles to be wired in parallel to a common branch circuit.

5.29 UNIT CONTAINER – The smallest carton, package, or container, in which a receptacle is packaged. A unit container may contain more than one receptacle if they are not intended to be removed from the container for individual sale.

CONSTRUCTION

6 All Devices

6.1 The ratings mentioned throughout this Standard including those mentioned in Table 87.1 represent maximum ampacity and maximum operating potential in volts for receptacles and other outlet devices such as cord connectors or current taps.

6.2 A device is considered to be for use on either alternating or direct current unless the rating includes the letters "ac" to restrict the use to alternating current.

7 Configurations

7.1 The NEMA configurations of various attachment plug and receptacle combinations referenced in ANSI/NEMA WD6 are included in Annex A for ease of reference. The figures referenced as Section C1, Non-NEMA Plugs and Receptacles, contain non-NEMA configurations and are found in UL 1681.

8 Insulating Materials

8.1 General

8.1.1 All parts that act as the electrical insulation or enclosure of a device shall be made of an insulating material intended for the particular application and shall comply with the requirements in 8.2.1 – 8.4.1. Hard rubber shall not be employed.

Exception No. 1: The internal insulating systems of components where component requirements exist are not required to comply with the requirements in 8.2.1 – 8.4.1.

Exception No. 2: A small part meeting all of the following criteria is not required to comply with the requirements in 8.2.1 – 8.4.1:

a) Its volume does not exceed 0.122 cubic inch (2 cm^3),

b) Its maximum dimension does not exceed 1.18 inches (3 cm), and

c) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

Exception No. 3: Fiber or similar material that is equal to or less than 0.010 inch (0.25 mm) thick is not required to comply with the requirements in 8.2.1 – 8.4.1.

8.1.2 A polymeric material used for electrical insulation or enclosure of live parts shall be fabricated in accordance with UL 746D.

Exception: A polymeric material that is fabricated in the same location where final assembly takes place and where no blending or compounding operations are involved is not required to comply with this requirement.

8.2 Flammability

8.2.1 A polymeric material used for electrical insulation or enclosure of live parts shall have a flame class rating of HB, V-2, V-1, V-0, VTM-2, VTM-1, or VTM-0 in accordance with the requirements of UL 94. The flame class rating of the material shall be judged at the minimum thickness employed at the walls and barriers in the device which are critical to the functioning of the insulation or enclosure of the device.

Exception : A polymeric material that complies with either the 3/4-inch (12 mm or 20 mm) flame flammability test described in UL 746C, need not have a flammability class rating.

8.3 Electrical properties

8.3.1 A polymeric material used for electrical insulation or enclosure of live parts shall have a Comparative Tracking Index (CTI) rating of 175 V or greater or a performance level class of at least 3.

Exception No. 1: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with this requirement if it complies with the Comparative Tracking Index Test, Section 35.

Exception No. 2: A polymeric material used in an enclosure that is separated through air by more than 1/32 inches (0.8 mm) from uninsulated live parts and more than 1/2 inch (12.7 mm) from arcing parts is not required to comply with this requirement.

8.3.2 A polymeric material used for electrical insulation or enclosure of live parts shall have Hot Wire Ignition (HWI) and High-Current Arc Resistance to Ignition (HAI) ratings or performance level classes of at least those shown in Table 8.1 for the flame class rating determined in accordance with 8.2.1. For materials with other than VTM flammability classifications, the HWI and HAI ratings of the material shall be evaluated using the specimen thickness employed in the end product or nominal 1/8 inch (3.2 mm) thickness, whichever is greater.

Exception No. 1: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with the HWI requirements if it complies with the Glow Wire Test, Section 36.

Exception No. 2: A polymeric material used for electrical insulation or enclosure of live parts is not required to comply with the HAI requirements if it complies with the High-Current Arc Resistance to Ignition Test, Section 37.

Exception No. 3: A polymeric material used in an enclosure of an attachment plug or cord connector which does not enclose live parts, or which encloses insulated live parts where the insulation thickness is greater than 0.028 inches (0.71 mm), is not required to comply with the HWI requirements.

Exception No. 4: A polymeric material used in an enclosure that is separated through air by more than 1/32 inches (0.8 mm) from uninsulated live parts and more than 1/2 inch (12.7 mm) from arcing parts is not required to comply with the HWI and HAI requirements.

Table 8.1
Hot Wire Ignition (HWI) and High-Current Arc Resistance to Ignition (HAI) Ratings of Insulating Materials

Flammability classification[a]	HWI[b,d]		HAI[c,d]	
	Mean ignition time (sec)	PLC	Mean no. of arcs	PLC
V-0, VTM-0	7 and up to 15	4	15 and up to 30	3
V-1, VTM-1[e]	15 and up to 30	3	15 and up to 30	3
V-2, VTM-2	15 and up to 30	3	15 and up to 30	3
HB	30 or more	2	60 or more	1

[a] Flammability classification – Described in UL 94.

[b] Hot Wire Resistance to Ignition – Described in UL 746A.

[c] High-Current Arc Resistance to Ignition – Described in UL 746A.

