UL 1363

STANDARD FOR SAFETY

Relocatable Power Taps

UL Standard for Safety for Relocatable Power Taps, UL 1363

Sixth Edition, Dated July 13, 2023

Summary of Topics

This new edition of ANSI/UL 1363 dated July 13, 2023 includes the following changes in requirements:

– Update Standards Reference UL 62368-1; 28.1 and B4.1

– Addition of Requirements Allowing Electronic Installation Instructions; 52.5

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated March 3, 2023 and June 2, 2023.

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Standard for Relocatable Power Taps

The first edition was titled Temporary Power Taps.

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This ANSI/UL Standard for Safety consists of the Sixth Edition.

The most recent designation of ANSI/UL 1363 as an American National Standard (ANSI) occurred on July 13, 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 ULSE's Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover indoor use cord and plug connected, relocatable power taps (RPT) rated 250 V AC or less and 20 Amperes or less. A RPT may include an integral Class 2 power supply with an integral lead and/or connector(s) output. In accordance with the National Electric Code, NFPA 70, RPT are for use as a movable power supply connection for cord and plug connected electrical utilization equipment and shall not serve as fixed wiring of a structure or of fixed furnishings, such as but not limited to applications in permanent countertops of kitchens and bathrooms.

1.2 A cord-and-plug-connected product as described in 1.1 with less than three receptacle outlets and provided with a Luminaire is covered under the Standard for Portable Electric Luminaires, UL 153.

1.3 A cord-and-plug-connected product as described in 1.1 with less than three receptacle outlets that employs an electromagnetic interference filter is covered under the Standard for Electromagnetic Interference Filters, UL 1283.

1.4 A cord-and-plug-connected product as described in 1.1 with less than three receptacle outlets that employs a surge protective device (SPD) is covered under the Standard for Surge Protective Devices, UL 1449, for SPD Type 3.

1.5 These requirements cover RPT with more than two receptacle outlets that employ a surge protective device (SPD) shall also comply with the applicable requirements for cord-connected, Type 3 Surge Protective Device (SPD) in the Standard for Surge Protective Devices, UL 1449.

1.6 A cord-and-plug-connected product as described in 1.1 that employs ground-fault protection is covered under the requirements for portable GFCIs in the Standard for Ground-Fault Circuit Interrupters, UL 943.

1.7 This standard does not cover RPT including those employing Hospital Grade receptacles or Hospital Grade plugs (see 52.1), intended for use with medical equipment. RPT are not suitable for use in Category 2 (General Patient Care) Spaces or Category 1 (Critical Patient Care) Spaces or Patient Care Vicinities of health care facilities.

1.8 These requirements do not cover a cord-and plug-connected product, Health Care Facility Receptacle Assemblies (HCOA), covered by the Outline of Investigation for Cord-and-Plug-Connected Health Care Facility Outlet Assemblies, UL 2930. HCOA are intended as a movable power supply connection for cord-and-plug-connected medical electrical utilization equipment for use in Category 2 (General Patient Care) Spaces or Category 1 (Critical Patient Care) Spaces, including Patient Care Vicinities equipped with Patient Equipment Grounding Points, of health care facilities.

1.9 These requirements do not cover a cord-and-plug-connected component, Special Purpose Relocatable Power Taps (SPRPT), covered by the covered in the Outline of Investigations Special Purpose Relocatable Power Taps, UL 1363A. SPRPT are power distribution components intended to supply power to plug-connected components of a movable equipment assemblies that are rack, table, or pedestal-mounted. SPRPT are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The SPRPT shall be an integral part of the equipment assembly and permanently attached to the equipment assembly only by those qualified to assemble medical electrical equipment systems compliant with Medical Electrical Equipment – Part 1: General Requirements for Basic Safety and Essential Performance, IEC 60601-1. SPRPT are not suitable for use in Patient Care Vicinities.

1.10 A RPT may employ an integral cord reel for the supply cord and attachment plug. A cord reel provided with pull out receptacle outlets or cord connectors is covered under the Standard for Cord Reels, UL 355.

1.11 These requirements do not cover RPT with work surfaces or surfaces intended to support weight loads other than as specified in 6.16 for the storage of hand-held electronic devices and charging equipment such as a cell phone, cell phone charger and the like.

1.12 These requirements cover RPT provided with isolated secondary circuits.

1.13 These requirements cover RPT provided with batteries located in isolated secondary circuits. See UL 1363 Annex B – Relocatable Power Taps Incorporating Batteries.

1.14 A product that has a battery backup feature or other uninterruptible power supply equipment located in the Primary Circuit shall comply with the applicable requirements in the Standard for Uninterruptible Power Supply Equipment, UL 1778.

1.15 A RPT with three or more receptacle outlets may employ a Light Emitting Diode (LED) Luminaire.

1.16 A cord-and-plug-connected product as described in 1.1 for fixed mounting by use of tools to portable or stationary furnishings is covered under the requirements in the Standard for Furniture Power Distribution Units, UL 962A.

1.17 This standard contains the following Annexes:

a) Annex A – Extendable Relocatable Power Taps.

b) Annex B – Relocatable Power Taps Incorporating Batteries.

c) Annex C – Relocatable Power Taps Employing An Integral Thermal Interruption Mechanism.

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 Annex D 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.

2.5 A RPT that incorporates a LED Luminaire and LED components and subassemblies shall comply with the applicable requirements of the Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750.

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 indicated, all voltage and current values mentioned in this standard are root-mean-square (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 Use

5.1 A RPT is intended to be connected to a permanently installed branch circuit receptacle outlet.

5.2 A RPT is not intended to be permanently mounted.

5.3 A RPT is not intended to be series connected (daisy chained) to other RPT or to extension cords.

6 Glossary

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

6.2 ATTACHMENT PLUG – A male contact device for the temporary connection of a flexible cord or cable to a receptacle outlet or cord connector.

6.3 CLASS 2 LEAD – Consists of a factory-made, power-limited cable with a connector at one end. The other end is secured within the housing or enclosure of the RPT. The connector is intended for connection to the Class 2 separable interface.

6.4 CLASS 2 SEPARABLE INTERFACE – A separable component containing Class 2 low-voltage connector(s) only (such as Universal Serial Bus (USB) connector(s).

6.5 CORD CONNECTOR – A female contact device assembled or molded on flexible cord to allow a detachable electrical connection to an attachment plug.

6.6 ISOLATED SECONDARY CIRCUIT – A circuit derived from an isolating source (such as a transformer, optical isolator, limiting impedance or electro-mechanical relay) and having no direct connection back to the primary circuit (other than through the grounding means). A secondary circuit that has a direct connection back to the primary circuit is considered part of the primary circuit.

6.7 MEANS FOR TEMPORARY MOUNTING – A mounting method that does not require the use of tools for mounting or dismounting the RPT and conceals the head of a screw or other fastener so that it cannot be tightened after the RPT is mounted.

6.8 OVERCURRENT PROTECTION (OCP) DEVICE – A supplementary protection device provided within a RPT that provides overcurrent and short-circuit protection.

6.9 PATIENT CARE SPACE, CATEGORY 1 (CRITICAL CARE) – A health care facility space in which failure of equipment or a system is likely to cause major injury or death of patients, staff, or visitors, as established by health care facility's governing body or its designee.

6.10 PATIENT CARE SPACE, CATEGORY 2 (GENERAL CARE) – A health care facility space in which failure of equipment or a system is likely to cause minor injury of patients, staff, or visitors, as established by health care facility's governing body or its designee.

6.11 PATIENT CARE VICINITY – A health care facility space, within a location intended for the examination and treatment of patients, extending 6 ft (1.8 m) beyond the normal location of the patient bed, chair, table, treadmill, or other device that supports the patient during examination and treatment, and extending vertically to 7 ft 6 in. (2.3 m) above the floor.

6.12 PEDESTAL MOUNTED RPT – A RPT assembly integral to or supported by a column(s) which is in turn provided with a base for stability.

6.13 PORTABLE (Relocatable) – Meets all of the following:

a) Not secured to the building structure unless provided with a securement means that allows the RPT to be removed without the use of tools, and

b) Connected electrically to an electrical source of supply with a power supply cord and attachment plug.

6.14 PRIMARY CIRCUIT – A circuit in which the wiring and components are conductively connected to the AC power interface.

6.15 RECEPTACLE OUTLET – A female contact device mounted within an electrical enclosure to allow a detachable electrical connection of an attachment plug.

6.16 RELOCATABLE POWER TAP (RPT) – An electrical enclosure provided with an attached power supply cord and attachment plug for connection to a permanently installed branch circuit receptacle outlet. The electrical enclosure may be provided with one or more receptacle outlets. The RPT may also be provided in any combination of the following configurations:

a) The electrical enclosure connected to the cord and attachment plug may be supplied with up to six lengths of flexible cord not exceeding 1-1/2 feet in length; each length shall be terminated with a maximum of 3 receptacle outlets within an electrical enclosure or with 3 cord connectors. Refer to 14.1 for overload requirements and 16.7 for interconnecting cord requirements.

b) Provided with supplementary overcurrent protection.

c) Provided with manual or automatic switch(es) such as an integral appliance timer to control all or some of the receptacle outlets.

d) Provided with indicator lights.

e) Provided with temporary mounting means.

f) When provided with three or more receptacle outlets the RPT may be provided with a surge protective device (SPD) or an electromagnetic interference (EMI) filter.

g) A RPT may employ a storage compartment to store hand-held electronic devices and charging equipment such as a cell phone, cell phone charger, and the like, when these devices are not in use.

h) A RPT may employ non-electrical decorative features. The decorative features may include various shapes such as rocks, birds and animals, etc.

i) A RPT may employ an integral cord reel for the power supply cord and attachment plug. The cord reel type feature, in addition to the requirements in this standard, shall also comply with the applicable requirements in the Standard for Cord Reels, UL 355.

j) A RPT may employ telephone equipment and communication circuit protectors.

k) A RPT may employ an antenna discharge unit or provide antenna connections for televisions and video products.

l) When provided with three or more receptacle outlets the RPT may be provided with LED (Light Emitting Diode) Luminaire(s).

m) A RPT may be provided with a wireless charging circuit.

n) A RPT may be extendable as specified in UL 1363 Annex A.

o) A RPT may incorporate batteries as specified in UL 1363 Annex B.

p) Provided with an integral Class 2 lead and mating Class 2 separable interface, or an integral power supply with one or more Class 2 output connector(s).

6.17 RISK OF FIRE – A risk of fire is considered to exist at any two points in a circuit where:

a) The open circuit voltage is more than 30 Vrms (42.4 V peak) and the energy available to the circuit under any condition of load including short circuit, results in a current of 8 A or more after 1 minute of operation; or

b) A power of more than 15 watts can be delivered into an external resistor connected between the two points.

6.18 SUPPLEMENTARY PROTECTOR – A manually resettable device designed to open the circuit automatically on a predetermined value of time versus current or voltage within an appliance or other electrical equipment. It is permitted to be provided with a manual means for opening or closing the circuit.

CONSTRUCTION

7 General

7.1 Only materials that are suitable for the particular use shall be used in a RPT.

7.2 If a RPT employs a decorative or ancillary feature, such as a LED Luminaire, a rock, bird or animal, or a storage compartment, it shall be designed so that the addition of the decorative feature part(s) does not:

a) Interfere with the function or temporary mounting means described in Section 11, Temporary Mounting Means;

b) Interfere with turning the power "on" or "off " using the switch provided on the RPT; or

c) Interfere with an attachment plug from fully seating in the outlet slot(s) of the RPT.

7.3 The base or column of a pedestal mounted RPT is not considered an electrical enclosure if the only electrical component within the base or column is a power supply cord and contains no splices.

7.4 The base or column of a pedestal mounted RPT is considered an electrical enclosure when electrical components other than specified in 7.3 are placed within the base or column.

7.5 A RPT that incorporates devices such as an integral appliance timer to control all or some of the receptacles shall comply with the Standard for Clock-Operated Switches, UL 917 or the Standard for Solid-State Controls for Appliances, UL 244A. Compliance with the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills the UL 244A requirements.

7.6 Products that employ timer(s) as specified in 7.3 shall be marked as specified in 51.20 to warn the user of the possible hazards.

7.7 A RPT that employs an integral cord reel for the power supply cord shall comply with the requirements in this standard and shall also comply with the applicable requirements in the Standard for Cord Reels, UL 355.

7.8 Telephone equipment and communication circuit protectors included in a RPT shall comply with the requirements in the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or the Standard for Audio/Video Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1 and the requirements in the Standard for Secondary Protectors for Communications Circuits, UL 497A.

7.9 A RPT that incorporates an antenna discharge unit or provides antenna connections to a television, a high-voltage video product, or antenna shall comply with the applicable requirements in the Standard for Antenna-Discharge Units, UL 452, and the Standard for Audio-Video Products and Accessories, UL 1492 or the Standard for Audio, Video, and Similar Electronic Apparatus – Safety Requirements, UL 60065, or the Standard for Audio/Video Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1.

7.10 A cord and plug connected RPT with three or more receptacle outlets that employs an electromagnetic interference filter shall also comply with the Standard for Electromagnetic Interference Filters, UL 1283.

7.11 A cord and plug connected RPT with three or more receptacle outlets that employs a surge protective device shall also comply with the Standard for Surge Protective Devices, UL 1449, for SPD Type 3.

8 Enclosure

8.1 General

8.1.1 The enclosure shall be formed and assembled so that it has the strength and rigidity required to resist the abuses to which it is subjected, without resulting in 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.

8.1.2 The enclosure shall not have any openings or knockouts that are capable of being used for permanent mounting or connection to a permanent wiring system. See Temporary Mounting Means, Section 11.

8.1.3 An opening in an enclosure shall have such size and shape – or shall be so covered by screening or barrier or by an expanded, perforated, or louvered panel – that a test rod having a maximum diameter of 1/16 in (1.6 mm) shall be prevented from contacting live parts.

8.1.4 A keyhole slot, notch, or similar means for temporary mounting, when provided, shall be located so that the supporting screws or the like cannot damage any electrical insulation or reduce spacings to live parts.

8.1.5 A barrier that covers a mounting hole and thereby forms part of the required enclosure shall be subjected to the Mounting Hole Barrier Tests, Section 36.

8.1.6 A part which forms the decorative feature of a RPT shall be for ornamental purposes only and not serve as an enclosure or insulation of live parts.

8.1.7 A RPT employing a decorative feature that encapsulates the RPT or surrounds the enclosure of the RPT, shall be constructed in such a manner that all marking requirements identified in Section 51, Details, shall remain visible when the decorative feature is installed.

8.1.8 Enclosure parts shall be secured together by a positive means. Press fit alone is not considered a positive means of securement.

8.2 Metallic

8.2.1 A metal enclosure of a RPT shall have a minimum thickness in accordance with Table 8.1.

Table 8.1
Minimum Thicknesses of Enclosure Metal

Metal	At small, flat unreinforced surfaces and at surfaces of a shape or size to provide adequate mechanical strength,		At relatively larger unreinforced flat surfaces,	
	in	(mm)	in	(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)	0.026	(0.66)
Galvanized sheet steel	0.029	(0.74)	0.029	(0.74)
Nonferrous sheet metal	0.036	(0.91)	0.036	(0.91)

8.3 Nonmetallic

8.3.1 A polymeric enclosure shall comply with the flammability requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, for non-attended, non-intermittent duty portable equipment.

8.3.2 The enclosure shall comply with the strain relief, impact, crush and mold stress-relief test requirements of Sections 37, 38, 39 and 43 respectively, of this standard.

8.3.3 A RPT that employs a decorative feature or storage compartment which is constructed of polymeric material shall comply with the flammability requirements for an enclosure material as identified in the Standard for Polymeric Material – Use in Electrical Equipment Evaluations, UL 746C, for non-attended, non-intermittent duty portable equipment.

