UL 1310

STANDARD FOR SAFETY

Class 2 Power Units

UL Standard for Safety for Class 2 Power Units, UL 1310

Seventh Edition, Dated March 9, 2018

Summary of Topics

This revision of ANSI/UL 1310 dated June 9, 2022 includes the following:

– Addition of requirements to allow electronic medium for Installation Instructions and other required instructions; 54.6, 66.7, 72.4, 78.3, 89.2 and 97.6.

– Revised marking for products with USB type outlets; 80.1.

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

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated January 21, 2022.

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UL 1310

Standard for Class 2 Power Units

The first and second editions were titled Standard for Direct Plug-In Transformer Units.

First Edition – May 1981
Second Edition – September 1986
Third Edition – August 1992
Fourth Edition – July 1994
Fifth Edition – May 2005
Sixth Edition – August 2011

Seventh Edition

March 9, 2018

This ANSI/UL Standard for Safety consists of the Seventh Edition including revisions through June 9, 2022.

The most recent designation of ANSI/UL 1310 as an American National Standard (ANSI) occurred on June 9, 2022. 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 UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover indoor and outdoor use Class 2 power supplies and battery chargers. These units utilize an isolating transformer and may incorporate components to provide an alternating- or direct-current output. Each output provides Class 2 power levels in accordance with the National Electrical Code, NFPA 70. Maximum output voltage does not exceed 42.4 V peak for alternating current, 60 V for continuous direct current. These products are intended primarily to provide power to low voltage, electrically operated devices. These requirements apply to:

a) Portable and semipermanent mounted direct plug-in units provided with 15 A blade configurations for use on nominal 120 or 240 V alternating current branch circuits with a maximum potential of 150 V to ground;

b) Cord- and plug-connected units provided with a 15 or 20 A attachment plug configuration for use on nominal 120 or 240 V alternating current branch circuits with a maximum potential of 150 V to ground; and

c) Units permanently connected to the input supply for use on nominal 600 V or less alternating or direct current branch circuit.

Direct plug-in and cord-connected units may also be provided with an integral cigarette lighter connector assembly, or a direct current input jack for being powered from a vehicle battery adapter or from a data port associated with information technology equipment. These units utilize an isolating transformer and may incorporate components to provide an alternating or direct-current output. Each output provides Class 2 power levels in accordance with the National Electrical Code, NFPA 70. Maximum output voltage does not exceed 42.4 V peak for alternating current, 60 V for continuous direct current. These products are intended primarily to provide power to low voltage, electrically operated devices.

1.2 These requirements cover direct plug-in and cord-connected products whose input power does not exceed 660 W under any possible condition of output loading.

1.3 These requirements do not cover the effect that a power unit may have on the equipment or system to which it is connected.

1.4 A product marked for a specific end-use involving additional considerations may be subject to additional requirements found in the applicable end-product standard. See 51.4. Examples include considerations related to:

a) Mechanical risks such as those presented by tools;

b) Build up of static charges such as those of radio equipment with external antennae connections;

c) Special shock limits such as those for medical equipment; and

d) Fire risks such as those posed by decorative lighting products.

1.5 These requirements do not cover products intended to charge batteries for starter motors used to start engines. Products of this type are covered by the Standard for Battery Chargers for Charging Engine-Starter Batteries, UL 1236.

1.6 These requirements cover Class 2 products, as defined in this Standard, intended for use with toys. Products of this type shall also comply with the Standard for Toy Transformers, UL 697.

1.7 These requirements do not cover products with outputs other than Class 2, nor battery chargers intended to charge batteries employed in wheel chairs or similar types of mobility aids. Products of this type are covered by the Standard for Power Units Other Than Class 2, UL 1012.

1.8 Products without a rectifier may be covered by the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3.

1.9 These requirements do not cover products powered solely by a dc source. Products of this type are covered by the Standard for Power Converters/Inverters and Power Converter/Inverter Systems for Land Vehicles and Marine Craft, UL 458, or by other requirements appropriate for the intended application.

1.10 These requirements do not cover products intended for supplying low voltage landscape lighting. Products of this type are covered by the Standard for Low Voltage Landscape Lighting Systems, UL 1838.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components used in the products 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.

