UL 1815

STANDARD FOR SAFETY

Nonducted Heat Recovery Ventilators

UL Standard for Safety for Nonducted Heat Recovery Ventilators, UL 1815

Fifth Edition, Dated February 29, 2012

Summary of Topics

This revision of UL 1815 dated January 5, 2024 includes requirements for power supplies without grounding conductor, 8.1A, 30.3, and 30.3A.

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 new and revised requirements are substantially in accordance with Proposal(s) on this subject dated November 22, 2023.

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1

UL 1815

Standard for Nonducted Heat Recovery Ventilators

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This UL Standard for Safety consists of the Fifth Edition including revisions through January 5, 2024.

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.

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No Text on This Page

CONTENTS

INTRODUCTION

CONSTRUCTION

UL 60335-1 BASED REQUIREMENTS FOR THE EVALUATION OF ELECTRONIC CIRCUITS

PROTECTION AGAINST INJURY TO PERSONS

PERFORMANCE

MANUFACTURING AND PRODUCTION TESTS

INSTALLATION INSTRUCTIONS

RATING

MARKING

Appendix A

INTRODUCTION

1 Scope

1.1 These requirements cover nonducted, stationary or fixed heat recovery ventilators for household, commercial, or industrial use and intended to be employed in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 These requirements cover heat recovery ventilators rated 600 volts or less.

1.3 These requirements cover heat recovery ventilators that may be mounted through a wall or ceiling, or in a window.

1.4 These requirements cover heat recovery ventilators that may employ short ducts intended to bring air to and from the equipment. These requirements do not cover heat recovery ventilators employing ducts intended to supply conditioned air for environmental heating and/or cooling or distribute air throughout a building; such units are judged under the requirements in the Standard for Ducted Heat Recovery Ventilators, UL 1812. These requirements do not preclude a preheater provided as part of the air exchange system.

2 Undated References

2.1 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.

3 Units of Measurement

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

4 Glossary

4.1 For the purpose of this standard the following definitions apply.

4.1.1 CAPACITOR, CLASS X – Capacitor or RC unit of a type suitable for use in situations where failure of the capacitor or RC unit would not lead to danger of electrical shock but could result in a risk of fire. Examples would be units connected phase to phase or phase to neutral.

Note 1: X1 capacitors are generally used in circuits of permanently connected appliances. However, if the appliance is provided with a separate surge protective device that limits the impulse voltage to £ 2.5KV, an X2 capacitor is permitted.

Note 2: X2 capacitors are generally used in circuits of cord-connected appliances.

4.1.2 CAPACITOR, CLASS Y – Capacitor or RC unit of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock. Examples would be capacitors connected across the primary and secondary circuits where electrical isolation is required to prevent an electric shock or between hazardous live parts and accessible parts.

Note 1: Y1 capacitors are used in circuits where the prevention of electric shock is afforded solely by the isolation provided by the capacitor. Two Y2 capacitors connected in series is considered to provide the same level of protection as one Y1 capacitor.

Note 2: Y2 capacitors are used where the prevention of electric shock is provided by the combination of the capacitor and earth ground for circuits operating at voltages ≥ 150V and ≤ 300V.

Note 3: Y4 capacitors are used where the prevention of electric shock is provided by the combination of the capacitor and earth ground for circuits operating at voltages ≤ 150V.

4.2 CONTROL, AUTOMATIC – A control in which at least one aspect is non-manual.

4.3 CONTROL, AUXILIARY – A device or assembly of devices that provides a functional utility, is not relied upon as an operational or protective control, and therefore is not relied upon for safety. For example, an efficiency control not relied upon to reduce the risk of electric shock, fire, or injury to persons during normal or abnormal operation of the end product is considered an auxiliary control.

4.4 CONTROL, MANUAL – A device that requires direct human interaction to activate or rest the control.

4.5 CONTROL, OPERATING – A device or assembly of devices, the operation of which starts or regulates the end product during normal operation. For example, a thermostat, the failure of which a thermal cutout/limiter or another layer of protection would mitigate the potential hazard, is considered an operating control. Operating controls are also referred to as “regulating controls”.