9 Mechanical Assembly

9.1 A RPT shall be formed and assembled so as to reduce the risk of contact with any sharp edges, fins, burrs or the like that are capable of increasing the risk of injury to persons, or abrade the insulation on conductors or otherwise damage wires.

9.2 A switch, a lampholder, a power-supply cord and its strain-relief bushing, receptacle, or similar component shall be mounted securely and, except as noted in 9.3 and 9.4, shall be restrained from turning. See 9.5.

9.3 The requirement that a switch be restrained from turning is capable of being waived when all of the following conditions are met:

a) The switch is to be of the plunger or other type whose actuator does not tend to rotate when operated (the actuator of a toggle or rocker switch is considered to be subject to forces that tend to turn the switch during operation of the switch).

b) The means of mounting the switch makes it unlikely that operation of the switch loosens it.

c) The spacings are not to be reduced below the minimum acceptable values when the switch rotates.

9.4 A lampholder of a type in which the lamp is not intended 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 be restrained from turning when the rotation is not capable of reducing spacings below the minimum acceptable values.

9.5 The means by which the turning specified in 9.2 is prevented is to include more than friction between surfaces. For example, a lockwasher, properly applied, is not prohibited from being used as a means to restrain turning of a device having a single-hole mounting means.

9.6 A base and column or sections of columns of a pedestal mounted RPT that does not form an electrical enclosure may be disassembled for shipment. When disassembled for shipment all the following shall apply:

a) When disassembled there shall be no sharp edges exposed to conductors, cords or to the user. A method for determining sharp edges is the standard for Tests for Sharpness of Edges on Equipment, UL 1439.

b) Assembly shall not require cutting or drilling. Assembly shall not subject conductors, cords or splices to damage.

c) A pedestal mounted RPT not completely assembled when shipped shall be provided with assembly instructions.

9.7 A pedestal mounted RPT shall comply with the Impact Tests, Section 38, the Stability Test, Section 41 and the Tipover Test, Section 42.

Exception: The tip over test need not be performed if the overall height of the pedestal mounted RPT is lower than 3 ft (0.91 m).

9.8 The power supply cord shall enter the pedestal within 1 ft (305 mm) of the floor or base.

10 Accessibility of Live Parts

10.1 The electrical parts of a RPT that do not require use of a tool for access shall be located or enclosed so that persons are protected against inadvertent contact with uninsulated live parts and film-coated magnet wire.

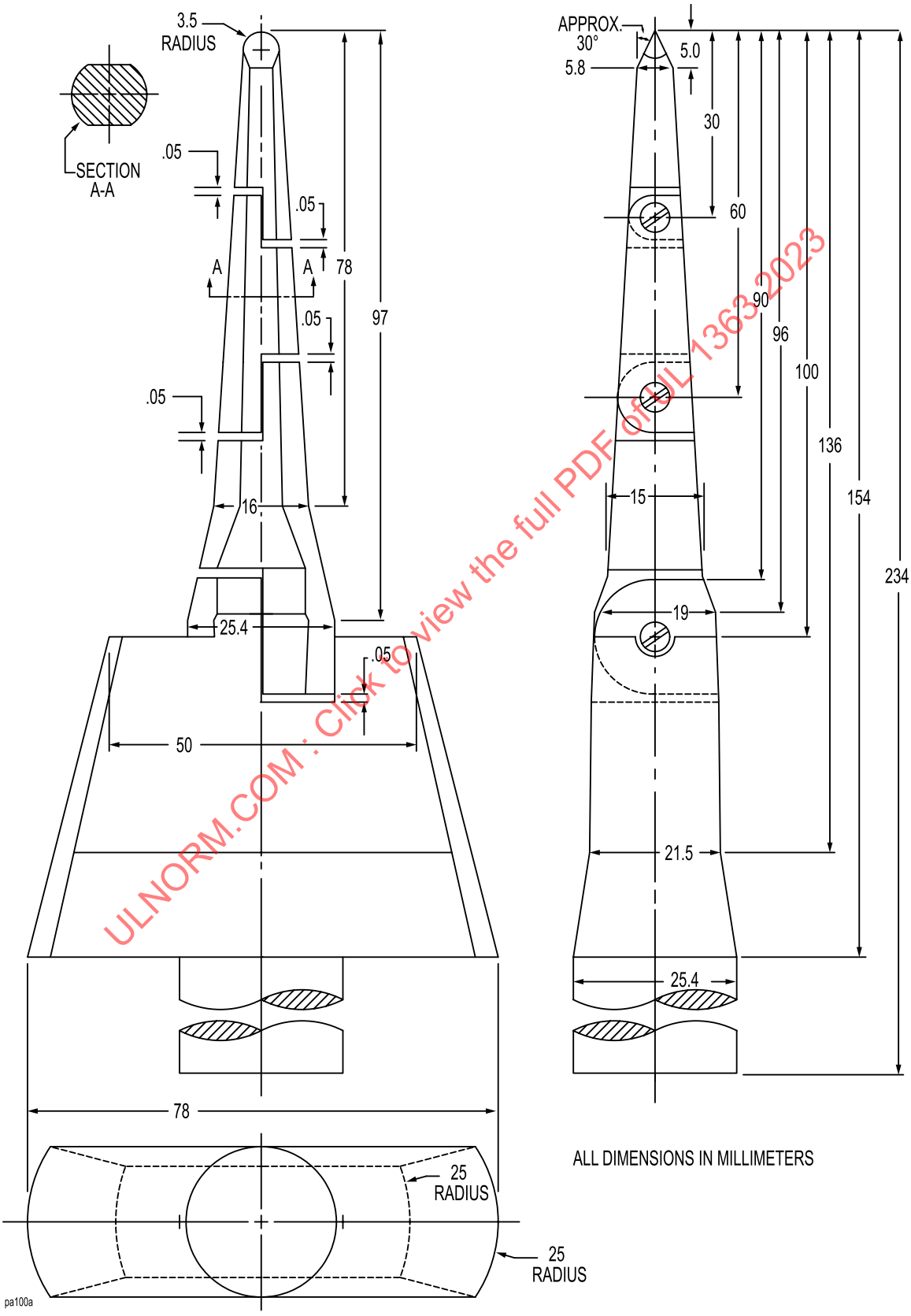
Exception: Connectors and contacts supplied by an isolated secondary circuit meeting Class 2 or Limited Power Circuit (LPS) power levels may be accessible to the user.

10.2 An opening in the enclosure of a RPT is not prohibited when an uninsulated live part or film-coated magnet wire is not capable of being contacted by the probe shown in Figure 10.1. The probe shall be applied to any depth that the opening permits, and shall be rotated or angled before, during, and after insertion through the opening to any position that is required to examine the enclosure. The probe shall be applied in any possible configuration; and, when required, the configuration shall be changed after insertion through the opening.

10.3 The probe shall be used as a measuring instrument to evaluate the accessibility provided by an opening, and not as an instrument to evaluate the strength of a material; it shall be applied with the minimum force required to determine accessibility.

Figure 10.1

Accessibility Probe



11 Temporary Mounting Means

11.1 A RPT may be provided with a means for temporary mounting. A tool shall not be required to dismount a RPT.

11.2 A means for temporary mounting shall provide for secure positioning that requires a positive, deliberate action by the user to dismount it.

11.3 A keyhole slot, notch, or similar means for temporary mounting, shall be located so that the screw head, nail head, hook, or other supporting device is not accessible for further securing of the RPT once it is mounted.

Exception: A temporary mounting means that does not comply with the above requirement is capable of being used when investigated for the purpose.

11.4 When a temporary mounting means is provided, installation instructions shall be furnished with the product. When the mounting means requires special hardware, to comply with the requirements in the Adequacy of Mounting Test, Section 40, or 11.1 – 11.3, the hardware shall be provided with the product.

Exception: Installation instructions are not required to be furnished when it is determined that the mounting means is obvious.

11.5 The temporary mounting means shall comply with the requirements in 8.1.4 and Sections 36 and 40.

11.6 An RPT intended to be mounted on a desk or similar furnishing surface shall comply with the requirements in 16.5 and Section 44, Spill Test.

12 Corrosion Protection

12.1 Iron and steel parts or other parts not inherently corrosion resistant shall be protected against corrosion by painting, enameling, galvanizing, plating, or other equivalent means.

Exception: Minor parts of iron or steel, such as washers, screws and the like that are not in the grounding conductor path are not required to comply with this requirement.

13 Insulating Materials

13.1 A barrier or integral part, such as an insulating washer or bushing, and a base or support for the mounting of live parts, shall be of a moisture-resistant material that will not be damaged by the temperature and stresses to which it will be subjected under conditions of actual use.

13.2 An insulating material is to be investigated with regard to its acceptability for the application in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. Materials, such as mica, ceramic, or some molded compounds are capable of being used as the sole support of live parts. When it is required to investigate a material to determine its acceptability, consideration is to be given to such factors as its mechanical strength, resistance to ignition sources, dielectric strength, insulation resistance, and heat-resistant properties in both the aged and unaged conditions, the degree to which it is enclosed, and any other features affecting the risk of fire and electric shock.

13.3 Vulcanized fiber, industrial laminates, polymeric films or similar materials are capable of being used for insulating bushings, washers, separators, and barriers, but not as sole support for uninsulated live parts. Hard rubber is not to be used.

Exception: Industrial laminates that have been investigated for the purpose are capable of being used as sole support for uninsulated live parts.

14 Power-Supply Cord

14.1 General

14.1.1 The power-supply cord shall be of the grounding type and shall employ one of the following flexible cord Types: SJ, SJE, SJO, SJT, SJTO, or equivalent.

Exception: SPT-3 is not prohibited from being used on a RPT rated 15 A or less when marked in accordance with 51.11.

14.1.2 A detachable power-supply cord shall not be used.

14.1.3 The minimum conductor size of the power-supply cord shall be as indicated in Table 14.1.

Table 14.1
Guide to Construction and Performance Requirements for RPTs

RPT rating (A)	Minimum power cord size (AWG)	Number of receptacles	Supplementary OCP required?[a] (A)		Supplementary OCP rating[a] (A)	Temperature test load (A)	Minimum internal wiring size[b] (AWG)
				When LED[h] Luminaire or wireless charging circuits are incorporated			
20	12	<6	NO	YES	20[c]	20	12
20	12	≥6	YES	YES	20	20	12
15	14	<4	NO	YES	15[c]	15	14
15	14	≥4	YES[g]	YES	15	15	14
<15	14	<4	NO	YES	15[c,d]	15[e,f]	14
<15	14	≥4	YES	YES	15[d]	OCP[f]	14

[a] OCP shall not trip when the RPT is operated at the RPT marked rated current.

[b] Smaller AWG is not prohibited from being used when an OCP is provided and the results of the Temperature Test (Section 30), the Fault Current Test (Section 34), and the Overcurrent Test (Section 35) comply with the requirements of those tests using the smaller AWG wire. Isolated secondary conductors shall also comply with Sections 20 and 24.

[c] When provided with an OCP.

[d] Maximum rating. An OCP rated less than 15 A and not less than the RPT rating complies with the intent of this requirement. See note (a) above.

[e] Test is capable of being conducted at OCP rating when provided.

[f] When the OCP rating is greater than the RPT rating, conduct the Temperature Test at the OCP rating. The OCP is not prohibited from being bypassed when nuisance tripping occurs. See 30.3.

[g] An OCP is not required for a 15 A RPT with four receptacles as long as:

a) Internal wiring is 12 AWG;

b) The power-supply cord is 12 AWG;

Table 14.1 Continued on Next Page

Table 14.1 Continued

RPT rating (A)	Minimum power cord size (AWG)	Number of receptacles	Supplementary OCP required?[a] (A)		Supplementary OCP rating[a] (A)	Temperature test load (A)	Minimum internal wiring size[b] (AWG)
				When LED[h] Luminaire or wireless charging circuits are incorporated			
	c) All other components are evaluated for use at 20 A; and d) The Temperature Test load is 20 A.						
[h] A RPT incorporating an LED Luminaire or a wireless charging circuit shall be provided with supplementary OCP as shown in the column "Supplementary OCP ratinga (A)" The RPT shall also be provided with instructions as indicated in 52.4.							

14.1.4 The length of a power-supply cord – as measured from the outside surface of the enclosure of the RPT to the plane of the face of the attachment plug – shall not exceed 25 ft (7.62 m) nor be less than 1.5 ft (0.46 m).

14.1.5 A power-supply cord shall have a voltage rating not less than the rated voltage of the RPT and have an ampacity not less than the current rating of the RPT.

14.1.6 The power-supply cord shall not include a through-cord switch.

14.2 Class 2 lead

14.2.1 A Class 2 lead may be one of the following types:

a) Type CL2 cable in accordance with the Standard for Power-Limited Circuit Cables, UL 13.

b) An appliance wiring material with a maximum length of 10 feet (3.5 m), minimum of 26 AWG, rated minimum VW-1 flammability and minimum 300 V, in accordance with the Standard for Appliance Wiring Material, UL 758.

14.2.2 One end of a Class 2 lead shall be either molded-on or permanently attached to the RPT housing or enclosure. Where the Class 2 leads pass into the interior of the RPT housing or enclosure, the power-limited cable shall be separated in accordance with 24.1 from AC power circuit conductors and from conductive parts energized by AC power circuits.

14.2.3 The other end of a Class 2 lead shall terminate in a connector capable of being inserted into the mating connector of the Class 2 separable interface.

14.2.4 Permanently attached can be achieved by crimping, welding, riveting, or equivalent to render the connector non-rewireable.

14.3 Bushings

14.3.1 Where the power-supply cord passes through an opening in the enclosure, a smooth, well-rounded surface shall be provided to protect the cord from damage.

15 Strain Relief

15.1 Strain relief shall be provided so that a mechanical stress on a power-supply cord, cord connector, flexible cord, or Class 2 lead is not transmitted to terminals, splices, or interior wiring. See Strain Relief Test, Section 37.

15.2 The strain relief means shall not damage the insulation or cord jacket. The normal compressive deformation inherent in providing strain relief is not considered to be damage.

16 Receptacles

16.1 The receptacle outlets of a RPT shall have a current rating of 15 or 20 A and a voltage rating of 125 or 250 V. The contact components of a receptacle shall have a voltage and current rating equal to that of the attachment plug on the power-supply cord.

Exception: A 15 A receptacle is not prohibited from being used with a RPT rated 20 A with a 20 A attachment plug.

16.2 All of the receptacle outlets of a RPT shall have the same current rating and shall be of the grounding type. They are not prohibited from being of the same or different slot configurations (locking and non-locking) or employing a spring-actuated latching mechanism for locking a mated attachment plug in place after the blades have been inserted into the female contacts.

16.3 The receptacle outlets of a RPT shall comply with the applicable requirements in the Standard for Attachment Plugs and Receptacles, UL 498 and shall comply with the requirements of the Grounding Contact Test in UL 498.

16.4 The receptacle outlets of a RPT that also incorporates terminals for coaxial cable (TV/CATV) connection shall be marked in accordance with 51.10.

16.5 An RPT intended to be mounted on a desk or similar furnishing surface shall be covered or otherwise protected from spillage while not in use and shall comply with the Spill Test, Section 44.

Exception: When the intended use of the RPT is for it to be mounted above the furnishing surface and oriented such that spilled liquid on the furnishing surface cannot enter any part of the RPT, these requirements do not apply.

16.6 The receptacle outlets of an RPT shall be wired in one of the following methods:

a) Always On (Unswitched) – all receptacles on the RPT energized when the RPT is plugged into a receptacle; or

b) Switched – all receptacles switched via one or more switches; or

c) Partially switched – combination of one or more switched and one or more always on (unswitched) receptacles. The "always on" (unswitched) receptacles are energized at all times when the RPT is plugged into a receptacle.