3.2 Unless otherwise stated, values of current and voltage are rms.

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 shall apply:

5.2 BONDING CONDUCTOR – A conductor by which dead metal parts are bonded (connected) to the grounding means.

5.3 CLASS 2 – A source having limited voltage and energy capacity. Requirements for voltage and energy capacity limitations are as indicated in this standard. See the Maximum Output Voltage Test, Section 28, and the Output Current and Power Test, Section 30.

5.4 CONDUCTIVELY CONNECTED – A part is conductively connected to another part if the current between the parts exceeds the limit for leakage current specified in Leakage Current Test, Section 26.

5.5 CONSECUTIVE BATTERY CHARGER – A battery charger whose charging cycle is completed in four hours or less.

5.6 DIRECT CURRENT (DC) – A voltage or current waveform where the instantaneous value does not vary.

5.7 ENCLOSURE – Any surface or surrounding structure that prevents access to a real or potential risk of electric shock or injury to persons.

5.8 ENERGY LIMITING CIRCUIT/ENERGY LIMITING IMPEDANCE – A circuit or component depended on to limit an output to Class 2 levels or to limit energy to an accessible part. Reliability of circuit components shall be determined unless the unit is tested as specified in 39.7.1.

5.9 INDOOR USE – Use in an indoor location or where wet contact is not likely to occur.

5.10 INJURY TO PERSONS – The words "injury to persons" are in reference to physical harm to persons other than the physiological effects of electric shock.

5.11 MULTIPLE VOLTAGE RATED POWER UNIT – A power unit with a rated voltage range (such as 100 – 240 volts) or a power unit with more than one discrete voltage rating (such as 120/240 volts).

5.12 POWER UNIT INTENDED FOR USE BY TRAVELERS – A multiple voltage rated direct plug-in power unit with a 125 V 15 A (parallel) input blade configuration, or a multiple voltage rated cord-connected power unit with a non-detachable power supply cord terminating in a 125 V 15 A (parallel) blade plug.

5.13 RISK OF ELECTRIC SHOCK – A risk of electric shock is considered to exist if:

a) The voltage between parts exceeds the value specified in 16.2.2; and

b) The current between the parts measured in the Leakage Current Test, Section 26, exceeds 0.5 mA.

5.14 TAB, INTEGRAL (including a mounting tab) – A molded on or otherwise mechanically secured tab provided as part of the enclosure. An integral tab is usually not provided as part of the required enclosure, but may be provided for compliance with certain requirements of this standard.

5.15 UNIT – For the purposes of this Standard, a unit is either a direct plug-in unit, a cord connected unit, or a unit permanently connected to the input supply.

5.16 UNIT, CORD-CONNECTED – A power unit which employs a cord and plug assembly for connection to the branch circuit.

5.17 UNIT, DIRECT PLUG-IN – A power unit which employs a blade assembly on the enclosure for connection to the branch circuit.

5.18 UNIT, LINEAR DESIGN – A unit employing a branch circuit frequency transformer design where operation is not dependent on circuitry.

5.19 UNIT, PORTABLE – A unit other than a stationary unit or semipermanent mounted unit.

5.20 UNIT, SEMIPERMANENT MOUNTED – A direct plug-in unit provided with a mounting tab. For the purpose of this standard, semipermanent mounted units shall also comply with the requirements for portable units unless otherwise specified.

5.21 UNIT, STATIONARY – A cord- and plug-connected unit that is:

a) Intended to be fastened in place;

b) Intended to be located in a dedicated space; or

c) Not easily moved.

5.22 UNIT, SWITCH MODE DESIGN – A unit employing a high frequency transformer design where transformer operation is dependent on an inverter circuit.

5.23 WORKING VOLTAGE – The highest voltage to which the insulation under consideration is, or is able to be, subjected when the equipment is operating at its rated voltage under conditions of normal use.

6 Terminology

6.1 The term "power unit" as used in these requirements refers to all power supplies, battery chargers, and transformers covered by these requirements.

CONSTRUCTION

7 Mechanical Assembly

7.1 A unit shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it is likely to be subjected, without producing or increasing a 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. See also 46.1.1.