4.6 CONTROL, PROTECTIVE – A device or assembly of devices, the operation of which is intended to reduce the risk of electric shock, fire or injury to persons during normal and reasonably anticipated abnormal operation of the appliance. For example, a thermal cutout/limiter, or any other control/circuit relied upon for normal and abnormal conditions, is considered a protective control. Protective controls are also referred to as “limiting controls” and “safety controls”.

4.7 CONTROL, TYPE 1 – The actuation of an automatic control for which the manufacturing deviation and the drift (tolerance before and after certain conditions) of its operating value, operating time, or operating sequence has not been declared and tested under this standard.

4.8 CONTROL, TYPE 2 – The actuation of an automatic control for which the manufacturing deviation and the drift (tolerance before and after certain conditions) of its operating value, operating time, or operating sequence have been declared and tested under this standard.

4.8.1 DANGEROUS MALFUNCTION – Unintended operation of the appliance that may impair safety. Operating Control functions whose failure would result in a Dangerous Malfunction would be considered Safety Critical Functions. See 4.15.3.

Note: Control functions whose failure might result in a Dangerous Malfunction would include:

a) Unexpected operation of the appliance where the operation would result in risk of electric shock, fire or mechanical risk of injury.

b) Unattended energization of a heating appliance where the user has placed flammable materials near the appliance based on the assumption the appliance would remain off.

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4.9 DUCT FAN – A straight-through ventilator provided with flanges for connection to a duct and which may be used with heated air.

4.9.1 ELECTRONIC DISCONNECTION – The de-energizing of the functional load of the appliance by an electronic device of a circuit with no air gap.

4.10 ENCLOSURE – That part of a unit which by itself or in conjunction with barriers reduces the risk of contacting all or any parts of the unit that may otherwise present a risk of electric shock or injury to persons and/or prevents propagation of flame initiated by electrical disturbances occurring within.

4.11 FIELD WIRING TERMINAL – A terminal to which a wire may be connected in the field, unless the wire and a means of making the connection – such as a pressure terminal connector, soldering lug, soldered loop, or crimped eyelet – that is factory assembled to the wire are provided as part of the heat recovery ventilator.

4.12 FUNCTIONAL PART – A part other than an enclosure or structural part that is necessary for the intended operation of a unit.

4.13 HEAT RECOVERY VENTILATOR – A product intended to remove air from a building, replace it with air outside the building and in the process transfer heat from the warmer to the colder air.

4.13.1 INTENTIONALLY WEAK PART – A part intended to rupture under conditions of abnormal operation to prevent the occurrence of a condition which could impair compliance with this standard.

4.13.2 LOW-POWER CIRCUIT – A circuit or parts of circuits farther from the supply source than a low-power point.

4.13.3 LOW-POWER POINT – A point closest to the supply source in an electronic circuit where the maximum available power to an external load at the end of 5 seconds does not exceed 15 watts.

4.14 MOTORS:

a) OPEN MOTOR – A motor having ventilating openings that permit passage of external cooling air over and around the windings of the motor.

b) TOTALLY ENCLOSED MOTOR – A motor that is enclosed so as to prevent the free exchange of air between the inside and outside of the case but not sufficiently enclosed to be termed airtight.

c) TOTALLY ENCLOSED FAN-COOLED MOTOR – A totally enclosed motor with external cooling by a fan or fans integral with the motor but external to the enclosing parts.

4.15 POWER VENTILATOR – A ventilator that consists of an impeller – which may be of the centrifugal, axial, or propeller type – and an integral driver. A power ventilator is:

a) Installed in a weather-resisting base intended to fit, usually by a curb, over a wall or roof opening, or

b) Provided with flanges for connection to a duct.

4.15.1 PROTECTIVE ELECTRONIC CIRCUIT (PEC) – An electronic circuit that prevents a hazardous situation under abnormal operating conditions. The function of a Protective Electronic Circuit would be considered a Safety Critical Function. See 4.15.4.