16.7 The cord connectors that is employed in an RPT shall be molded-on or assembled-on to the flexible cord. The cord connector shall be the grounding type and shall comply with the requirements in the Standard for Attachment Plugs and Receptacles, UL 498 or the Standard for Cord Sets and Power Supply Cords, UL 817. The flexible cord employed shall be of the type as specified in 14.1.1 and shall have the conductor size, voltage and current rating as specify in Table 14.1 and 14.1.5.

16.8 A RPT employing tamper-resistant receptacle outlets may be marked "TR" or "Tamper Resistant" provided the receptacle outlets comply with the Tamper-Resistant Receptacle requirements, as specified in the Standard for Attachment Plugs and Receptacles, UL 498.

17 Supplementary Protection

17.1 An RPT having 14 AWG (2.1 mm^2) flexible cord and four to six receptacle outlets, and all RPT's having LED Luminaires, wireless charging circuits or six or more receptacle outlets, shall be provided with supplementary overcurrent protection. See Table 14.1.

17.2 A supplementary protection device shall not open during the Temperature Test, Section 30.

Exception: See note (g) of Table 14.1.

17.3 An RPT that requires supplementary overcurrent protection shall have a supplementary overcurrent protective device connected between the power-supply cord and the receptacles, see Table 14.1.

17.4 A supplementary overcurrent protection device shall be capable of clearing a fault current of not less than that indicated in Table 17.1 and shall comply with the requirements in the Standard for Supplementary Protectors for Use in Electrical Equipment, UL 1077. The supplementary overcurrent protection device shall have been subjected to the Overload Test in UL 1077, tested for motor starting at 6 times the AC full load current rating.

Exception No. 1: A fuse that is capable of clearing a fault current of not less than that indicated in Table 17.1, and that complies with the requirements in the Standard for Low-Voltage Fuses – Part 14: Supplemental Fuses, UL 248-14, is not prohibited from being used as a supplementary overcurrent protection device.

Exception No. 2: A circuit breaker that complies with the requirements in the Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489, and is in accordance with the National Electrical Code, NFPA 70 for branch circuit protection, is not prohibited from being used in lieu of a supplementary overcurrent protection device.

Table 17.1
Circuit Capacity of Supply Source

Rating (VA)	Available fault current (A)
1875 or less	1000
More than 1875 to 3750	2000
More than 3750	3500

17.5 The overcurrent protective device shall be a supplementary protector of the automatic-trip-free, manual-reset type or a replaceable fuse installed in an extractor type fuse holder. An RPT that is provided with fuses that are intended to be replaced in the field shall be marked in accordance with the requirements in 51.8.

17.6 A single-pole supplementary protection device shall be connected in the ungrounded (line) conductor of the supply circuit only. A double-pole device shall be connected on both the ungrounded and grounded (neutral) conductors such that when it operates, it opens both ungrounded and grounded conductors.

17.7 A supplementary protection device shall not be connected in the grounding conductor.

17.8 The ampere rating of the overcurrent protective device of 17.2 shall not be greater than the ampacity of:

a) The configuration of the receptacles it is to protect;

b) That of the power-supply cord; or

c) Other electrical components, whichever is lower.

17.9 When a single overcurrent protective device does not protect all receptacle outlets, more than one overcurrent protective device shall be used, and each receptacle outlet shall be marked to indicate the rating of the overcurrent protective device connected to it. See 51.5.

17.10 Thermal cutoff devices, thermal relays, and similar devices, shall not be used as supplementary overcurrent protection devices.

18 Switches

18.1 An RPT may be provided with a switch(es) to control receptacles/circuits employed in the RPT. Each switch, if provided, shall have voltage and current ratings not less than the load it is intended to control. A switch shall open all ungrounded circuit conductors and, in addition, is not prohibited from opening the grounded circuit conductor.

18.2 A switch provided in a RPT shall comply with the requirements of the Standard for Switches for Appliances – Part 1: General Requirements – UL 61058-1. The switch shall be rated for use with other than resistive (Res), AC Tungsten filament lamp (L), or AC and DC Tungsten filament lamp (T) loads.

Exception: A switch that complies with the requirements of the Standard for General-Use Snap Switches, UL 20, for a general-use AC switch is not prohibited from being used in a RPT.

18.3 Each switch shall indicate to the user when its associated circuit is energized. See 51.7.

Exception: A RPT is not prohibited from being equipped with indicator or pilot lights, such as neon-series-resistor, LED type, or similar items, to show which receptacles are live, or to indicate that the unit is energized.

19 Live Parts

19.1 Current-carrying parts shall have adequate ampacity, and shall be of copper, a copper-base alloy, or other material determined to be acceptable for the use.

19.2 Uninsulated live parts shall be secured to the base or mounting surface so that they do not turn or shift in position, when such motion results in a reduction of spacings below the minimum acceptable values.

19.3 Friction between surfaces is not to be used as the sole means to prevent shifting or turning of live parts. A lockwasher is not prohibited from being used in such a manner.

20 Internal Wiring

20.1 The internal wiring of a RPT shall be rated for the voltage, temperature, and other conditions of use as indicated in Table 14.1.

20.2 Internal wiring shall be routed and secured to reduce the risk of mechanical damage to the insulation or stress on wiring terminations. The internal wiring shall be positively routed away from any exposed screw threads.

20.3 Screw threads, including those of sheet metal screws, shall not be exposed for more than 3/16 in (4.76 mm) inside a compartment containing wiring and shall be located so that contact with conductor insulation is unlikely.

20.4 Metal clamps and guides used for routing wiring shall have smooth, well-rounded edges.

20.5 A hole through which insulated wires pass through a sheet-metal wall within the overall enclosure of a RPT shall be provided with a smooth, well rounded bushing or any surfaces upon which the wire can bear shall be smooth and well-rounded.

20.6 All splices and connections shall be mechanically secure and shall provide sufficient ampacity. A soldered connection shall be made mechanically secure before being soldered.

Exception: Printed-wiring board joints are not required to be mechanically secure before soldering.

20.7 A lead is considered to be mechanically secure when it is:

a) Wrapped at least halfway (180°) around a terminal,

b) Provided with at least one right angle bend when passed through an eyelet or opening, or

c) Twisted with other conductors.

20.8 A splice shall be provided with insulation at least equivalent to the conductor insulation.

20.9 In determining whether splice insulation consisting of coated-fabric, thermoplastic, or another type of tape or tubing is capable of being used, consideration is to be given to such factors as mechanical strength, dielectric properties, heating and moisture-resistant characteristics, and the equivalent.

20.10 Where stranded wiring is connected to a wire-binding screw, the construction shall be such that any loose strand of wire is prevented from contacting live parts of opposite polarity or dead metal parts that may be grounded. This can be accomplished by use of upturned lugs on the terminal plate, pressure terminal connectors, soldering lugs, crimped eyelets, or equivalent means.

20.11 Soldered stranded (bunch tinned/solder dipped/tinned bonded) wire shall not be used with the terminals of a receptacle unless the receptacle has been investigated for such use.

20.12 A conductor that passes through and/or is connected to a movable joint such that the conductor will be flexed, shall be subjected to the Flexing Endurance Test, Section 47.

21 Spacings

21.1 The spacings of a RPT shall comply with the requirements of Table 21.1.

Exception No. 1: The spacings between the live parts of a receptacle or switch and the intended mounting surface for the receptacle or switch shall not be less than 3/64 in (1.2 mm).

Exception No. 2: As an alternative to Table 21.1, lesser spacings may be acceptable when determined in accordance with the requirements for Clearance and Creepage Distances – Isolated Secondary Circuits, Section 22.

Exception No. 3: The acceptability of the inherent spacings of a component shall be based on the requirements for the component.

Exception No. 4: Circuits that comply with the requirements for Isolated Secondary Circuits need not be evaluated for spacings. The spacing between these circuits and other circuits shall comply with Table 21.1.

Table 21.1
Minimum Spacings

Potential involved in volts		Minimum spacing					
		0 – 50		51 – 125		126 – 250	
		inch	(mm)	inch	(mm)	inch	(mm)
Between any uninsulated live part and an uninsulated live part of opposite polarity, uninsulated grounded part other than the enclosure, or exposed metal part[b]	Through air	3/64	(1.2)	1/16	(1.6)	3/32	(2.4)
	Over surface	3/64	(1.2)	1/16	(1.6)	3/32	(2.4)
Between any uninsulated live part and the walls of a metal enclosure[b]	Shortest distance	3/64	(1.2)	1/4	(6.4)	1/4	(6.4)

[a] A printed-wiring board intended to be completely encapsulated in a suitable potting compound, epoxy, or be conformally coated shall not have any spacing less than 1/32 in (0.8 mm).

[b] For the purpose of this requirement, a metal piece or component attached to the enclosure is considered to be a part of the enclosure when deformation of the enclosure reduces the spacing between the metal piece or component and uninsulated live parts.

21.2 A barrier or liner of insulating material used in areas where spacings do not comply with the requirements in this standard shall be evaluated and determined to comply with the requirements for internal barriers outlined in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and shall be secured in place or its position fixed by space limitations. An adhesive used to position a barrier shall be investigated for the effects of temperature, humidity, and cyclic conditions outlined in UL 746C.

21.3 Vulcanized fiber not less than 0.028 in (0.71 mm) thick is not prohibited from being used as a barrier or liner.

Exception: Where required spacings are insufficient but at least 1/2 of the required spacing is provided, the vulcanized fiber is not prohibited from being 1/64 in (0.40 mm) thick.

21.4 All uninsulated live parts connected to different circuits shall be spaced from one another as though they were parts of opposite polarity, in accordance with the requirement in 21.6, and shall be investigated on the basis of the highest voltage involved.

21.5 An electrically energized live screw head or nut on the underside of an insulating base shall be prevented from loosening and shall be insulated or spaced from the mounting surface.

21.6 In multicomponent equipment, the spacings from one component to another, from any component to the enclosure, or to other uninsulated dead metal parts excluding the component mounting surface, are based on the maximum voltage rating of the complete equipment and not on the individual component ratings. The inherent spacings within an individual component are investigated on the basis of the voltage used and controlled by the individual component. Spacings between metal oxide varistors, capacitors, and other components shall comply with the minimum spacing requirements in Table 21.1.

21.7 Spacings at a fuse and fuseholder are to be measured with a fuse in place that has the maximum standard dimensions for the rating, and such spacings are to not be less than those specified in Table 21.1.

22 Clearance and Creepage Distances – Isolated Secondary Circuits

22.1 As an alternative approach to the spacing requirements specified in 21.1, and other than as noted in 22.2, clearances and creepage distances in isolated secondary circuits of RPT's are able to be evaluated in accordance with the requirements in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, as described in 22.2.

22.2 In conducting evaluations in accordance with the requirements in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, the following guidelines shall be used:

a) Unless specified elsewhere in this standard, the pollution degree within an RPT housing, based on the presence of contaminants and possibility of condensation or moisture, shall be pollution degree 2 – Normal;

b) Pollution degree 2 exists on a printed wiring board between adjacent conductive material which is covered by any coating which provides an uninterrupted covering over at least one side and the complete distance up to the other side of conductive material;

c) Any printed wiring board which complies with the requirements in the Standard for Printed Wiring Boards, UL 796, shall be considered to provide a Comparative Tracking Index (CTI) of 100, and if it further complies with the requirements for Direct Support in UL 796 then it provides a CTI of 175;

d) For the purposes of compliance with the requirements for coatings of printed wiring boards used to achieve pollution degree 1 in accordance with UL 840, a coating which complies with the requirements for Conformal Coatings in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, complies with the requirements;

e) Pollution degree 1 is also achievable at a specific printed wiring board location by application of at least a 0.79 mm (1/32 inch) thick layer of silicone rubber or for a group of printed wiring boards through potting, without air bubbles, in epoxy or potting material;

f) Evaluation of clearances, only, to determine equivalence with current through air spacings requirements are able to be conducted in accordance with the requirements for Clearance A (Equivalency) of UL 840. An impulse test potential having a value as determined in UL 840 is to be applied across the same points of the device as would be required for the Dielectric Voltage-Withstand Test, Section 31;

g) As an alternative approach to the spacing requirements specified in 21.1 evaluation of clearances and creepage distances shall be conducted in accordance with the requirements in UL 840 for Clearance B (Controlled Overvoltage), and Creepage Distances;

h) The System Voltage used in the evaluation of the isolated secondary circuitry is able to be interpolated with interpolation continued across the table for the Rated Impulse Withstand Voltage Peak and Clearance; and

i) Determination of the dimensions of clearance and creepage distances shall be conducted in accordance with the requirements for Measurement of Clearance and Creepage Distances of UL 840.

23 Printed-Wiring Boards

23.1 A printed-wiring board shall comply with the requirements in the Standard for Printed-Wiring Boards, UL 796, and shall be classed V-0, V-1, or V-2 in accordance with the requirements in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

23.2 A resistor, capacitor, inductor, or other part that is mounted on a printed-wiring board to form a printed-wiring assembly shall be secured to reduce the risk of electric shock or fire as the result of displacement from forces exerted on it during assembly, normal operation, or servicing.

23.3 The receptacle outlets of a RPT shall comply with the applicable requirements in the Standard for Attachment Plugs and Receptacles, UL 498.

23.4 A RPT that has a receptacle grounding path through traces on a printed-wiring board shall comply with the Fault Current Test, Section 34, and the Overcurrent Test, Section 35.

23.5 A RPT that has a load-current-carrying circuit conductor path through traces on a printed-wiring board shall comply with the Overcurrent Test, Section 35.

24 Separation of Circuits

24.1 A RPT employing connection to telephone communication or to data communication or incorporating isolated secondary circuits or power-limited Class 2 circuits shall be provided with a barrier, physically secured by means other than friction, which separates the AC power circuit conductors from the conductors of the other circuits. Bonding of the equipment grounding conductor and the referenced conductors of the telecommunication circuits is permissible.

Exception No. 1: A barrier is not required between conductors that are separated by a minimum spacing of 2 inches (50.8 mm), including lead dress.

Exception No. 2: Conductors that are suitably insulated for the maximum AC power circuit voltage involved are not required to be separated from the AC power circuit conductors, when breakage or loosening of a conductor at a terminal in either circuit cannot result in contact between uninsulated parts of one circuit and uninsulated or inadequately insulated parts of the other circuit.

Exception No. 3: For conductors other than AWM (traces on a printed-wiring board, terminals mounted on insulating blocks, and the like), the minimum separation between communication circuits and the AC power circuits shall be in accordance with Table 21.1.

25 Grounding

25.1 General

25.1.1 A metallic enclosure and other dead metal parts that are exposed to contact by persons shall be conductively connected to the grounding conductor of the power-supply cord.

Exception No. 1: Dead metal parts that are isolated from grounded metal and are not a part of the enclosure are not required to be connected to the grounding conductor of the power-supply cord.

Exception No. 2: A small metal part, such as an adhesive-attached foil label, a screw, or the like, that is on the exterior of the enclosure and separated from all electrical components by grounded metal or is electrically isolated from all components, is not required to be connected to the grounding conductor of the power-supply cord.

25.1.2 A RPT having a 125/250 V rating shall not use the neutral circuit conductor as the equipment-grounding conductor.

25.1.3 The conductive connection of parts required by 25.1.1 shall be by a clamp, bolt, screw, braze, weld or an equivalent positive means that cannot be loosened from the outside and may include a corrosion resistant strap or jumper; see 25.2.2. Mechanical connections shall be secured. A solder connection is not prohibited from being used when the power-supply cord grounding lead is mechanically secure to the enclosure in accordance with 20.7. A push-in (screwless), quick-connect, or similar friction-fit connector shall not be used for this connection.

Exception: A splicing wire connector that complies with the Standard for Splicing Wire Connectors, UL 486C, and the Standard for Grounding and Bonding Equipment, UL 467, is acceptable within the ground path when located within the electrical enclosure and used in accordance with its ratings.