7.2 A unit shall have all parts reliably secured in place.

7.3 An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to cause a risk of injury in normal maintenance or use.

7.4 A unit shall be constructed so that it is not necessary to open or remove the enclosure when the unit is used as intended.

7.5 Each lampholder, switch, and similar component shall be mounted securely and shall be prevented from turning by more than friction between surfaces. For example, the use of a lock washer is acceptable to prevent the turning of a device having a single hole mounting means.

Exception No. 1: A lampholder of a type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in by a nonremovable jewel) need not be prevented from turning if rotation cannot reduce spacings below the minimum acceptable values or produce stress on an electrical connection.

Exception No. 2: A switch or other similar component need not comply with this requirement if the turning of such a component and servicing of the part introduces no additional risk of fire or electric shock, such as reduced spacings below minimum acceptable values or stress on an electrical connection.

7.6 A replaceable lamp in a unit shall be wired in the secondary circuit, and shall be replaceable without opening the enclosure. There shall be no primary live part accessible to contact during lamp replacement.

7.7 A nonreplaceable pilot lamp, such as an indicating-type overload- or short-circuit protector, a neon light, or an indicator light, is one in which the lamp is sealed-in, such as by a nonremovable jewel.

7.8 A switch in the primary circuit or an overcurrent-protective device shall be located within the unit enclosure in such a manner as not to be accessible or exposed to tampering nor subject to damage during normal use. This requirement does not apply to the actuating means of a switch, except as noted in 7.10.

7.9 If the exterior part of the switch or control forms part of a unit enclosure, the part shall be subjected to the Abuse Tests, Section 46.

7.10 The requirements in 7.8 also apply to the actuating means – toggle, handle, or the like – if the dislodging of such part exposes live parts or film-coated magnet wire that can be contacted as specified in Accessibility of Live Parts, Section 16.

7.11 The maximum acceptable moment, center of gravity, dimensions, and weight of a direct plug-in unit shall comply with the following requirements (See 7.12):

a) The quotient of WY/Z shall not exceed 48 ounces (1361 g);

b) The quotient of WY/S shall not exceed 48 ounces (1361 g);

c) The product of WX shall not exceed 80 ounce-inches (0.56 N·m) for a unit not intended for use by travelers, and 36 ounce-inches (0.25 N·m) for a unit intended for use by travelers (see 14.1.4); and

d) The weight of a unit shall not exceed 28 ounces (794 g).

Where the definitions for the symbols are as follows:

W is the weight of the unit in ounces (g).

Y is the distance illustrated in Figure 7.1 in inches (mm).

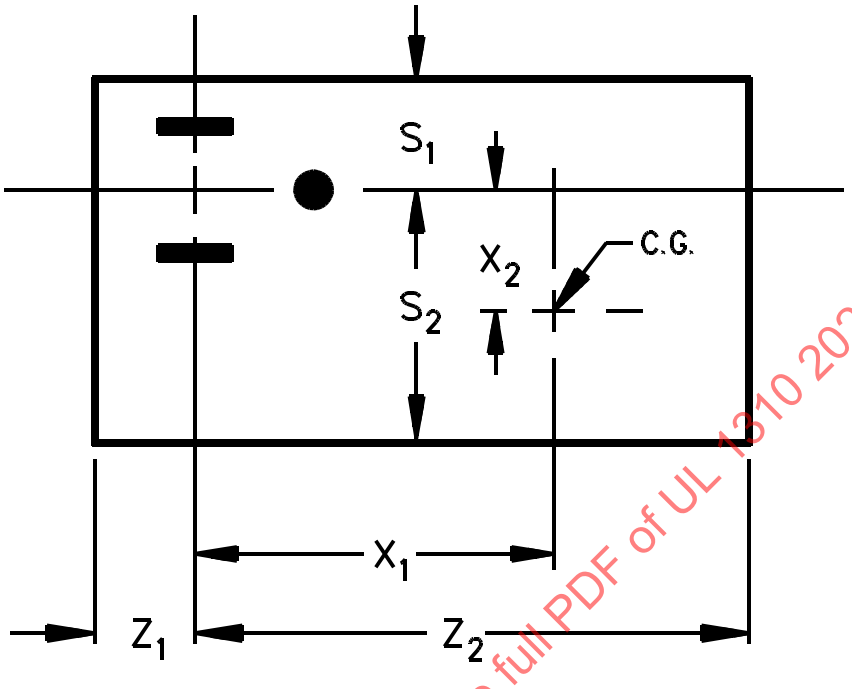
Z is the lesser of the two distances, Z_1 or Z_2, as illustrated in Figure 7.1 in inches (mm).