4.15.2 RISK OF ELECTRIC SHOCK – A risk of electric shock is considered to exist within a circuit unless the circuit meets one of the following criteria. The circuit shall be supplied by an isolating source such that:

a) The voltage does not exceed 30 V rms;

b) The voltage does not exceed 42.4 V peak;

c) The voltage does not exceed 60 V dc continuous; or

d) The voltage does not exceed 24.8 V peak for DC interrupted at a rate of 200 Hz or less with approximately 50 percent duty cycle.

e) When protective impedance is used, the current available through a 1500 ohm resistor between the part or parts and either pole of the supply source does not exceed 0.7 mA peak or 2 mA DC.

4.15.3 RISK OF FIRE – A risk of fire is considered to exist at any two points in a circuit where a power of more than 15 watts can be delivered into an external resistor connected between the two points.

4.15.4 SAFETY CRITICAL FUNCTION – Control, protection and monitoring functions which are being relied upon to reduce the risk of fire, electric shock or casualty hazards.

4.16 STRUCTURAL PART – A part used in such a manner that failure of the part may present a risk of electric shock or injury to persons.

4.17 USER SERVICING – Any form of servicing, such as routine cleaning, changing a filter or a heat exchange medium, and the like, that might be performed by personnel other than those trained to maintain the appliance.

CONSTRUCTION

5 General

5.1 An appliance shall employ materials that are acceptable for the particular use.

6 Component

6.1 A component of a product covered by this standard shall:

a) Comply with the requirements for that component;

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

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

d) Additionally comply with the applicable requirements of this end product standard; and

e) Not contain mercury.

Exception No. 1: 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.

Exception No. 2: A component complying with a UL component standard other than those cited in this standard is acceptable if:

a) The component also complies with the applicable component standard; or

b) The component standard:

1) Is compatible with the ampacity and overcurrent protection requirements in the National Electrical Code, NFPA 70, where appropriate;

2) Considers long-term thermal properties of polymeric insulating materials in accordance with the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B; and

3) Any use limitations of the other component standard is identified and appropriately accommodated in the end use application. For example, a component used in a household application, but intended for industrial use and complying with the relevant component standard may assume user expertise not common in household applications.

6.2 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.

6.3 A component that is also intended to perform other functions, such as over current 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.

Exception: Where these other functions are not required for the application and not identified as part of markings, instructions, or packaging for the appliance, the additional component standard(s) need not be applied.

6.4 A component not anticipated by the requirements of this standard and that involves a potential risk of electric shock, fire, or personal injury, shall be additionally investigated in accordance with the applicable UL standard, and shall comply with 6.1 (b) – (d).

6.5 With regard to a component being additionally investigated, reference to construction and performance requirements in another UL end product standard is appropriate where that standard anticipates normal and abnormal use conditions consistent with the application of this standard.

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 necessary to resist the abuses to which it may be subjected, without resulting in a risk of fire, electrical shock, or injury to persons due to total or partial collapse with a resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

7.1.2 A cast- or sheet-metal section of the enclosure shall not be thinner than the applicable value specified in Table 7.1.

Exception No. 1: A small area or surface that is curved or otherwise reinforced to provide equivalent mechanical strength need not comply with the specifications in the first column of thicknesses in Table 7.1.

Exception No. 2: A section of the enclosure made of uncoated or galvanized sheet steel or cast malleable iron may be thinner than the specifications in the first column of thicknesses in Table 7.1 if such factors as the following are considered acceptable:

a) Mechanical strength and impact resistance with regard to intended use and location of the appliance;

b) Resistance to corrosion;

c) Size and shape; and

d) Location on the appliance.

Table 7.1
Minimum acceptable thicknesses of enclosure metal

Metal	At small, flat, unreinforced surfaces and at surfaces of a shape or size to provide adequate mechanical strength, inch (mm)		At surfaces to which a wiring system is to be connected in the field, inch (mm)[a]		At large, unreinforced, flat surfaces, inch (mm)	
Die-cast metal	3/64	(1.2)	–		5/64	(2.0)
Cast malleable iron	1/16	(1.6)	–		3/32	(2.4)
Other cast metal	3/32	(2.4)	–		1/8	(3.2)
Uncoated sheet steel	0.026	(0.66)	0.032	(0.81)	0.026	(0.66)
Galvanized sheet steel	0.029	(0.74)	0.034	(0.86)	0.029	(0.74)
Nonferrous sheet metal	0.036	(0.91)	0.045	(1.14)	0.036	(0.91)

[a] A sheet-metal wall of thickness less than that specified is acceptable if it is not less than 0.026 inch (0.66 mm) and the area surrounding the knockout has a thickness not less than 0.053 inch (1.35 mm).