25.1.4 Connections in the equipment-grounding conductor path from the receptacle grounding contact to the equipment-grounding conductor of the power-supply cord shall be welded, bolted, mechanically secured and soldered, or made by equivalent positive means. A quick-connect, or similar friction-fit connector shall not be used in the grounding conductor path.

Exception: Grounding connections provided as part of a cord reel shall comply with the applicable requirements in the Standard for Cord Reels, UL 355.

25.1.5 The equipment-grounding conductor of the power-supply cord shall be green with or without one or more yellow stripes and of the same size as the current-carrying conductors. No other lead in the power-supply cord shall be so identified. The equipment-grounding conductor shall be secured to the frame or enclosure of a metallic RPT by a reliable means, such as a screw, that is not removed during ordinary servicing not involving the power-supply cord. The grounding connection shall penetrate nonconductive coatings, such as paint or vitreous enamel. All conductors in the grounding circuit of a RPT shall be green with or without one or more yellow stripes.

25.1.6 The yoke or faceplate mounting screws of the receptacle shall not be used to provide or maintain the grounding means of the receptacle or enclosure of a RPT.

25.1.7 When a receptacle used in a RPT is provided with a grounding screw, this screw shall be used to provide the ground connection to the receptacle.

25.1.8 An equipment-grounding conductor shall be of copper, copper alloy, or other material that has been investigated for use as an electrical conductor. A ferrous metal part in the grounding path shall be protected against corrosion.

25.1.9 A copper-base-alloy rivet that is used to secure parts in the grounding path, or that forms a part of the grounding path, shall contain not less than 80 % copper.

25.1.10 The line and neutral circuit conductor path shall not be connected to the grounding circuit conductor path.

Exception: Connection between the line or neutral conductor path and the grounding conductor path are able to be made when the components are investigated for the application (such as an across-the-line capacitor investigated to the Standard for Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14).

25.1.11 A conductor utilized for grounding that passes through and/or is connected to a movable joint such that the conductor will be flexed, shall be subjected to the Flexing Endurance Test, Section 47.

25.2 Bonding

25.2.1 Accessible dead-metal or other conductive parts that become energized and not connected directly to the grounding conductor shall be bonded to grounded parts by clamps, rivets, bolts, screws, brazes, welds, or an equivalent positive means that is capable of including a corrosion-resistant strap or jumper.

25.2.2 A corrosion-resistant bonding strap or jumper providing positive electrical connection is capable of being used.

25.2.3 A bonding conductor shall be of copper, copper alloy, aluminum or other material that has been investigated for use as an electrical conductor. A ferrous metal part in the grounding path shall be protected against corrosion.

25.2.4 Metal parts in a bonding path shall be galvanically compatible so as to reduce electrolytic action between dissimilar metals.

25.2.5 A bonding member shall:

a) Be protected from mechanical damage;

b) Not be secured by a removable fastener used for any purpose other than bonding unless the bonding conductor is not omitted after removal or replacement of the fastener; and

c) Have the flexibility required to withstand mechanical stress.

25.2.6 When a bonding means depends on screw thread, two or more screws shall be employed, or at least two full threads of a single screw shall engage metal.

25.2.7 A bonding connection shall penetrate a nonconductive coating such as paint.

25.2.8 A bonding conductor shall not be spliced.

Exception: A splicing wire connector that complies with the Standard for Splicing Wire Connectors, UL 486C, and the Standard for Grounding and Bonding Equipment, UL 467, is acceptable within the bond path when located within the electrical enclosure and used in accordance with its ratings.

25.2.9 A conductor utilized for bonding that passes through and/or is connected to a movable joint such that the conductor will be flexed, shall be subjected to the Flexing Endurance Test, Section 47.

26 Storage Compartment

26.1 The storage compartment of a RPT shall not exceed 12 in (304.8 mm) long by 6 in (152.4 mm) wide by a height of 6 in (152.4 mm). The storage compartment may be segmented.

26.2 In addition to the applicable requirements contained in this standard, a RPT that incorporates a storage compartment shall comply with the Water Leakage Test, Section 45, and marking requirements identified in 51.21 – 51.22.

26.3 The storage compartment of a RPT shall not be provided with cord passageways that promote charging of electronic devices while stowed in the compartment.

27 Cord Reel Feature

27.1 A RPT that has a receptacle grounding path other than through internal wiring, such as a brush contact shall comply with the Fault Current Test, Section 34, and the Overcurrent Test, Section 35.

27.2 When performing the Short Circuit Test of the Standard for Cord Reels, UL 355, the circuit supply currents of Table 17.1 shall be employed.

28 Low Voltage Charging and Isolated Secondary Output Circuits

28.1 A charging circuit and/or isolated secondary output circuit provided in a RPT, shall comply with the Standard for Class 2 Power Units, UL 1310, as a Power Limited Circuit (LPC) with the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or in accordance with the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1 for Limited Power Circuits. When UL 62368-1 is used ES1 (Electrical Energy source class1) and PS2 (Power source class 2) ratings apply.

28.2 A RPT provided with a wireless charging circuit shall comply with the Standard for Induction Power Transmitters and Receivers for Use with Low Energy Products, UL 2738.

PERFORMANCE

29 General

29.1 When the use of cheesecloth is specified, the cloth to be used is to be a bleached cheesecloth running 14 – 15 yd^2/lb (approximately 26 – 28 m^2/kg) and having what is known as "a count of 32 by 28," that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads by 11 threads).

29.2 A RPT shall be subjected to the applicable tests specified in Sections 30 – 43. A separate sample shall be used for each test. Additional samples may be required for investigations of constructions, such as nonmetallic enclosures or components, that are not covered by this standard.

29.3 For tests in which the RPT is to be connected to a power-supply circuit, the branch circuit shall be protected by a branch-circuit protective device rated 20 A, and the power-supply voltage is to be the voltage rating of the RPT.

29.4 The frequency of the power-supply circuit is to be 50 – 60 Hz.

30 Temperature Test

30.1 A RPT shall be subjected to the temperature test described in 30.2 – 30.14.

30.2 An overcurrent protective device shall not open the circuit during the temperature test specified in 30.4.

30.3 When the OCP rating is greater than the RPT rating, the temperature test as described in this section is to be conducted at the OCP rating. The OCP is not prohibited from being bypassed when nuisance tripping occurs.

30.4 The temperature of a RPT, tested under the conditions of Table 14.1 shall not adversely affect any materials employed, or exceed the temperatures indicated in Table 30.1. The temperature test shall be

performed using the complete assembly including the decorative feature installed, if employed, that encapsulate the RPT or that contain the outlets or partially surround the enclosure to represent actual use.

Table 30.1
Maximum Temperatures

Materials and components	°C	(°F)
1. Varnished-cloth insulation	85	(185)
2. Fiber, wood, and other similar electrical insulation	90	(194)
3. Phenolic composition employed as electrical insulation or as a part whose malfunction would result in a risk of fire or electric shock	150[a]	(302[a])
4. Insulated wires and cables	60[a]	(140[a])
5. On the surface of a capacitor casing:		
Electrolytic	65[b]	(149[b])
Other types	90[b]	(194[b])
6. Receptacle contacts	55	(135)
7. Fuses other than Class CC, G, J, T	90	(194)
8. Fuses Class CC, G, J, T	110	(230)

NOTE – See 30.7.

[a] The limitations on phenolic composition and on wire insulations do not apply to compounds that have been investigated and determined to be in compliance for higher temperatures.

[b] A capacitor operating at a temperature higher than indicated is not prohibited from being evaluated on the basis of its marked temperature rating, or when not marked with a temperature rating, is capable of being investigated to determine its compliance at the higher temperature.

30.5 The RPT shall be loaded to the rated voltage and current by connecting a resistive load by means of a solid-blade attachment plug to the last receptacle and any other receptacle that attains higher temperatures as determined by their proximity to heat-producing components.

30.6 Measurements are to be made until there is thermal equilibrium as demonstrated by three successive temperature readings indicating no change taken at intervals of 5 min, or more.

30.7 The temperatures specified in Table 30.1 are based on an assumed ambient temperature of 25 °C (77 °F). A test is capable of being conducted at an ambient temperature within the range of 10 – 40 °C (50 – 104 °F), and the observed temperature corrected for a room temperature of 25 °C (77 °F).

30.8 During a test conducted at an ambient temperature of 25 °C (77 °F), an observed temperature shall not exceed the required values specified in Table 30.1 and Table 30.2.

Table 30.2
Maximum Surface Temperatures

Location	Composition of surface	
	Metal	Nonmetallic
Enclosure surface that is contacted in normal use	70 °C (158 °F)	95 °C (203 °F)

30.9 When a test is conducted at an ambient temperature other than 25 °C (77 °F), an observed temperature shall be corrected as described in 30.10.

30.10 An observed temperature is to be corrected by addition [when the ambient temperature is lower than 25 °C (77 °F)], or subtraction [when the ambient temperature is higher than 25 °C] of the difference between 25 °C and the ambient temperature.

30.11 Temperature readings are to be obtained by means of thermocouples consisting of 28 – 32 AWG (.08 – .032 mm^2) iron and constantan wires. Whenever referee temperatures are required, 30 AWG (.05 mm^2) iron and constantan wires and a potentiometer-type of indicating instrument are to be used.

30.12 The thermocouples and related instruments are to be accurate and calibrated in accordance with good laboratory practice. The thermocouple wire is to conform to the requirements listed in the Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples, ASTM E230/E230M.

30.13 A thermocouple junction and the adjacent thermocouple lead wire are to be securely held in good thermal contact with the surface of the material whose temperature is being measured. In most cases, acceptable thermal contact results from securely taping or cementing the thermocouple in place but, when a metal surface is involved, brazing or soldering the thermocouple to the metal may be required.

30.14 To facilitate conducting the test on a totally enclosed – encapsulated – component of a RPT, thermocouples are to be attached to internal components prior to the addition of potting materials and are to be routed through holes made in the enclosure for this purpose.

31 Dielectric Voltage-Withstand Test

31.1 A RPT shall withstand a potential as follows:

a) For RPT's rated 125 V AC or less – 1250 V AC or 1768 V DC;

b) For RPT's rated 250 V AC or less – 1500 V AC or 2121 V DC,

between uninsulated live metal parts and the enclosure – a nonconductive enclosure is to be wrapped in conductive foil – and between live parts of opposite polarity.

31.2 To determine whether a RPT complies with the requirements in 31.1, the test potential is to be applied as described in 31.4 by means of test equipment having the characteristics outlined in 31.3.

31.3 The test equipment for conducting the dielectric voltage-withstand test is to have the following features and characteristics:

a) A means for indicating the test voltage that is being applied to the appliance under test (this is accomplished by sensing the voltage at the test leads or by an equivalent means);

b) An output voltage that has a sinusoidal waveform, a frequency that is within the range of 40 – 70 Hz, and a peak value of the waveform that is not less than 1.3 and not more than 1.5 times the root-mean-square value;

c) A sensitivity of the test equipment that is such that when a resistor of 120,000 Ω is connected across the output, the test equipment does not indicate unacceptable performance for any output voltage less than the specified test voltage, and the test equipment does indicate unacceptable performance for any output voltage equal to or greater than the specified test value. The resistance of the calibrating resistor is to be adjusted as close to 120,000 as instrumentation accuracy provides, but never more than 120,000 Ω.

Exception: The sensitivity of the test equipment is capable of being increased, and a higher value of calibrating resistance is capable of being used, when agreeable to those concerned.

31.4 The method of applying the test voltage to the RPT is to be such that there are not any transient voltages that result in the instantaneous voltage applied to the RPT exceeding 105 % of the peak value of the specified test voltage. The applied potential is to be increased from zero at a substantially uniform rate so as to arrive at the specified test potential in approximately 5 s, and then, is to be maintained at the test potential for 1 min. Manual control of the rate of rise is not prohibited from being used.

31.5 Suppressor elements and across-the-line connected components are to be disconnected or removed during this test.

32 Leakage Current Test

32.1 General

32.1.1 The leakage current of a product rated for a nominal 250 V or less supply, when tested in accordance with 32.1.3 – 32.1.6, shall not be more than 0.5 mA.

32.1.2 Leakage current refers to all currents, including capacitively coupled currents, that may be conveyed between exposed conductive surfaces of the product and ground or other exposed conductive surfaces of the product.

32.1.3 All exposed conductive surfaces and the equipment-grounding conductor paths are to be tested for leakage currents. The leakage currents from exposed conductive surfaces and the receptacle grounding contacts are to be measured to the grounded supply conductor individually as well as collectively where simultaneously accessible, and from one surface to another where simultaneously accessible. Surfaces are considered to be simultaneously accessible when they can be readily contacted by one or both hands of a person at the same time.

32.1.4 When a material other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using metal foil having an area of 10 by 20 cm in contact with the surface. When the surface has an area less than 10 by 20 cm, the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to affect the temperature of the product.

32.1.5 The measurement circuit for leakage current is to be as illustrated in Figure 32.1. The measurement instrument is defined in (a) – (d). The meter that is actually used for a measurement need only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used need not have all the attributes of the defined instrument.

a) The meter is to have an input impedance of 1500 Ω resistive shunted by a capacitance of 0.15 μF.

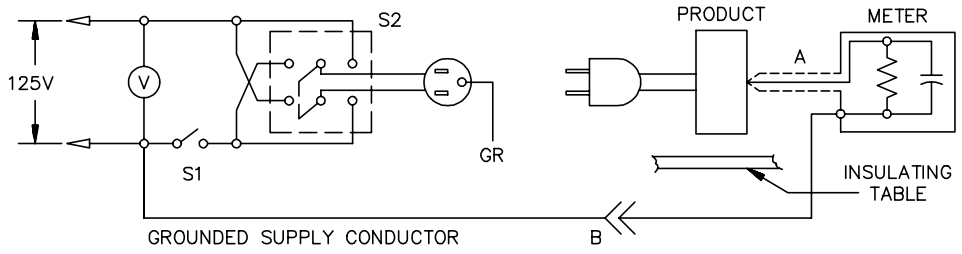
b) The meter is to indicate 1.11 times the average of the full-wave rectified composite waveform of the voltage across the resistor or current through the resistor.

c) Over a frequency range of 0 – 100 kHz, the measurement circuitry is to have a frequency response – ratio of indicated to actual value of current – equal to the ratio of the impedance of a 1500 Ω resistor shunted by a 0.15 μF capacitor to 1500 Ω. At an indication of 0.5 mA, the measurement is not to have an error of more than 5 % at 60 Hz.

d) Unless the meter is being used to measure leakage from one part of a product to another, the meter is to be connected between the accessible parts and the grounded power-supply conductor.

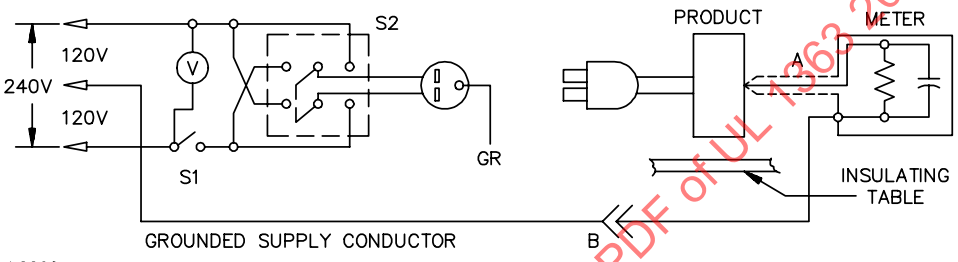
Figure 32.1

Leakage Current Measurement Circuits



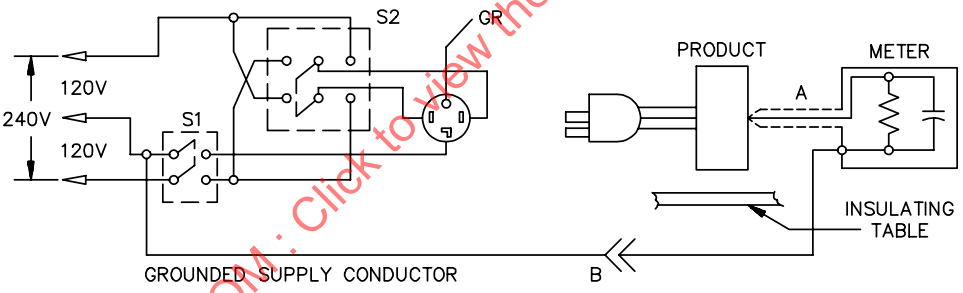
LC100C

Product intended for connection to a 125-volt power supply



LC200

Product intended for connection to a 3-wire, grounded neutral power supply, as illustrated above



LC300

Product intended for connection to a 3-wire, grounded neutral power supply, as illustrated above

A – Probe with a shielded lead.