S is the lesser of the two distances, S_1 or S_2, as illustrated in Figure 7.1 in inches (mm).

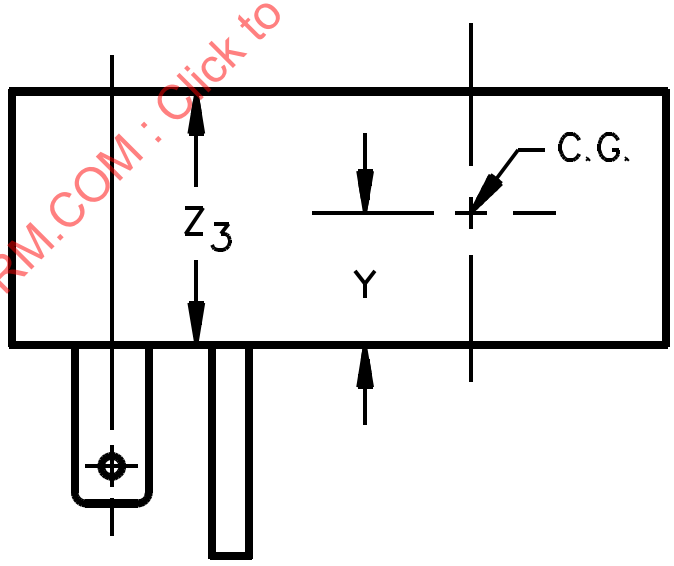
X is the greater of the two distances, X_1 or X_2, as illustrated in Figure 7.1 in inches (mm).

Figure 7.1

Dimensions of a direct plug-in unit



FRONT VIEW



SIDE VIEW

C.G. = Center of Gravity

7.12 The moment and weight specified in 7.11 are to be determined as follows:

a) For units with an output cord, the cord is to be cut off at the enclosure, or at the strain-relief means if the strain-relief means is outside the enclosure.

b) For units with directly mounted accessories, the values are to be measured with the accessories in place.

c) An integral tab is not to be included in measurements of the linear dimensions for the purpose of determining moments unless:

1) The tab and enclosure withstand the impact described in 46.2.1 with one impact on the tab itself, without deformation; and

2) For a polymeric enclosed unit having an integral tab, the tab and enclosure do not distort at temperatures to which the material may be subjected under conditions of normal and abnormal use as determined by the mold stress relief distortion test in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

7.13 When inserted in a duplex receptacle, no part of a direct plug-in unit, including an integral tab or output wiring, shall interfere with full insertion of an attachment plug into the adjacent receptacle. See Figure 7.2 and Figure 7.3.

Exception: This requirement does not apply to a unit that renders the adjacent receptacle completely unusable in any one mounting position.