7.1.3 Among the factors to be considered when judging a nonmetallic enclosure, including one of polymeric material, or a magnesium enclosure are:

a) Mechanical strength;

b) Resistance to impact;

c) Moisture-absorptive properties;

d) Combustibility;

e) Resistance to arcing;

f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of normal or abnormal use; and

g) For a polymeric enclosure, thermal aging.

7.1.4 For a polymeric enclosure all of the factors in 7.1.3 are considered with respect to aging. See Nonmetallic enclosure parts, Section 7.2; and Polymeric and Other Nonmetallic Materials, Section 34.

7.1.5 An overall enclosure for electrical components of an appliance intended for outdoor exposure shall have provision for drainage. See 20.1.1.12.

7.1.6 An appliance shall have provision for condensate drainage that shall be located below the lowest electrical part when installed as intended. The smallest dimension of the hole shall be at least 1/2 inch (12.7 mm).

7.2 Nonmetallic enclosure parts

7.2.1 Polymeric material or other material having a flame-spread rating greater than zero in accordance with the Standard for Tests for Surface Burning Characteristics of Building Materials, UL 723, shall not be employed as an enclosure or a skirt or other part of a venturi system of an appliance that is intended to be:

a) Permanently connected electrically and

b) Installed within a building structure so that the portion of the appliance enclosed within the wall is not visible to the user.

7.2.2 Unless otherwise specified in this end product standard, polymeric electrical insulating materials and enclosures shall comply with the applicable requirements of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

7.2.3 Metallized or painted polymeric parts or enclosures shall comply with the applicable requirements of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Exception: This requirement is not applicable to exterior surfaces of polymeric enclosure materials or parts provided that the metallized coating or paint does not offer a continuous path for an internal flame to propagate externally.

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

Exception: A fan blade may be within 1 inch of an opening in the motor housing if:

a) The material is classed as V-2, V-1, V-0, or V 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 3/4-inch (19.1-mm) flame, in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, or

c) No motor opening within 1 inch of the blade has a dimension more than 17/64 inch (6.75 mm) or an area more than 0.055 square inch (35.5 mm^2), and no more than six such openings are provided, or

d) In a skeleton or open frame type motor,

1) The fan blade 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 1/32 inch (0.8 mm) thick, and

3) The space between the coil wrap and bobbin does not exceed 1/32 inch, 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 fan employs a thermally protected motor to drive the blade and complies with the test requirements in the Blade Ignition Test, Section 55.

7.3 Accessibility of live parts

7.3.1 To reduce the likelihood of unintentional contact that may involve a risk of electric shock from uninsulated live parts and film-coated wire, an opening in an enclosure of an appliance or in a motor shall be investigated as described in (a) or (b):

a) For an opening that has a minor dimension (see 7.3.5) less than 1 inch (25.4 mm), such a part and film-coated wire shall not be contacted by the probe illustrated in Figure 7.1.

b) For an opening that has a minor dimension of 1 inch or more, neither an uninsulated live part nor film-coated wire shall be within X inches of the perimeter of the opening or within the volume generated by projecting the perimeter X inches normal to its plane. X equals five times the minor dimension of the opening, but not less than 6-1/16 inches (154 mm). See Figure 7.2.

Exception: A motor need not comply with these requirements if it complies with the requirements in 7.3.2.