B – Separated and used as a clip when measuring currents from one part of a product to another.

32.1.6 A sample of the RPT is to be tested for leakage current in the as-received condition, without prior energization except as may occur as part of the production-line testing, but with the grounding conductor open at the attachment plug. The power-supply voltage is to be adjusted to the rated voltage of the RPT. The test sequence, with reference to the measuring circuit in Figure 32.1, is to be as follows:

a) With the switch S1 open, the RPT is to be connected to the measuring circuit. Leakage current is to be measured using both positions of switch S2, and with the RPT switching devices in all their normal operating positions.

b) Switch S1 is then to be closed, energizing the RPT, and within 5 s, the leakage current is to be measured using both positions of switch S2 and with the RPT switching devices in all their normal operating positions.

c) The leakage current is to be monitored until thermal stabilization. Both positions of switch S2 are to be used in determining this measurement. Thermal stabilization is to be obtained by operation of the RPT as in the Temperature Test by loading only the receptacle furthest from the power-supply cord.

32.2 Leakage current after humidity conditioning

32.2.1 At the end of the conditioning period specified in 32.2.2 a sample of a RPT shall be subjected to the leakage current test specified in 32.1.3 – 32.1.6. The leakage current shall not be more than 0.5 mA.

32.2.2 A sample of a RPT shall be heated to a temperature just above 34 °C (93 °F) to reduce the likelihood of condensation of moisture during conditioning. The heated sample is then to be placed in the humidity chamber and conditioned for 48 h in air having a relative humidity of 88 ±2 % and a temperature of 32 ±2 °C (90 ±4 °F).

32.2.3 Following the conditioning, the leakage current should be measured, as described in 32.1.6(a), on the sample while it is still in the humidity chamber. See 32.1.4 and 32.1.5.

32.2.4 The sample, either in or immediately after (within 1 min) removal from the humidity chamber, should be energized and tested as described in 32.1.6 (b) and (c).

33 Grounding Continuity Test

33.1 A previously untested RPT is to be subjected to the Grounding Continuity Test as described in 33.2. A RPT shall have a grounding-path resistance of 0.1 Ω or less.

33.2 The resistance of the grounding path is to be determined by the use of a resistance measuring instrument or calculated by measuring the voltage drop between the power-supply cord grounding pin and:

a) Each receptacle outlet grounding contact and

b) Any point on a metal enclosure.

Resistance is to be determined with a 25 A, 60 Hz, alternating current being passed from the grounding pin to each receptacle grounding contact or the enclosure, and dividing the measured voltage by the test current. In the event that unacceptable results are recorded using a resistance measuring instrument, the voltage drop method shall be used as the referee method. The current power-supply source shall be at any convenient voltage, not exceeding 6 V.

34 Fault Current Test

34.1 General

34.1.1 When required by note (b) of Table 14.1, 23.4, or 27.1, three samples of previously untested RPT's are to be subjected to the Fault Current Test as described in 34.1.2, 34.1.3, and 34.2.1. The RPT shall comply with the requirements in 34.1.3. Each RPT shall be tested once.

34.1.2 Each RPT shall be tested on a circuit calibrated in accordance with 34.2.1. The available current capacity of the circuit is to be as specified in Table 17.1. The frequency of the test circuit is to be 60 ±12 Hz. The grounding or bonding circuit is to be connected in series with a circuit breaker or time-delay non-current limiting fuse that is rated for the maximum ampacity of the circuit in which the RPT is intended to be installed, suitable for branch circuit protection, and connected directly to the test circuit. The circuit breaker or fuse shall open when the test circuit is closed.

34.1.3 A RPT shall have a grounding-path resistance of 0.1 Ω or less after the test described in 34.1.2. See 33.2. Also, during and following the Fault Current Test, the following conditions shall not occur:

a) Emission of flame, molten metal, or glowing or flaming particles through any openings (pre-existing or created as a result of the test) in the product;

b) Charring, glowing, or flaming of the supporting surface;

c) Ignition of the enclosure;

d) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10; and

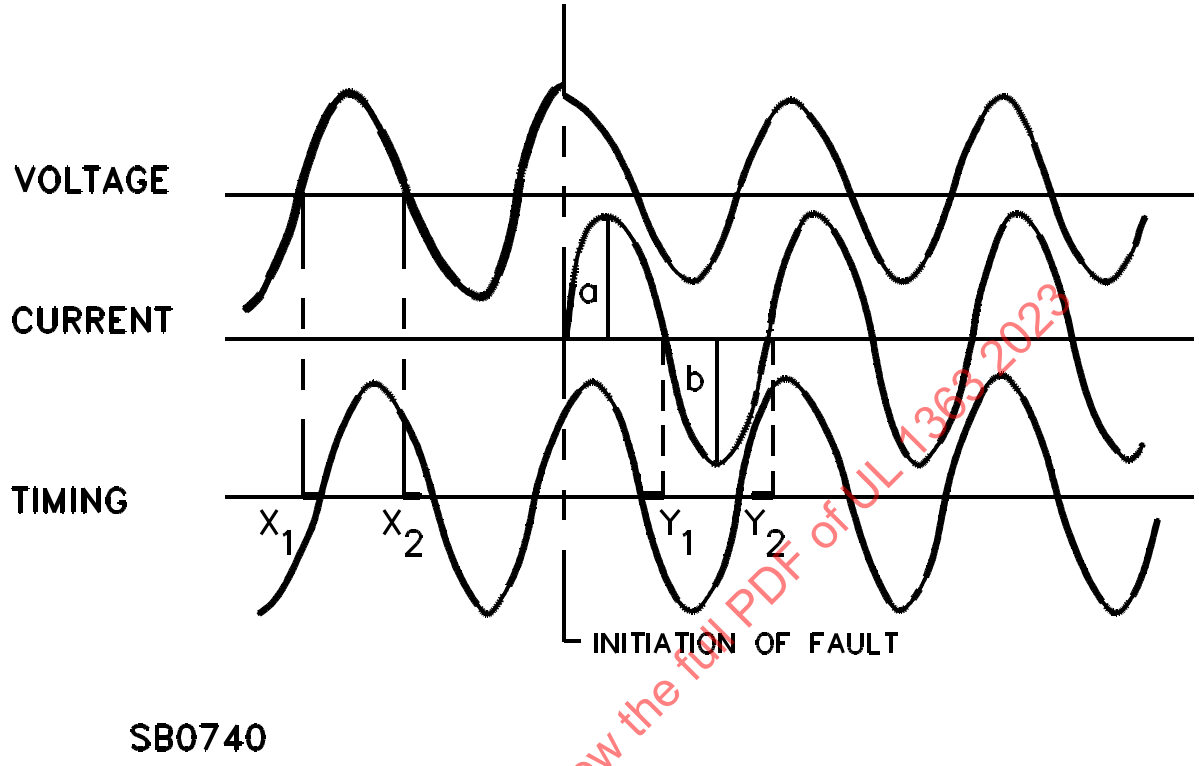
e) There shall not be evidence of degradation or separation of the trace from the printed-wiring board.

34.2 Calibration of test circuits

34.2.1 The current is to be the rms value of the first complete cycle – see Figure 34.1 – when the circuit is closed to produce a symmetrical current waveform. The direct-current component is not to be added to the value obtained when measured as illustrated. In order to obtain the required symmetrical waveform of a single-phase test circuit, controlled closing is recommended although random closing methods may be used. The power factor is to be determined by referring the open-circuit voltage wave to the two adjacent zero points at the end half of the first complete current cycle by transposition through a required timing wave. The power factor is to be computed as an average of the values obtained by using the two current zero points.

Figure 34.1

Determination of Current and Power Factor



35 Overcurrent Test

35.1 When required by note (b) of Table 14.1, 23.4, 23.5, or 27.1, three previously untested RPT's are to be subjected to the Overcurrent Test as described in 35.2 – 35.6. The RPT shall comply with the requirements in 35.6 and 35.7. Each RPT shall be tested once.

35.2 All integral supplementary protection devices are to be shunted out of the circuit for this test.

35.3 The resistance of each circuit conductor path as specified in 23.4 and 23.5 is to be determined by measuring the voltage drop when a current of 25 A, derived from a 60 Hz source with a no-load voltage not exceeding 6 V, is passed between the input port and output port connectors of each conductor path.

35.4 The RPT is to be mounted so as to provide free air flow around all sides and the top. The ambient temperature is to be 25 ±5 °C (77 ±9 °F). The load current and time duration is to be as indicated in 35.5. Rated frequency is to be used. Any voltage not higher than the rated voltage is not prohibited from being used.

35.5 For a RPT with integral overcurrent protection, the overload current is to be 200 % of the overcurrent device rating. For a RPT without integral overcurrent protection, the overload current is to be 200 % of the current rating of the maximum size branch circuit to which the RPT is intended to be connected. The overcurrent test current is to be applied for 2 min.

35.6 During and following this test, the following conditions shall not occur:

a) Emission of flame, molten metal, or glowing or flaming particles through any openings (pre-existing or created as a result of the test) in the product;

b) Charring, glowing, or flaming of the supporting surface;

c) Ignition of the enclosure;

d) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10; and

e) There shall be no evidence of degradation or separation of the trace from the printed-wiring board.

35.7 After the sample has cooled to room temperature, the resistance of each circuit conductor path is to be determined as specified in 35.3. The resistance of each conductor path shall not increase by more than 10 %. Additionally, the resistance of the grounding circuit shall not exceed 0.1 Ω.

36 Mounting Hole Barrier Tests

36.1 General

36.1.1 When penetration or deflection of a barrier behind a mounting hole of the RPT increases the risk of fire, electric shock, or injury to persons, the RPT is to be subjected to the Mounting Hole Barrier Tests as described in 36.2.1 – 36.3.1 without any occurrence of the following due to the penetration or deflection of the barrier:

a) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10;

b) A reduction of spacings below the values specified in Spacings, Section 21;

c) Transient distortion that results in contact with live parts causing energization of a metallic enclosure;

d) Any condition that is capable of affecting the intended mechanical performance of the RPT; and

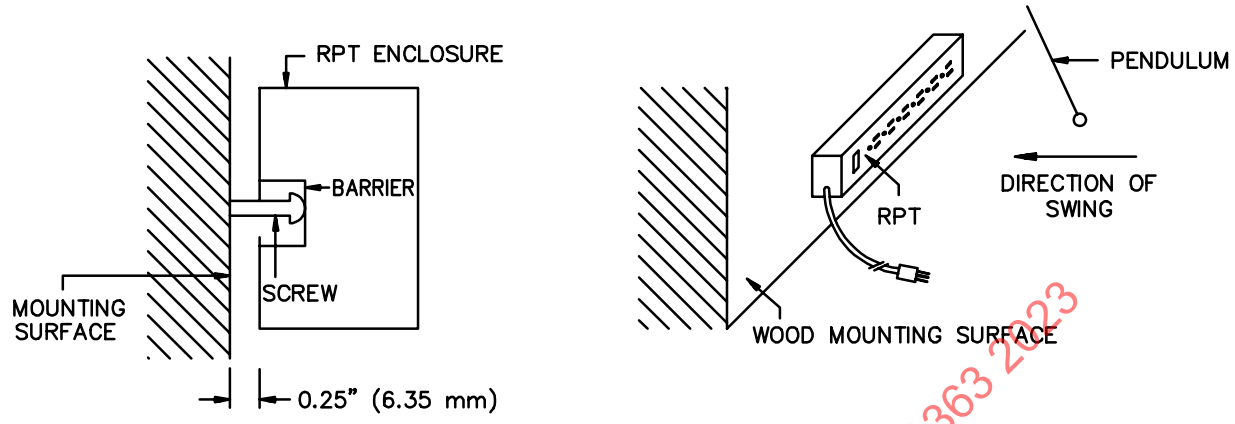
e) Any other condition that increases the risk of electric shock.

36.2 Mounting hole barrier impact test

36.2.1 The RPT is to be mounted on a vertical surface using the hardware supplied or the hardware recommended by the manufacturer. When no hardware is supplied or recommended, the RPT is to be mounted using a No. 8 x 3/4-in wood screw. When the screws are resting against the barrier there is to be 1/4 in (6.35 mm) clearance between the back of the enclosure and the mounting surface. See Figure 36.1.

Figure 36.1

Test Set-Up for Mounting Hole Barrier Impact Test



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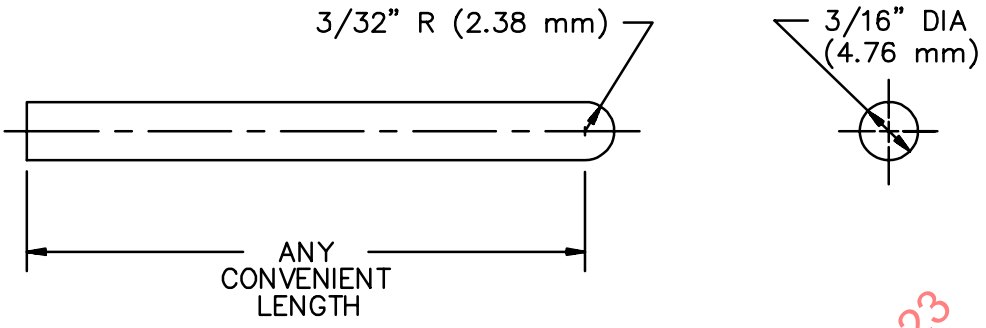
36.2.2 Each mounting hole configuration of the RPT shall be subjected to a single impact of 5 ft-lbf (6.8 J) to the RPT mounted as specified in 36.2.1. This impact is to be produced by a steel sphere, 2 in (50.8 mm) in diameter and weighing 1.18 lb (0.535 kg), suspended by a cord and swung as a pendulum, dropping through a vertical distance of 51 in (1.29 m) to cause it to strike the RPT with the specified impact as shown in Figure 38.2. Each impact shall be applied to a point on the RPT surface that is evaluated as being the most severe for the mounting hole configuration under test.

36.3 Mounting hole barrier probe test

36.3.1 Each barrier of an untested sample of a RPT shall withstand a force of 20 lbf (89 N). The force is to be applied by means of the barrier probe shown in Figure 36.2.

Figure 36.2

Barrier Probe



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37 Strain Relief Test

37.1 A RPT shall be tested for strain relief as described in 37.2.

37.2 The RPT shall be held securely in place in a position that allows a pull on the cord in directions that produce the most severe stresses on the strain relief. The product is to be secured in a manner that does not affect the test results, and the power-supply conductors shall be cut at their terminations. The power-supply cord is to withstand a direct pull of 35 lbf (158 N) applied to the cord for 1 min without sufficient movement of the power-supply conductors at the cut end to indicate transmission of stress to internal connections.

37.3 A RPT that is also provided with an integral Class 2 lead shall be additionally subjected to the testing method described in 37.2 except the pull values shown in Table 37.1 shall be applied to the Class 2 lead.