Figure 7.2

125V, 15A Duplex receptacle

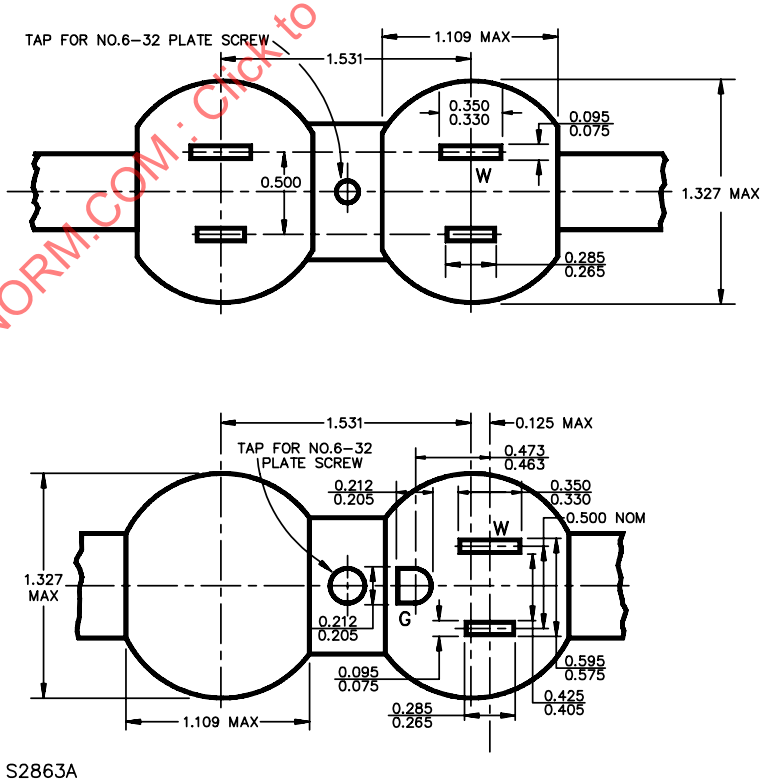
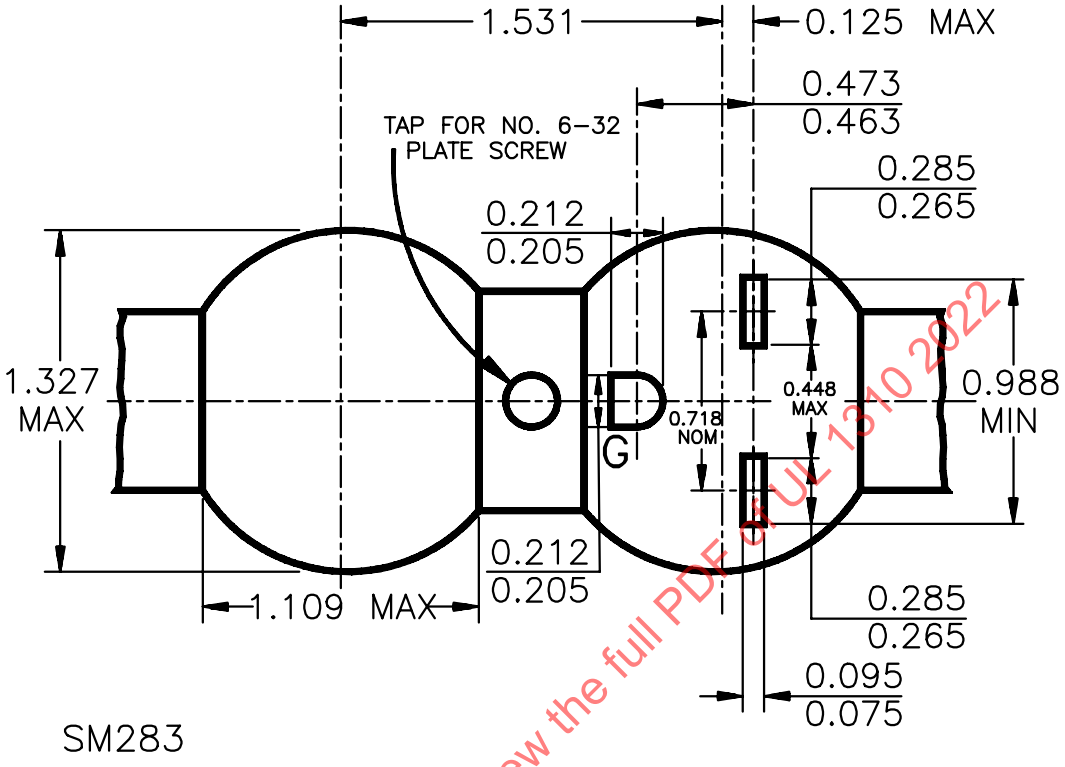


Figure 7.3

250V, 15A Duplex receptacle



7.14 A portable cord-connected unit intended for wall mounting shall employ key hole slots or the equivalent as a mounting means.