Figure 7.1

Articulate probe with web stop

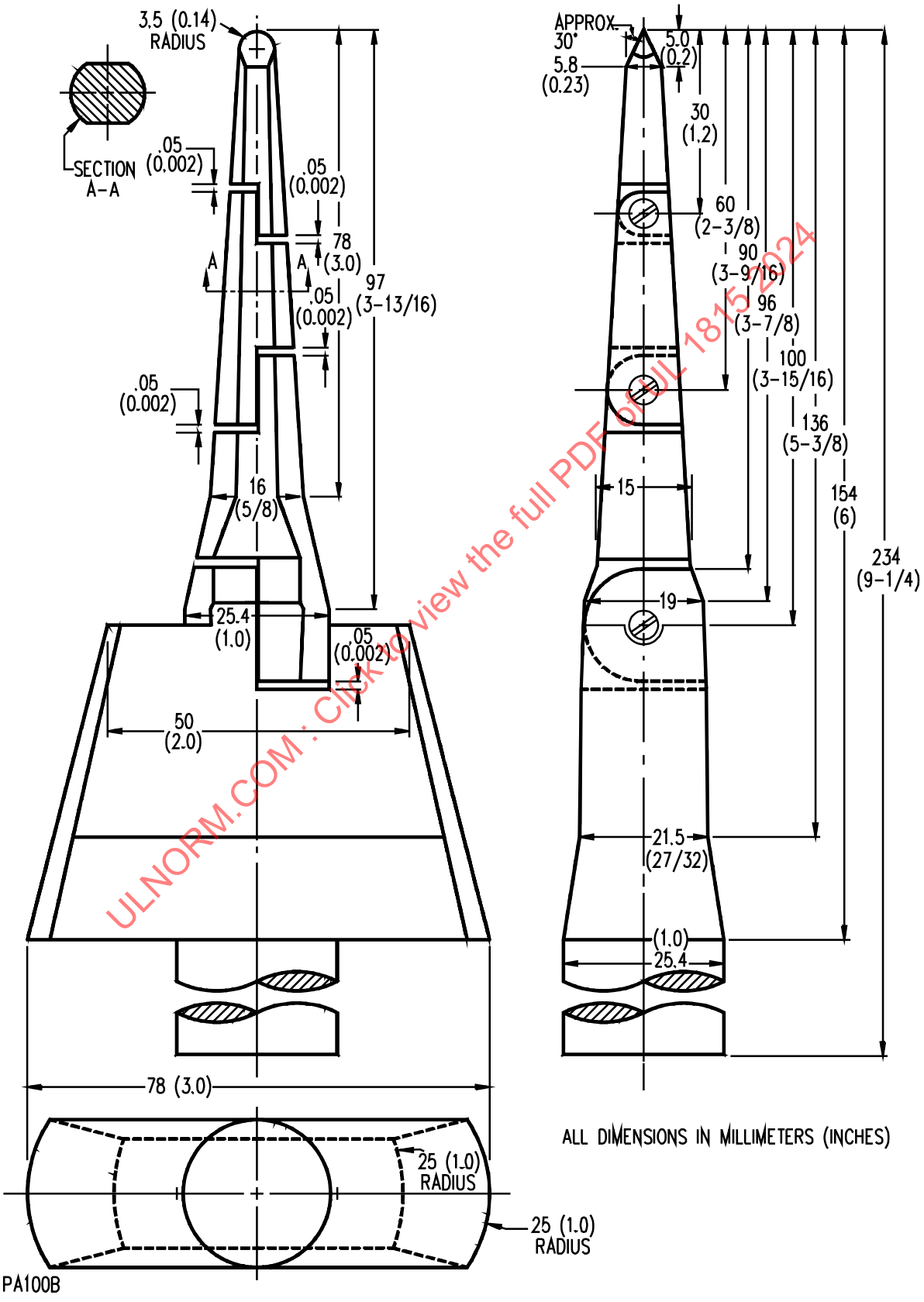
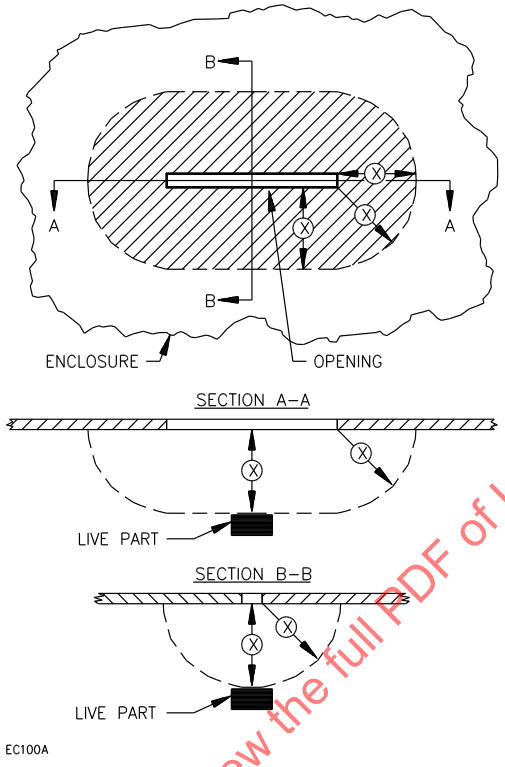