Table 37.1
Pull Values

Size of conductor		Pull force	
AWG	(mm^2)	lbf	(N)
32	(0.03)	0.5	(2.2)
30	(0.05)	1	(4.4)
28	(0.08)	2	(8.9)
26	(0.13)	4	(17.8)
24	(0.20)	6	(26.7)
20 – 22	(0.52 – 0.32)	8	(36)

38 Impact Tests

38.1 General

38.1.1 A RPT employing a metallic or polymeric enclosure is to be subjected to the impact tests described in 38.2.1 – 38.4.1 without any occurrence of the following:

a) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10;

b) Any condition that is capable of affecting the intended mechanical performance of the RPT;

c) Any other condition that increases the risk of electric shock; and

d) Spacings shall not be less than those described in Spacings, Section 21.

38.1.2 With reference to 38.1.1(b), there shall not be cracking or denting of the enclosure that affects the function of any features such as overcurrent protective devices or strain relief. Cracking or denting of the enclosure is not to result in exposure of moving parts capable of causing injury to persons.

38.1.3 With reference to 38.1.1(c), the RPT is to comply with the Dielectric Voltage-Withstand Test, Section 31, after being subjected to the impact tests described in this section.

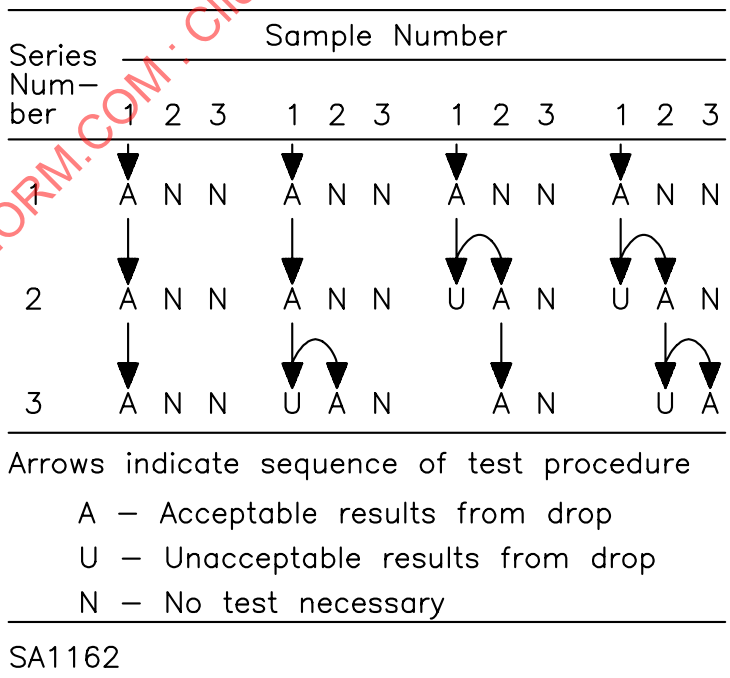
38.2 Drop impact test

38.2.1 Each of three samples of the RPT is to be subjected to an impact that results from the sample being dropped three times (a series) through a distance of 3 ft (0.91 m) from the bottom of the RPT to strike a concrete surface in the positions that produce adverse results. In each drop, the sample is to strike in a position on the enclosure different from those of each of the other two drops in the series.

Exception: When agreeable to those concerned, fewer samples are not prohibited from being used in accordance with Figure 38.1 wherein each series consists of three drops of the sample. The overall performance is acceptable upon completion of any one of the sequences represented in the figure.

Figure 38.1

Procedure for Impact Tests



Each series consists of three drops or one ball impact as applicable.

38.2.2 A RPT employing a storage compartment, as described in 6.16(g) shall be subjected to the Drop Impact test, as described in 38.2.1 with a weight of a 2 lb (0.91 kg) steel sphere placed in the center of the storage compartment.

38.2.3 A pedestal mounted RPT shall be grasped along the column and the column held parallel to the floor at any point considered to produce the most severe result. Additional samples may be required to determine the most severe drop. The 3 ft (0.91 m) drop distance specified in 38.2.1 shall be measured from the center line of the column.

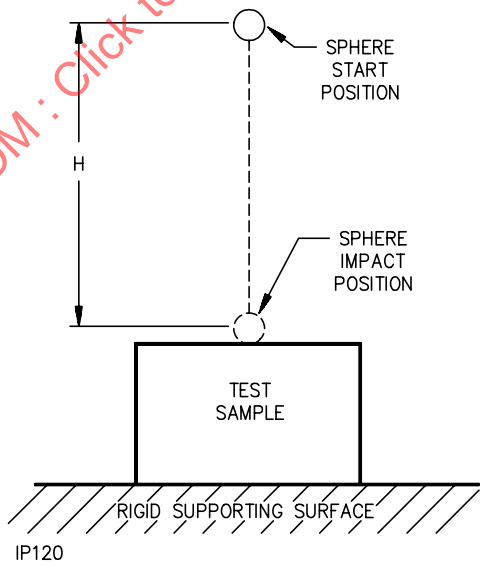
38.3 Steel sphere impact test

38.3.1 Each of three samples of the RPT shall be subjected to a single impact of 5 ft lbf (6.8 J). Each impact shall be applied to an enclosure surface not impacted previously in the test sequence. Each impact is to be imparted by dropping a steel sphere 2 inches (50.8 mm) in diameter, and weighing 1.18 lb (0.535 kg), from a height that produces the specified impact as shown in Figure 38.2. The ball shall not impact on a receptacle face, overcurrent protective device, switch, pilot light or similar component. For surfaces other than the top on an enclosure, the steel sphere is to be suspended by a cord and swung as a pendulum, dropping through the vertical distance required to cause it to strike the surface with the specified impact as shown in Figure 38.3. Three samples are to be used for the tests in the equipment restrained mode.

Exception: When agreeable to those concerned, fewer than three samples are not prohibited from being used for the tests in accordance with Figure 38.1 in which each series of impacts is to consist of one impact. The overall performance is acceptable upon completion of any one of the sequences represented in the figure.

Figure 38.2

Ball Drop Impact Test

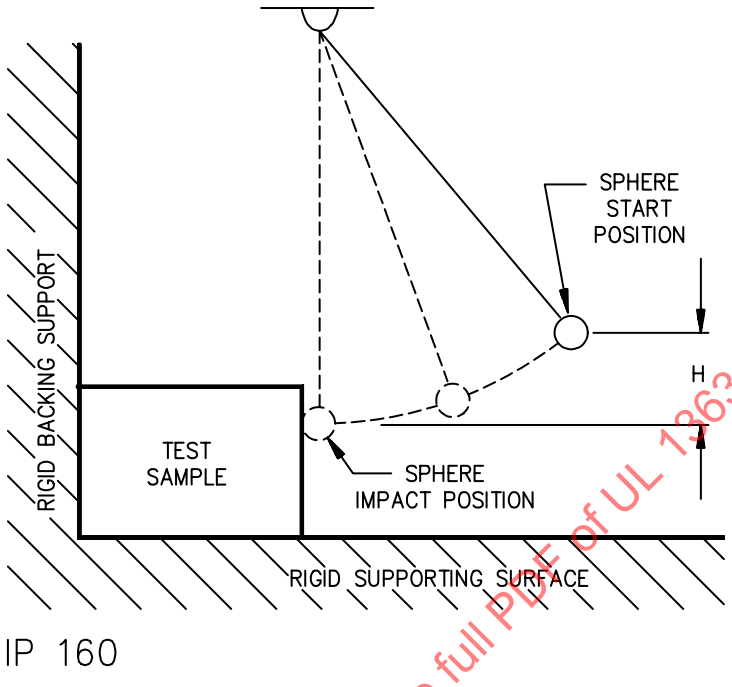


1 – H indicates the vertical distance the sphere must travel to produce the desired impact.

2 – The supporting surface is to consist of a layer of tongue-and-groove oak flooring mounted on two layers of 3/4 in (19 mm) plywood. The oak flooring is nominally 3/4 in thick (actual size 3/4 by 2 1/4 in or 19 by 57 mm). The assembly is to rest on a concrete floor. An equivalent non-resilient supporting surface is not prohibited from being used.

Figure 38.3

Ball Pendulum Impact Test



1 – H indicates the vertical distance the sphere must travel to produce the desired impact.

2 – For the ball pendulum impact test the sphere is to contact the test sample when the string is in the vertical position as shown.

3 – The supporting surface is to consist of a layer of tongue-and-groove oak flooring mounted on two layers of 3/4 in (19 mm) plywood. The oak flooring is nominally 3/4 in thick (actual size 3/4 by 2 1/4 in or 19 by 57 mm). The assembly is to rest on a concrete floor. An equivalent non-resilient supporting surface is not prohibited from being used.

4 – The backing surface is to consist of 3/4 in (19 mm) plywood over a rigid surface of concrete. An equivalent nonresilient backing surface is not prohibited from being used.

38.4 Low-temperature steel sphere impact test

38.4.1 For a RPT with a polymeric enclosure, three samples of a RPT shall be cooled to a temperature of 0.0 ±2.0 °C (32.0 ±3.6 °F) and maintained at this temperature for 24 h. While the unit is still cold, within 1 min after removal from the temperature chamber, the samples are to be subjected to the impact described in 38.3.1.

39 Crushing Test

39.1 A RPT employing a metallic or polymeric enclosure is to be subjected to the crush test described in 39.4 without any occurrence of the following:

a) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10;

b) Any condition that is capable of affecting the intended mechanical performance of the RPT; and

c) Any other condition that increases the risk of electric shock.

39.2 With reference to 39.1(b), the enclosure shall not crack or dent or affect the function of any features such as overcurrent protective devices or strain relief. Cracking or denting of the enclosure is not to result in exposure of moving parts capable of causing injury to persons.

39.3 With reference to 39.1(c), the RPT is to comply with the Dielectric Voltage-Withstand Test, Section 31, after being subjected to the crush tests described in this section.

39.4 A previously untested sample of a RPT shall be placed on a 1/2-in (12.7-mm) thick, horizontal maple board, and a crushing force of 150 lbf (667.2 N) is to be applied to three different locations of the RPT by means of a horizontal 3/4-in (19.1-mm) diameter steel rod. The rod is to be placed across the center of the smaller dimension of the test surface of the RPT, perpendicular to the long axis of the RPT. The length of the rod is to span the smaller dimension of the surface being tested. Force is to be gradually applied and maintained for a period of 1 min. The crushing force is not to be applied to protruding members of receptacles, switch toggles/triggers, indicator lamps and OCP reset members.

39.5 At the end of the tests described in 39.1 – 39.4, spacings shall not be less than those described in Spacings, Section 21.

40 Adequacy of Mounting Test

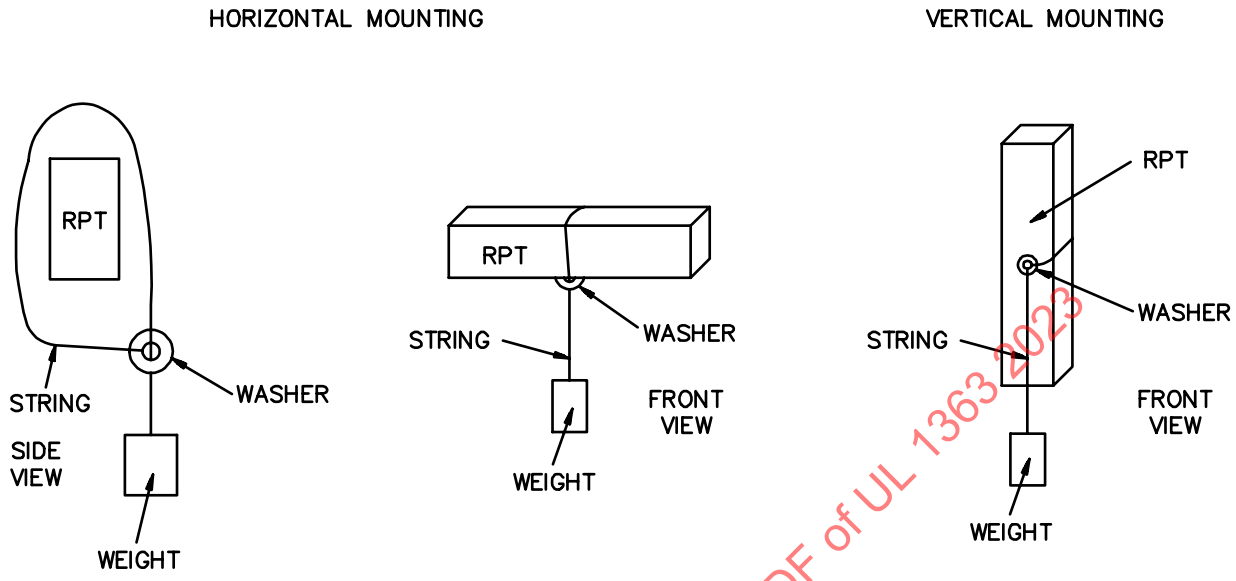
40.1 To determine compliance with 40.2 and 40.3, a RPT provided with a means for temporary mounting is to be mounted in accordance with manufacturer's installation instructions on any secure wall.

Exception: When the RPT is not provided with installation instructions, the RPT shall be tested in the most severe mounting configuration.

40.2 After the RPT has been installed according to manufacturer's instructions, a weight of four times the weight of the RPT or 5 lbs (2.27 kg), whichever is greater, is to be hung from the center of the RPT as shown in Figure 40.1 for each mounting configuration.

Figure 40.1

Test Method for Adequacy of Mounting Test



40.3 There shall be no occurrence of the following as a result of this test:

a) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10;

b) Any condition that is capable of affecting the intended mechanical performance of the RPT; and

c) Any other condition that increases the risk of electric shock.

41 Stability Test

41.1 General

41.1.1 As specified in 9.7 a pedestal mounted RPT shall not overturn when tested in accordance with 41.2 – 41.5.

41.2 Test method – general

41.2.1 The pedestal mounted RPT is to be placed on the inclined plane and turned to a position that is most likely to result in tip over.

41.2.2 The plane is to be inclined at an angle of 10° ±0.2° with the horizontal.

41.3 Pedestal mounted RPT with multiple or articulated columns

41.3.1 When the pedestal mounted RPT has a flexible or articulated column the column is to be bent before the RPT is placed on the inclined plane, starting at the lower end of the column to form a quarter circle such that a line joining the ends of the column make an angle of 45° with the horizontal. When a flexible or articulated column is off-center with respect to the base, the arm is to be bent in the direction that most likely results in tip over. When the RPT has more than one flexible or articulated column, one of the columns is to be adjusted at the 45° angle and the other column or columns are to be placed in a vertical orientation.

41.4 Pedestal mounted RPT having provisions for loading

41.4.1 A RPT employing a storage compartment, as described in 6.16(g) shall be subjected to the stability tests as described in 41.2 and 41.3 with a weight of a 2 lb (0.91 kg) steel sphere placed in the center of the storage compartment.

41.5 Pedestal mounted RPT over 54 in (1472 mm) in height

41.5.1 A Pedestal mounted RPT over 54 in (1472 mm) tall is to be subjected to a gradually increasing horizontal force applied through the center of an 8 in (203 mm) diameter disc at any location centered along a horizontal line 54 in (1.4 m) above the floor. The force is to be increased until either a 40 lb (180 N) force is attained or the pedestal mounted RPT inclines to an angle of 10° without tipping over, whichever occurs first.

42 Tipover Test

42.1 A pedestal mounted RPT shall comply with 38.1 following the tests specified in 42.2.

42.2 The pedestal mounted RPT shall be placed on a level concrete floor ±0.2°. A plug with an attached cord shall be inserted into the receptacle located the greatest distance from the floor. The cord shall then be slowly pulled until the pedestal mounted RPT overturns. The test may be repeated at any angle to the axis of the column to determine the most severe impact from overturning. If the attachment plug becomes disengaged from the outlet before the pedestal mounted RPT overturns a string or cord maybe attached at the outlet location to facilitate the tip over of the pedestal mounted RPT.