[d] Mean ignition time and mean no. of arcs to be used to evaluate Filament Wound Tubing, Industrial Laminates, Vulcanized Fiber, and similar polymeric materials only. All other materials are to be judged using the performance level class values.

[e] A polymeric material subjected to the flammability test with either the 3/4-inch (12 mm or 20 mm) flame in accordance with the Exception to 8.2.1 shall comply with the PLC for a V-1 rating.

8.4 Thermal properties

8.4.1 A polymeric material used for electrical insulation or enclosure of live parts shall have the relative thermal index ratings shown in Table 8.2 for the specific application of the insulating material. For materials with other than VTM flammability classifications, the material shall be evaluated using the specimen thickness employed in the end product or nominal 1/8 inch (3.2 mm) thickness, whichever is greater.

Exception: The following generic materials having readings of 65 or less on the Shore Durometer D scale [when measured for five seconds at an ambient temperature of 23.0 ±2.0°C (73.4 ±3.6°F)] are acceptable for use at 60°C (140°F) based on their successful completion of the appropriate accelerated aging test described in Accelerated Aging Tests, Section 41:

a) Ethylene/Propylene/Diene (EPDM)

b) Natural Rubber (NR)

c) Neoprene (Chloroprene Butadiene) Rubber (CBR)

d) Nitrile Rubber (NBR)

e) Polyvinyl Chloride (PVC) and its copolymers

f) Silicone Rubber (SIR)

g) Styrene (Butadiene) Rubber (SBR)

h) Thermo Elastomeric [TEE; includes Thermoplastic Elastomers (TPE) and Ethylene Propylene Thermoplastic Rubber (EPTR)]

Table 8.2
Minimum Relative Thermal Indices of Insulating Materials Used in Insulation and Enclosure Applications

Application	Minimum relative thermal index[a], Degrees C		
	Electrical	Mechanical with impact[b]	Mechanical without impact
Permanently-wired devices (including appliance, fixture and equipment outlets, inlets, and receptacles	80[c]	60[c]	80[c]
Cord-connected devices (including attachment plugs, and cord connectors)	60[c]	60[c]	60[c]

[a] Relative Thermal Index – Described in UL 746B.

[b] For industrial laminates, vulcanized fiber, and similar polymeric materials, the material's minimum RTI for Mechanical shall be evaluated using the values specified for Mechanical Without Impact.

[c] For devices containing fuses, the minimum thermal indices shall be the values shown above or the temperature measured on the insulating material during the Fuseholder Temperature Test, whichever is greater. See Sections 49, 52, 61, and 67.

8.5 Vulcanized fiber

8.5.1 Vulcanized fiber is not prohibited from being used for insulating washers, separators, and barriers, but shall not be used as the sole support of live parts.

8.5.2 Vulcanized fiber shall comply with the requirements in 8.2.1 – 8.4.1 and shall be moisture-resistant in accordance with 39.1 and 39.2.

8.6 Sealing compounds

8.6.1 A sealing compound shall be insulating, waterproof, and shall not soften at a temperature of 65°C (149F). The softening point is to be determined using ASTM E28.

8.6.2 Sulphur shall not be employed as a sealing compound.

8.7 Fuse enclosures

8.7.1 A fuse enclosure shall be of a moisture-resistant material in accordance with 39.1 and 39.2. Fiber and similar absorptive materials shall not be used for the enclosure of a fuse.

8.7.2 A polymeric material classified as Type V-0, V-1, or V-2 is considered as having flammability properties acceptable for use as the enclosure of a fuse.

9 Enclosure

9.1 General

9.1.1 A device shall have live parts protected against exposure to contact by persons when fully assembled using all essential parts (described in 9.1.5) and installed in the intended manner.

Exception No. 1: Male blades which are energized only when mated with the corresponding outlet are not required to comply with this requirement.

Exception No. 2: Exposed wiring terminals or other live parts enclosed within equipment or within an outlet box when the device is installed in the intended manner are not required to comply with this requirement.

9.1.2 Accessible dead-metal parts of a grounding device shall be conductively connected to the grounding-conductor path through the device.

Exception: Accessible dead-metal parts electrically insulated from current-carrying parts are not required to comply with this requirement.

9.1.3 Accessible dead-metal parts of a non-grounding device shall be electrically insulated from live parts and wiring other than the complete flexible cord so that they are unable to be energized by stray strands, failure of wiring terminals (such as loosening of screws), or damaged or broken wiring. When the stray strand length affects whether a device complies with this requirement, the device shall be marked in accordance with Reference No. 3 to Table 88.1. See 9.1.7.

9.1.4 In order to judge the accessibility of a live or dead-metal part, the device is to be wired and assembled in accordance with the manufacturer's instructions, except that any nonessential parts (described in 9.1.6) that are able to be opened or removed by the user without using a tool are to be opened or removed. The probe shown in Figure 9.1 is to be applied with a force of not more than 3 lbf (13.3 N) to any depth that recessing will permit. The probe is to be rotated, changed in configuration, or angled before, during, and after application to any position that is necessary to examine the device. A live or dead-metal part is determined to be accessible when:

a) The part is contacted by the probe, or

b) The part is located in a hole larger than 9/32 inch (7.1 mm) in diameter and recessed less than 3/16 inch (4.8 mm).