7.15 A mounting tab shall not be provided with a direct plug-in unit unless all of the following conditions are met:

a) The unit is intended for use on a 15-ampere, 125- or 250-volt receptacle;

b) A screw is provided and constructed to secure the mounting tab of the unit to a duplex receptacle that has a center screw (see Figure 7.2);

c) For a unit without a grounding pin, the mounting tab is constructed so that the unit may be mounted to both grounding and nongrounding receptacles; and

d) The unit is marked as specified in 52.4.

7.16 The enclosure of a unit shall be capable of being gripped for removal from the receptacle to which it is connected, and the perimeter of the face section from which the blades project shall not be less than 0.20 inch (5.1 mm) from any point on either blade. In order to determine compliance with this requirement for units with rounded edges, the perimeter of the face section is considered to be the point at which the articulate probe is able to access as shown in Figure 7.5.

Exception: For products that are intended for use with children's toys, this distance shall be increased to 7.9 mm, as required in the Standard for Toy Transformers, UL 697. These products shall be marked "intended for use with children's toys," or an equivalent marking.

7.17 With reference to 7.16, for an extension from the face for mechanical support of the blades provided as shown in Figure 7.4, the point of measurement shall be determined by application of the articulate probe, Figure 16.2, as shown in Figure 7.5.

Figure 7.4

Extension for mechanical support of blades

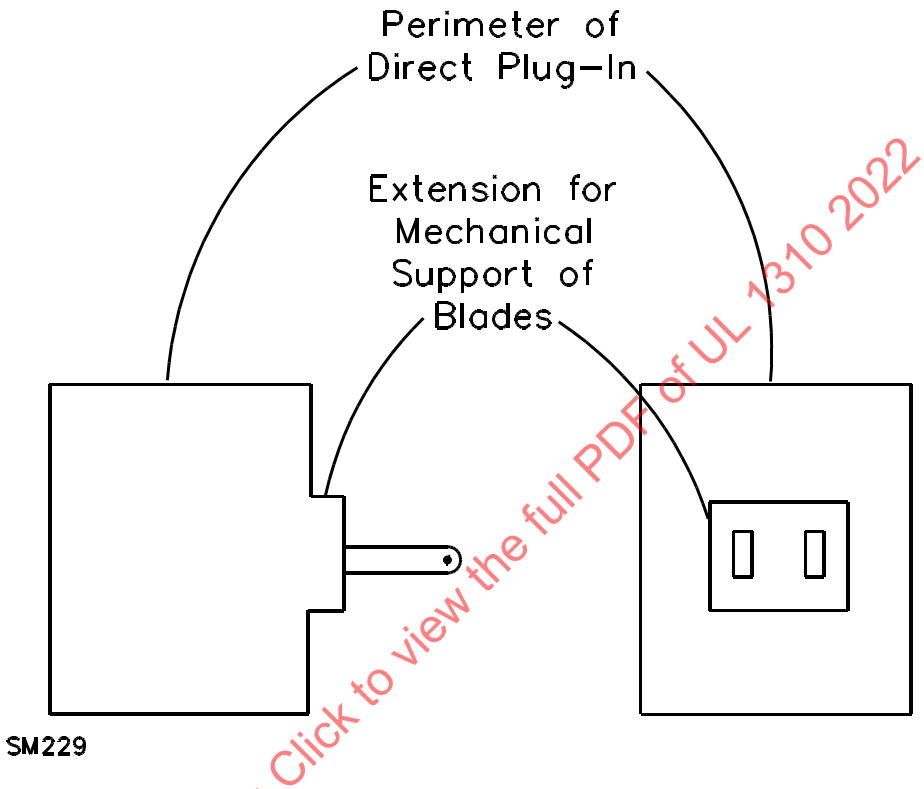
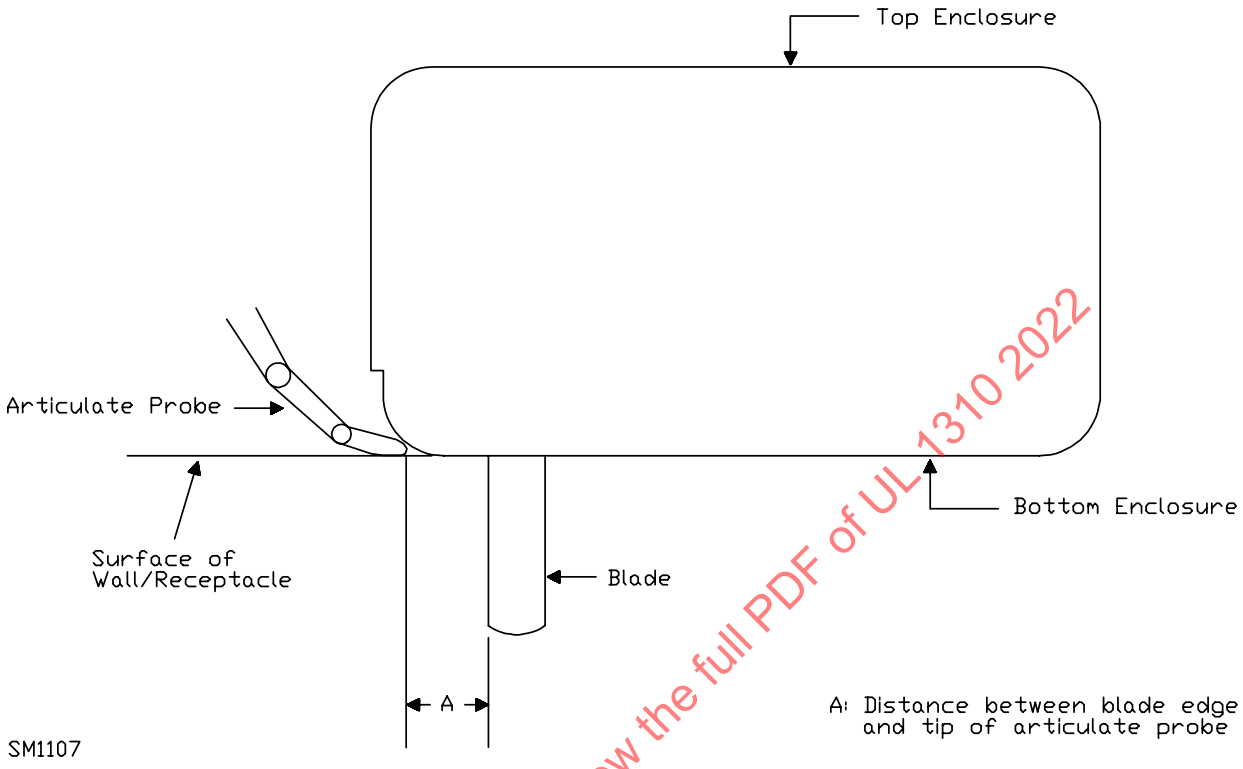