43 Mold Stress-Relief Distortion Test

43.1 For a RPT with a polymeric enclosure, conditioning of the equipment as described in 43.2 shall not result in softening of the material as determined by handling immediately after the conditioning, nor shall there be shrinkage, warpage, or other distortion as evaluated after cooling to room temperature, that results in any of the following:

a) Reduction of spacings between uninsulated live parts of opposite polarity, and uninsulated live parts and accessible dead or grounded metal below the minimum values specified in Spacings, Section 21;

b) Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with Accessibility of Live Parts, Section 10, or defeating the integrity of the enclosure so that the required mechanical protection is not afforded to internal parts of the equipment;

c) A condition that results in the equipment not complying with the Strain Relief Test, Section 37, when applicable; and

d) Interference with the intended operation or servicing of the equipment.

Exception: The conditioning described in 43.2 is not required for rigid thermosetting materials or for low-pressure, foamed molded parts.

43.2 For equipment that has a polymeric enclosure, one sample of the equipment shall be conditioned in accordance with either (a) or (b) below:

a) One sample of the complete equipment (in the case of an enclosure) or the part under consideration, is to be placed in a full-draft, circulating-air oven maintained at a uniform temperature at least 10 °C (18 °F) higher than the maximum temperature of the material measured under actual operating conditions, but not less than 70 °C (158 °F) in any case. The sample is to remain in the oven for 7 h. After its careful removal from the oven and return to room temperature, the sample is to be investigated for compliance with 43.1.

b) One sample of the complete equipment is to be placed in a test cell. The circulation of air within the cell is to simulate actual room conditions. The air temperature within the cell, as measured at the supporting surface of the equipment, is to be maintained at 60 °C (140 °F). The equipment is to be operated in the same way as for the temperature test except for equipment that is not loaded or is not continuously loaded during the normal temperature test. Such equipment, although unloaded, shall be connected to 106 % or 94 % of normal rated voltage, whichever results in higher temperatures. In any case, the equipment is to be operated for 7 h. After its careful removal from the test cell, the sample is to be investigated for compliance with 43.1.

44 Spill Test

44.1 An RPT intended to be mounted on a desk or similar furnishing surface shall be subjected to the test described in this section and, after the testing, shall be subjected to the Dielectric Voltage-Withstand Test, Section 31 with acceptable results.

44.2 The RPT is to be mounted as intended by the manufacturer. Any cover is to be opened to the position that allows the greatest egress of liquid. A cover that is self-closing or tends to close itself is to be allowed to fall to its natural resting position. If more than one receptacle is enclosed by such a self-closing cover, then a single power-supply cord is to be mated with one of the receptacles and the cord is to exit through the wiring channel from behind the cover as intended.

44.3 A 3-inch (76.2-mm) diameter container, 4 inches (101.6 mm) in height, is to be filled with 8 oz (0.24 L) of saline solution, consisting of 8 g of table salt per liter of distilled water, and placed on the supporting surface of the RPT immediately adjacent to the receptacles. The container is then to be tipped over and an effort is to be made to direct the spill toward the area of the assembly that allows the greatest egress of liquid. The Dielectric Voltage-Withstand Test, Section 31 is to be conducted 1 min after the container is tipped over.

45 Water Leakage Test

45.1 As required by 26.2, a RPT provided with a storage compartment shall be subjected to the test described in this section and, after the testing, shall be subjected to the Dielectric Voltage-Withstand Test, Section 31, and the Leakage Current Test, Section 32, with acceptable results.

45.2 A 16.9 oz (0.5 L) container with a 0.79 in (20 mm) inside diameter opening at the top, is to be filled with 16.9 oz (0.5 L) of saline solution, consisting of 8 g of table salt per liter of distilled water. The content is to be emptied within 4 seconds in such a manner as to direct the entire flow into the compartment of the DUT.

45.3 With the RPT positioned on a flat and level surface and in the worst case orientation, the saline solution is then poured into the storage compartment. The storage compartment shall be allowed to drain for 5 minutes

45.4 The Dielectric Voltage-Withstand Test, Section 31 is to be conducted 5 minutes after the liquid is poured into the storage compartment.

45.5 Immediately following the Dielectric Voltage-Withstand Test, the sample shall be subjected to the Leakage Current Test, Section 32.

46 Permanence of Cord Tag Test

46.1 General

46.1.1 To determine that a cord tag is permanent in accordance with 51.15, representative tags shall be conditioned and subjected to the tests described in 46.2.1 – 46.3.1. As a result of the tests, the tag shall comply with the following:

a) The tag shall not tear for a distance greater than 1/16 in (1.6 mm) at any point;

b) The tag shall not separate from the cord. A hang-type tag shall not separate from the securement strap, and the securement strap shall not separate from the cord;

c) The tag or securement strap shall not slip or move along the length of the cord more than 1/2 in (12.7 mm) and there shall not be visible damage to the cord;

d) There shall not be permanent shrinkage, deformation, cracking, or other condition that renders the marking on the tag illegible; and

e) Overlamination, when provided, shall remain in place and shall not be torn or otherwise damaged. The printing shall remain legible.

46.2 Conditioning

46.2.1 For each type of conditioning, three tags applied to the cord in the intended manner are to be used. For tags applied by an adhesive, tests are to be conducted no sooner than 24 h after application of the tag.

46.2.2 Three tags are to be tested as received.

46.2.3 Three tags are to be tested after 30 min of conditioning at 23.0 ±2.0 °C (73.4 ±3.6 °F) and 50 ±5 % relative humidity, following 240 h of conditioning in an air-circulating oven at 60 ±1 °C (140 ±1.8 °F).

46.2.4 Three tags are to be tested within 1 min after being exposed for 72 h to a relative humidity of 85 ±5 % at a temperature of 32.0 ±2.0 °C (89.6 ±3.6 °F).

46.2.5 For a tag that is intended to be applied to oil resistant flexible cord jacket, samples are to be conditioned as follows. Three tags are to be tested within 2 min after being immersed for 48 h in IRM 902 type oil (ASTM D471) at a temperature of 23.0 ±2.0 °C (73.4 ±3.6 °F).

46.3 Test Method

46.3.1 Each test is to be performed on a sample consisting of a length of cord to which the tag has been applied. The cord, with the attachment plug pointing up, is to be held taught in a vertical plane. A force of 5 lbf (22.2 N), which includes the weight of the clamp, is to be applied for 1 min to the uppermost corner of the tag farthest from the cord, within 1/4 in (6.4 mm) of the vertical edge of the tag. The force is to be applied by affixing a C-clamp with a pad diameter of 3/8 in (9.5 mm) to the tag and securing the weight to the C-clamp. The force is to be applied vertically downward in a direction parallel to the major axis of the cord. To determine compliance with 46.1.1(d), manipulation is permissible, such as straightening of the tag

by hand. To determine compliance with 46.1.1(e), each tag is to be scraped 10 times vertically across printed areas and edges, with a force of approximately 2 lbf (9 N), using the edge of a 5/64-in (2.0-mm) thick steel blade held at a right angle to the test surface. The edges of the steel blade are to be just rounded so as not to be sharp.

47 Flexing Endurance Test

47.1 Three samples of a RPT, as required by 20.12, 25.1.11 and 25.2.9, shall be mounted as intended (if provided with a mounting means) and the movable part(s) shall be subjected to 6000 cycles of movement from one extreme position to the other extreme position. A cycle is one extreme position to the other extreme position returning to the starting position.

47.2 The test rate shall be no faster than 20 cycles per minute unless the manufacturer agrees to a faster cycle.

47.3 After the flexing endurance test, the three RPT's shall comply with the following tests and inspection in the order shown in Table 47.1.

Table 47.1
Test Order

	SAMPLE 1	SAMPLE 2	SAMPLE 3
1	Temperature Test, Section 30	NA	NA
2	Dielectric Voltage Withstand Test, Section 31 conducted in the following manner – Between each conductor in relation to every other conductor. (L to N, L to G, N to G, L to L). The RPT shall be flexed through 4 cycles of movement for each application of the test voltage, approximately 1 cycle every 15 seconds, while energized during the dielectric voltage withstand tests.	Dielectric Voltage Withstand Test, Section 31 conducted in the following manner – Between each conductor in relation to every other conductor. (L to N, L to G, N to G, L to L). The RPT shall be flexed through 4 cycles of movement for each application of the test voltage, approximately 1 cycle every 15 seconds, while energized during the dielectric voltage withstand tests.	Dielectric Voltage Withstand Test, Section 31 conducted in the following manner – Between each conductor in relation to every other conductor. (L to N, L to G, N to G, L to L). The RPT shall be flexed through 4 cycles of movement for each application of the test voltage, approximately 1 cycle every 15 seconds, while energized during the dielectric voltage withstand tests.
3	Leakage Current Test, Section 32	Leakage Current Test, Section 32	Leakage Current Test, Section 32
4	Fault Current Test, Section 34	Fault Current Test, Section 34	Fault Current Test, Section 34
5	Overcurrent Test, Section 35	Overcurrent Test, Section 35	Overcurrent Test, Section 35
6	Grounding Continuity Test, Section 33. The RPT shall be flexed through 4 cycles of movement during the test. At any flexed position the grounding path resistance shall comply with 33.1	Grounding Continuity Test, Section 33. The RPT shall be flexed through 4 cycles of movement during the test. At any flexed position the grounding path resistance shall comply with 33.1	Grounding Continuity Test, Section 33. The RPT shall be flexed through 4 cycles of movement during the test. At any flexed position the grounding path resistance shall comply with 33.1
7	Impact Tests, Section 38	Impact Tests, Section 38	Impact Tests, Section 38
8	Crushing Test, Section 39	Crushing Test, Section 39	Crushing Test, Section 39
9	Adequacy of Mounting Test, Section 40	Adequacy of Mounting Test, Section 40	Adequacy of Mounting Test, Section 40
10	The Accessibility of Live Parts, Section 10	The Accessibility of Live Parts, Section 10	The Accessibility of Live Parts, Section 10
11	Spacings, Section 21	Spacings, Section 21	Spacings, Section 21
12	No visual damage to the insulation of the conductors nor damage to the conductor, including grounding and bonding conductors	No visual damage to the insulation of the conductors nor damage to the conductor, including grounding and bonding conductors	No visual damage to the insulation of the conductors nor damage to the conductor, including grounding and bonding conductors

MANUFACTURING AND PRODUCTION-LINE TESTS

48 Dielectric Voltage-Withstand Test

48.1 Each RPT shall be capable of withstanding without electrical breakdown, as a routine production-line test, the application of a potential between uninsulated live parts and accessible, dead-metal parts that become energized.

Exception: This requirement does not apply to a RPT that employs a component that can be damaged by the dielectric potential.

48.2 The production-line test is to be in accordance with any of the alternatives of Table 48.1.

Table 48.1
Production-Line Dielectric Withstand Test Conditions for RPTs

Rating	Alternative A		Alternative B		Alternative C		Alternative D	
	Potential (V AC)	Time (s)	Potential (V AC)	Time (s)	Potential (V DC)	Time (s)	Potential (V DC)	Time (s)
125 V or less AC	1250	60	1500	1	1768	60	2121	1
125/250 V AC and 250 V AC or less	1500	60	1800	1	2121	60	2545	1

48.3 The test shall be conducted when the RPT is complete (fully assembled). It is not intended that the RPT be unwired, modified, or disassembled for the test.

48.4 The test equipment when adjusted for production-line testing, is to produce an output voltage that is not less than the factory test value specified, nor is the magnitude of the test voltage to be greater than 120 % of the specified test potential when the tester is used in each of the following conditions:

a) When the test duration is 1 s, the output voltage is to be maintained within the specified range when:

1) Only a voltmeter having an input impedance of at least 2 MΩ and a specimen of the product being tested are connected to the output terminals and

2) A relatively high resistance is connected in parallel with the voltmeter and the product being tested, and the value of the resistance is gradually reduced to the point where an indication of unacceptable performance just occurs.

b) When the test duration is 1 min, the output voltage is to be maintained within the specified range (by manual or automatic means) throughout the 1-min duration of the test or until there is an indication of unacceptable performance.

48.5 The specified control of the applied voltage, manual or automatic, shall be maintained under conditions of varying line voltage. Higher test potentials are not prohibited from being used when the higher dielectric stress does not adversely affect the insulating systems of the product.

48.6 In addition to the characteristics indicated in 48.4, the test equipment is to have the following features and characteristics:

a) A means of indicating the test voltage that is being applied to the appliance under test. This is accomplished by sensing the voltage at the test leads or by an equivalent means.

b) An output voltage that has a sinusoidal waveform, a frequency that is within the range of 40 – 70 Hz, and a peak value of the waveform that is not to be less than 1.3 and not more than 1.5 times the root-mean-square value.

c) A means of effectively indicating unacceptable performance. The indication is to be:

1) Auditory, when it can be readily heard above the background noise level;

2) Visual, when it commands the attention of the operator; or

3) A device that automatically rejects an unacceptable product. When the indication of unacceptable performance is auditory or visual, the indication is to remain active and conspicuous until the test equipment is reset manually.

d) When the test equipment is adjusted to produce the test voltage, and a resistance of 120,000 Ω is connected across the output, the test equipment is to indicate an unacceptable performance within 0.5 s. A resistance of more than 120,000 Ω is not prohibited from being used to produce an indication of unacceptable performance when the manufacturer elects to use a tester having higher sensitivity.

Exception: The sensitivity of the test equipment – and a lower value of resistance – is not prohibited from being used when testing an appliance intended to be permanently wired.

48.7 There shall not be any transient voltage applied to the RPT under test that results in the instantaneous voltage applied to the RPT exceeding 120 % of the peak value of the test voltage that the manufacturer elects to use for this test. This requirement applies for the entire duration of the test, including the time that the voltage is first applied to the RPT and the time that the voltage is removed from the RPT.

49 Grounding Continuity Test

49.1 Each RPT shall be tested, as a routine production-line test, to determine grounding continuity between the grounding pin or terminal of the attachment plug and the accessible, dead-metal parts of the RPT that become energized. The grounding contact of each receptacle, grounding pin of a supply-cord attachment plug, and other means for grounding on the load side are included in this test.

49.2 Compliance with 49.1 is determined by any appropriate device, such as an ohmmeter or a battery and buzzer combination, applied between the point of connection of the RPT grounding means and the metal parts in question.

RATINGS

50 Details

50.1 A RPT shall be rated in maximum AC current and AC voltage. The voltage rating shall not be higher than 250 V. The current rating shall not be higher than 20 A, the ampacity of the power-supply cord, nor the highest rating of the overcurrent protective device that is provided.

MARKINGS

51 Details

51.1 Unless otherwise indicated, all markings shall be clearly visible, readily legible, and placed on the outside of the enclosure. A decorative feature that encapsulates the RPT or surrounds the enclosure of the

RPT, shall be constructed in such a manner that all markings shall remain visible when the decorative feature is installed.

51.2 Markings required by this standard shall be permanent. A permanent marking shall be molded, die-stamped, or paint-stenciled; stamped or etched metal that is permanently secured; or indelibly stamped on a pressure-sensitive label secured by adhesive that complies with the Standard for Marking and Labeling Systems, UL 969. Ordinary usage, handling, storage, and the like of the unit are to be evaluated in determining whether a marking is permanent.

51.3 A RPT shall be marked with:

a) The manufacturer's name, trade name, trademark, or other descriptive marking by which the organization responsible for the product is identified;

b) The distinctive catalog number or equivalent;

c) The RPT electrical rating in volts and amperes; and

d) The date or other dating period of manufacture not exceeding any three consecutive months. Abbreviation of the date of manufacture complies with the intent of this requirement.

Exception: The date of manufacture that appears in a nationally-accepted conventional code or in a code affirmed by the manufacturer complies with the intent of this requirement when the code does not repeat in less than 10 years and does not require reference to the production records of the manufacturer to determine when the product was manufactured.

51.4 When a manufacturer produces or assembles a RPT at more than one factory, each RPT shall have a distinctive marking, that is not prohibited from being in code, by which it is identified as the product of a particular factory.