Figure 7.2

Opening in enclosure



7.3.2 With respect to a part or wire as mentioned in 7.3.1, in a motor as mentioned in the exception to 7.3.1:

a) An opening that has a minor dimension (see 7.3.5) less than 3/4 inch (19.1 mm) is acceptable if:

1) Film-coated wire cannot be contacted by the probe illustrated in Figure 7.4;

2) In a directly accessible motor (see 7.3.6), an uninsulated live part cannot be contacted by the probe illustrated in Figure 7.5; or

3) In an indirectly accessible motor (see 7.3.6), an uninsulated live part cannot be contacted by the probe illustrated in Figure 7.3.

b) An opening that has a minor dimension of 3/4 inch or more is acceptable if an uninsulated live part or film-coated wire is not within X inches of the perimeter of the opening or within the volume generated by projecting the perimeter X inches normal to its plane. X equals five times the minor dimension of the opening, but not less than 3-5/32 inches (80 mm) for contact with an uninsulated live part through an opening in the enclosure of a directly accessible motor and 4 inches (102 mm) for all other openings. See Figure 7.2.

Figure 7.3

Probe for uninsulated live parts

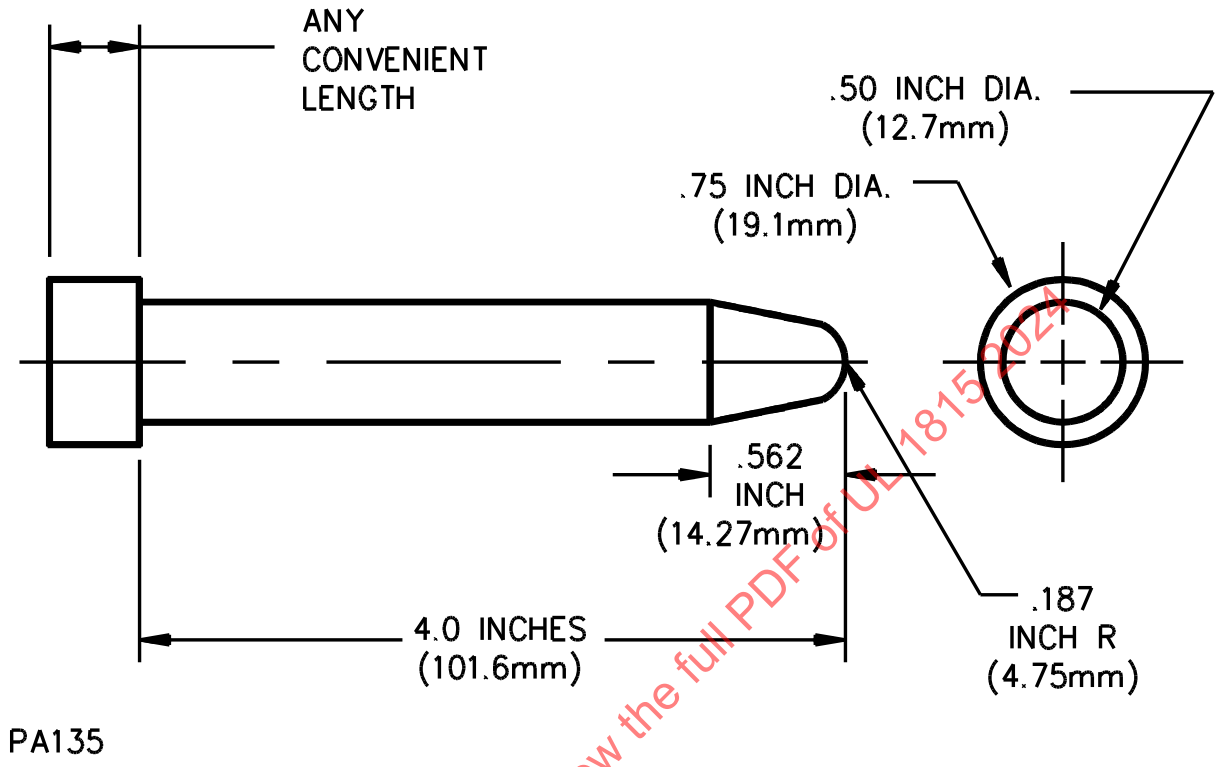


Figure 7.4

Probe for film-coated wire

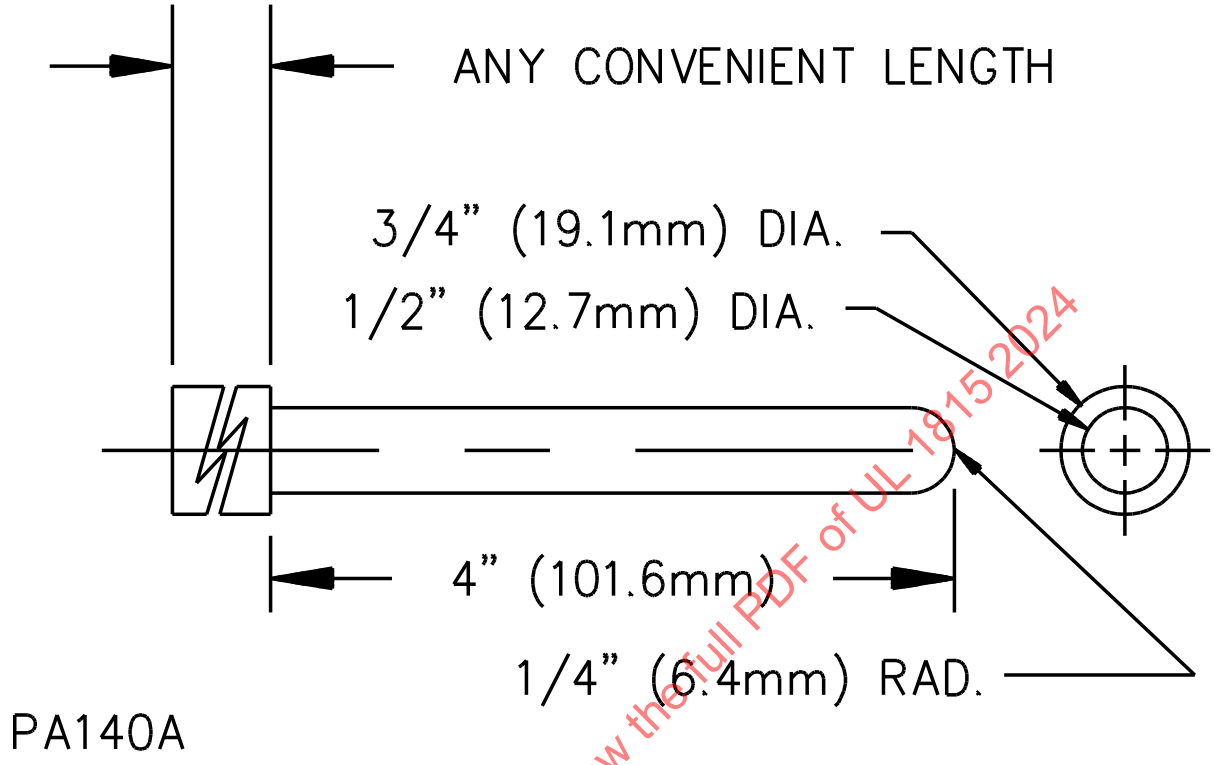


Figure 7.5

IEC articulate probe