Figure 7.5

Determination of perimeter of units with rounded edges



7.18 With reference to 7.16, for a direct plug-in unit employing removable blades for the input connectors, the measurement shall also be determined on the plug module while removed from the direct plug-in unit.

8 Enclosure

8.1 A unit shall be provided with an enclosure that shall house all current-carrying parts that pose a risk of electric shock. The enclosure shall have the strength and properties necessary to reduce the risk of mechanical damage to the various parts.

8.2 A unit shall have no openings larger than those complying with 16.2.1.

8.3 If an acceptable grade of vulcanized fiber is used as part of the enclosure for the support of secondary parts (terminals and the like) that do not present a risk of fire or electric shock, the amount of fiber shall not be more than is necessary to support the secondary parts in question. The fiber shall not be less than 1/32 inch (0.8 mm) thick and shall not introduce a risk of fire, electric shock, or injury to persons as a result of abuse. See 46.1.1.

8.4 An enclosure constructed of sheet metal shall be formed from stock having a thickness not less than that specified in Table 8.1. The thickness of enclosure sheet metal other than steel or aluminum shall not be less than that specified in Table 8.1 for uncoated steel and shall have the necessary strength and rigidity.

Exception: For transformers with end bells forming part of the enclosure, sheet steel having a thickness of not less than 0.020 inch (0.51 mm) if uncoated, or 0.023 inch (0.58 mm) if zinc coated, may be used if the