51.5 With regard to 17.9, a receptacle outlet or group of outlets of a RPT shall be marked to indicate the rating of the overcurrent protective device that protects the receptacle outlet.

51.6 A receptacle outlet or group of outlets of a RPT that is energized (relay or electronically activated) by the presence of a load in another outlet of the RPT shall be marked to indicate that they are so controlled.

51.7 A switch employed on a RPT, without an associated pilot light and as indicated in 18.3, shall be marked "on"/"off", "1"/"0", or the equivalent, to indicate to the user that the receptacles are energized when the RPT is connected to a power-supply. The marking shall be either on the switch or on an adjacent part of the enclosure.

51.8 A RPT having a fuse that is intended to be replaced in the field shall be marked to indicate the type, ampere, and voltage rating of the replacement fuse. In addition, the RPT shall be marked with the word "WARNING" and the following or equivalent: "For continued protection against risk of fire, replace only with same type and rating of fuse." Lettering shall not be less than 3/32 in (2.4 mm) high. These markings shall be located adjacent to the fuseholder so as to be visible during fuse replacement.

51.9 A RPT shall be marked to indicate that the product is intended for indoor use only, with the word "CAUTION:" and the following or equivalent: "To Reduce the Risk of Electric Shock – Use Only Indoors". Lettering shall not be less than 3/32 in (2.4 mm) high.

51.10 A RPT that incorporates terminals for coaxial cable (TV/CATV) connection shall be marked with (or provide on the smallest unit package) installation instructions for connection to the antenna system in

accordance with the National Electrical Code and shall comply with the antenna connection instruction requirements of the Standard for Audio-Video Products and Accessories, UL 1492.

51.11 A RPT that employs SPT-3 flexible cord for the power-supply cord shall be marked on the RPT and on smallest unit package with the following or equivalent wording: "For Household Use Only."

51.12 A RPT shall be marked to indicate that the product is not intended to be plugged into another RPT, or into an extension cord, with the word "CAUTION:" and the following or equivalent: "Risk of Electric Shock. Do not plug into another relocatable power tap or an extension cord."

Exception: This marking may be provided on a separate sheet or in the installation instructions when there is not sufficient room on the device for the marking.

51.13 An RPT that incorporates a molded-on or assembled-on hospital grade attachment plug or receptacle shall be marked with the following or equivalent wording: "CAUTION: Do not use relocatable power taps in General Patient Care Areas or Critical Patient Care Areas. They have not been evaluated for use where Article 517 of the National Electrical Code requires Hospital Grade components."

51.14 The caution marking of 51.13 shall comply with 51.2 and be:

a) Clearly visible after mounting of the RPT; or

b) Provided on a tag affixed to the RPT power supply cord within 6 in (152 mm) of the attachment plug.

The word CAUTION shall be a minimum of 9/64 in (3.6 mm) high and the remaining words shall be a minimum of 1/16 in (1.6 mm) high.

51.15 The cord tag of 51.14(b) shall be tear-resistant and shall comply with 51.16 and Section 46, Permanence of Cord Tag Test. The tag shall be permanently affixed to the cord.

Exception: A flag-type tag rated for the conditions of use and complying with the requirements for flag-type tags for use with cord sets and power supply cords is not required to be tested in accordance with Permanence of Cord Tag Test, Section 46.

51.16 The cord tag of 51.14(b) shall be in either of the following forms:

a) A hang-type tag having a hole to permit securement to the cord by a plastic strap or equivalent. The strap shall not be removable without cutting; or

b) A flag-type tag with an adhesive back. The tag shall be wrapped around and adhere to the cord. The ends of the tag shall adhere to each other and project as a flag.

51.17 Always on (unswitched) receptacles in a partially switched RPT (see 16.6) shall be provided with a lighted indication that the receptacle(s) are always on (unswitched). Each of the always on (unswitched) receptacle(s) shall have lighted indication (e.g. pilot light, not a lighted receptacle) that it is energized. This lighted indicator shall be directly adjacent to the receptacle it is indicating. This requirement applies to all always on (unswitched) receptacles whether or not the RPT employs a lighted switch as referenced in 51.7.

51.18 RPTs as described by 51.17 with both switched and always on receptacles shall be marked: "CAUTION: Contains Always On Receptacles. To Reduce the Risk of Electric Shock – Disconnect power strip from power source before servicing any equipment connected to the power strip." The word CAUTION shall be a minimum of 9/64 in (3.6 mm) high and the remaining words shall be a minimum of 1/8

in (3.2 mm) high. The marking shall be on the body of the RPT and shall be in a color that contrasts with the surface on which it appears.

51.19 A marking "Always On" identifying unswitched receptacles in a partially switched RPT (see 16.6) shall be provided and located adjacent to the unswitched receptacle(s) and shall be in a color different than the body of the RPT, and shall be a minimum of 1/8 in (3.2 mm) high.

51.20 RPTs as described in 7.3 shall be marked: “WARNING” and the following or the equivalent. “Timer could turn-on unexpectedly without the user being present. To Reduce the Hazardous Condition – Unplug the appliance that is plugged into the receptacle(s) controlled by the timer before servicing.” Lettering shall not be less than 3/21 inch (2.4 mm) high. This marking shall be located adjacent to the timer so as to be visible during use.

51.21 A RPT that incorporates storage compartment as described in Storage Compartment, Section 26 shall be marked "CAUTION:" and the following or equivalent: "Risk of Electric Shock. Do not place any liquids or liquid containers inside storage compartment." The word CAUTION shall be a minimum of 9/64 in (3.6 mm) high and the remaining words shall be a minimum of 1/16 in (1.6 mm) high.

51.22 RPT’s incorporating storage a compartment as described in Storage Compartment, Section 26 shall be marked "CAUTION:" and the following or equivalent: "Risk of Fire. Do not charge electrical devices while stowed in storage compartment." The word CAUTION shall be a minimum of 9/64 in (3.6 mm) high and the remaining words shall be a minimum of 1/16 in (1.6 mm) high.

51.23 A Class 2 lead or Class 2 separable interface shall be identified as being "Class 2" and marked with the output electrical rating. The "Class 2" and output electrical rating shall be permanently marked and visible after installation.

51.24 A RPT as described by 16.8 shall be marked with the phrase "Tamper Resistant" or the letters "TR". The letters "TR" shall be a minimum of 3/16 inch (4.8 mm) in height.

INSTRUCTIONS

52 Details

52.1 An RPT that incorporates a molded-on or assembled-on hospital grade attachment plug or receptacle, shall include in the instructions, packaging, or other literature accompanying the RPT, the following or equivalent wording: "CAUTION: Do not use relocatable power taps in General Patient Care Areas or Critical Patient Care Areas. They have not been evaluated for use where Article 517 of the National Electrical Code requires Hospital Grade components."

52.2 A partially switched RPT (see 16.6) shall include in the instructions, packaging, and other literature accompanying the RPT, the following or equivalent wording: "CAUTION – Contains Always On Receptacles. To Reduce the Risk of Electric Shock – Disconnect power strip from power source before servicing any equipment connected to the power strip."

52.3 A RPT that incorporates storage compartment as described in Storage Compartment, Section 26, shall include in the instructions, packaging, or other literature accompanying the RPT, the following or equivalent wording:

a) "CAUTION:" and the following or equivalent: "Risk of Electric Shock. Do not place any liquids or liquid containers inside storage compartment."

b) "CAUTION:" and the following or equivalent: "Risk of Electric Shock. Do not use in or near wet locations such as kitchens or baths."

c) "CAUTION:" and the following or equivalent: "Risk of Fire. Do not charge electrical devices while stowed in storage compartment."

52.4 As required in Table 14.1 footnote (h), the instructions shall include the following information or an equivalent statement: "A relocatable power tap provided with auxiliary lighting features is not for permanent installation. Do not permanently mount or remove the plug for permanent connection to the electrical system".

52.5 When the RPT manufacturer's web site is used to identify installation instruction information, the web address shall be marked on the RPT, packaging and/or information sheet. The web address may be in the form of a Uniform Resource Locator (URL – http://www.___.com/___/), or as a Quick Response Code (QR code). The referenced web page shall be reviewed for accuracy and date of validation.

ANNEX A (normative) – EXTENDABLE RELOCATABLE POWER TAPS

INTRODUCTION

A1 Scope

A1.1 The requirements of this Annex cover an extendable RPT.

A1.2 An extendable RPT shall comply with the applicable requirements of this Standard, UL 1363, except as modified by the requirements in this Annex.

A2 Glossary

A2.1 For the purposes of Annex A, the following definitions apply:

A2.2 BASE UNIT – An enclosure provided with a power supply cord in accordance with Section 14, Power-Supply Cord, and provided with one or more interconnector outlets.

A2.3 EXTENDABLE SEGMENT – A unit consisting of an enclosure that incorporates an interconnector inlet and may incorporate an interconnector outlet. The extendable segment shall be suitable for connection to the base unit or to another extendable segment.

A2.4 INTERCONNECTOR INLET – A male electrical contact device of a non-standard configuration integral to or directly secured to the enclosure.

A2.5 INTERCONNECTOR OUTLET – A female electrical contact device of a non-standard configuration integral to or directly secured to the enclosure.

A2.6 LATCHING AND LOCKING – A system that prevents separation of the interconnector inlet and outlet under the construction and performance requirements specified in Annex A for latching and locking mechanisms.

A2.7 NON-STANDARD ELECTRICAL CONTACT DEVICE – A unique electrical contact device configuration that neither accepts nor connects to an NEMA WD 6 nor IEC: UL/CSA 60320-1; IEC 60320-1 or IEC 60320-2-2 type electrical contact device.

CONSTRUCTION

A3 General

A3.1 An extendable RPT rated 20 Amps shall comply with the "20 Amp employing 6 or more receptacle requirements" as specified in Table 14.1 and an extendable RPT rated 15 Amps shall comply with the "15 Amp employing 4 or more receptacle requirements" as specified in Table 14.1.

A3.2 The overall length of an extendable RPT from the base unit (not including the power supply cord) to the last outlet receptacle on the last extendable segment shall not exceed 10 ft.

A3.3 The extendable segments shall latch and lock to the base unit and if intended to connect to additional extendable segments shall latch and lock to those extendable segments.

A3.4 A locking and latching mechanism shall require the user to perform manual manipulation to disengage the mating component segments.

A3.5 A locking and latching system shall comply with A6.2.

A4 Electrical Contact Devices

A4.1 General

A4.1.1 Interconnector inlets and outlets of an extendable RPT used to connect the extendable segments shall comply with A4.2.

A4.1.2 Accessibility to the electrical interconnector outlet contacts shall meet the UL 498 accessibility requirements for receptacle outlets before and after the tests specified in A4.2.

A4.2 Mating connectors

A4.2.1 All parts that provide electrical insulation of a connector shall comply with the requirements in A4.2 – A4.6.1. Hard rubber shall not be employed.

A4.2.2 A polymeric material used for electrical insulation shall be fabricated in accordance with the Standard for Polymeric Materials – Fabricated Parts, 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.

A4.3 Flammability

A4.3.1 A polymeric material used for electrical insulation 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 the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, 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 of the device.

A4.4 Electrical properties

A4.4.1 A polymeric material used for electrical insulation shall have a Comparative Tracking Index (CTI) rating of 175 V or greater or a performance level class of at least 3.

A4.4.2 A polymeric material used for electrical insulation 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 A4.1 for the flame class rating determined in accordance with A4.3. 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.

Table A4.1
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	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

Table A4.1 Continued on Next Page

Table A4.1 Continued

Flammability classification[a]	HWI[b, d]		HAI[c, d]	
	Mean ignition time (sec)	PLC	Mean no. of arcs	PLC

[a] Flammability classification – Described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

[b] Hot Wire Resistance to Ignition – Described in the Standard for Polymeric Materials – Short Term Property Evaluations, 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.

A4.5 Thermal properties

A4.5.1 A polymeric material used for electrical insulation or an enclosure of live parts shall have the relative thermal index ratings shown in Table A4.2 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.

Table A4.2
Minimum Relative Thermal Indices of Insulating Materials Used in Insulation

Application	Minimum relative thermal index[a], °C		
	Electrical	Mechanical with impact[b]	Mechanical without impact
Connectors	80	60	80

[a] Relative Thermal Index – Described in the Standard for Polymeric Materials – Long Term Property Evaluations, 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.

A4.6 Mating connector physical requirements

A4.6.1 Mating connectors shall:

a) Be of the locking type.

b) Be reliably keyed by a physical or mechanical means to maintain correct polarity.

c) The interconnector outlet electrical contacts shall not make connection to the interconnector inlet electrical contacts before the extendable segments are latched and locked.

Exception: Ground path contacts shall make connection before the interconnector segments are latched and locked.

A5 Enclosures

A5.1 Both base units and extendable segments are to be subjected to the enclosure requirements within this standard.

A6 Performance

A6.1 General

A6.1.1 An extendable RPT shall be connected together in the longest configuration, with the greatest number of interconnections, per the marking specified in A7.3 and the manufacturers' instructions as specified in A8.2 before performing the tests as outlined in this standard.

A6.1.2 The Impact test and Mold Stress test are to be conducted with both the extendable segments interconnected and not interconnected.

A6.1.3 The grounding continuity test shall be conducted using the maximum number of receptacle outlets and the maximum number of extendable segments as specified in A7.3 and the manufacturers' instructions A8.2.

A6.2 Locking and latching tests

A6.2.1 Prior to conducting the tests specified in A6.2.2 – A6.2.3 polymeric materials to be subjected to the locking and latching tests shall be subjected to the Mold Stress-Relief Distortion Test, Section 43. The interconnection means shall operate as intended after the Mold Stress Relief test as determined by A6.2.2.

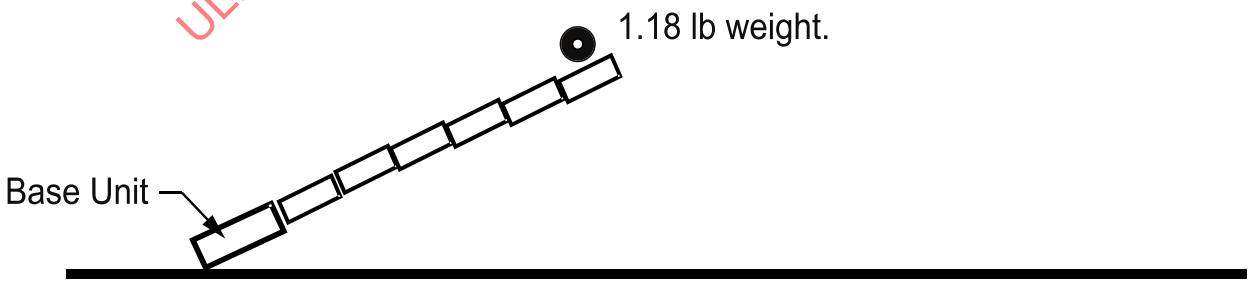
A6.2.2 Prior to conducting the tests specified in A6.2.3 and A6.2.4 the latching mechanism shall be subjected to 50 cycles of complete disconnection and reconnection.

A6.2.3 A locking and latching system shall not separate while under a 35 lbf (158 N) force applied pulling perpendicular to the interconnector inlet and outlet face such that the connection tends to separate the mating surfaces. The connection under test shall comply with the Accessibility of Live Parts, Section 10 while under tension.

A6.2.4 The extendable RPT shall be assembled per the instructions to the maximum extended length or maximum number of interconnected extendable segments from the base unit. A 1.18 lb (0.54 Kg) weight is to be secured over the last receptacle outlet. The base unit is to be rotated slowly until the last segment is suspended in air. See Figure A6.1. The extendable RPT shall be subjected to the moment for 1 minute. A locking and latching system shall not separate and the complete interconnected enclosures and segments shall comply with the Accessibility of Live Parts, Section 10.

Figure A6.1

Moment Test



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