



Produkte
Products

Prüfbericht - Nr.: <i>Test Report No.:</i>	50337286 001	Seite 1 von 75 <i>Page 1 of 75</i>			
Auftraggeber: <i>Client:</i>	FSP-POWERLAND TECHNOLOGY INC 12F Building A, No.6 Yongzhi Road, Qinhuai District, Nanjing Jiangsu, China, 210014.				
Gegenstand der Prüfung: <i>Test item:</i>	LI-ION BATTERY CHARGER				
Bezeichnung: <i>Identification:</i>	Refer to Electrical rating table	Serien-Nr.: <i>Serial No.:</i> Engineering samples			
Wareneingangs-Nr.: <i>Receipt No.:</i>	170124201	Eingangsdatum: 2019-12-12 <i>Date of receipt:</i>			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of test item at delivery:	Good for testing and checking				
Prüfört: <i>Testing location:</i>	TÜV Rheinland (GuangDong) Co., Ltd. No.199 Kezhu Road, GZ Science City, Guangzhou 510663, P.R. China				
Prüfgrundlage: <i>Test specification:</i>	UL1012:2010 R04.16 CSA C22.2 No. 107.1-16				
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>				
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd. 1F East & 2-4F, Cybio Technology Building No.1, No.16 Kejibei 2nd Road, High-Tech Industrial Park North Nanshan District, 518057, Shenzhen, China				
geprüft/ tested by:	kontrolliert/ reviewed by:				
					
2020-03-03 Chuck Wang / PE	2020-03-04 Sailing Li / TC				
Datum <i>Date</i>	Name <i>Name</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name <i>Name</i>	Unterschrift <i>Signature</i>
Sonstiges/ Other Aspects:					
1. This report is issued for cTUVus mark approval; 2. Attachment 1: 17 pages of CDF; Attachment 2: photo document (5 pages)					
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested		
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.					
<i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>					

TEST REPORT UL 1012 & CSA C22.2 No. 107.1 Power Units Other Than Class 2 & Power Conversion Equipment	
Report Reference No	See cover page
Tested by (printed name and signature)	See cover page
Approved by (printed name and signature)	See cover page
Date of issue	See cover page
Testing Laboratory Name	See cover page
Address	See cover page
Testing location	See cover page
Address	See cover page
Applicant's Name	See cover page
Address	See cover page
Test specification	
Standards	See cover page
Test procedure	cTUVus
Non-standard test method	N/A
Test Report Form No	
TRF originator	TÜV Rheinland (Shenzhen) Co., Ltd.
Master TRF	Dated July 2016
Test item description	
Trademark	SEGWAY, POWERLAND
Manufacturer	FSP-POWERLAND TECHNOLOGY INC 12F Building A, No.6 Yongzhi Road, Qinhuai District, Nanjing Jiangsu, China, 210014.
Factory	Chippower (Changzhou) Co., Ltd NO. 7, Fengxiang Road, Wujin, Changzhou City, Jiangsu Province 213164, P.R. China
Model and/or type reference	Refer to Electrical rating table
Serial number	N/A
Rating(s)	Refer to Electrical rating table

Copy of marking plate:

SEGWAY®
Dirt eBike X160
 LI-ION BATTERY CHARGER
 MODEL : NB-58D8-5D0 P/N : 21700-YQ1N-0000
 INPUT : 100-240 V 50-60 Hz 4A MAX OUTPUT : 58.8V $\overline{\text{---}}$ 5A
 Manufacturer: FSP-Powerland Technology Inc
 Address: 12F Building A, No.6 Yongzhi Road, Qinhuai District,
 Nanjing Jiangsu, China

⚠ WARNING / AVERTISSEMENT

Risk of electric shock. Do not disassemble the case or touch the metal contacts.

- Charge only 48V Li-Ion type batteries. Other types may burst, causing personal injury and damage.
- Do not plug into power socket when not charging. Unplug when fully charged.
- Keep away from flammable or explosive materials.
- Do not charge if it is damaged or see trace of water.
- CAUTION-Indoor use only.

Made in China Fabriqué en Chine

BFP

Risque de choc électrique, il est strictement interdit de démonter ou de toucher le contact métallique.

- Chargez uniquement des batteries de type Li-Ion 48V. D'autres types peuvent éclater et provoquer des blessures et des dommages.
- Ne pas placer à proximité de flammes.
- N'utilisez pas si le chargeur est endommagé ou si vous voyez des traces d'eau.
- ATTENTION-Pour utilisation à l'intérieur seulement.

Charging indicator ● Red flash: charging
 ● Green is on: full charge



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. CAN ICES-3 (B)/NMB-3(B).

S/N: XXXXXXXXXXXX DC: XXXX ID: XX

Remark:

1. For warning markings: the height of the letters in the word "CAUTION", "DANGER" shall be no less than 1/8 inch (3.2 mm) and the height of the remaining letters shall be no less than 1/16 inch (1.6 mm).
2. Manufacture date information included in S/N. Digits "XXXX" after DC: the first XX means final 2 numbers of year, the second XX means weeks, for example 2009 means the 9th weeks of year 2020.
3. FCC/ICES was not evaluated in this report.
4. Alternative for brand name: POWERLAND.

Instructions:**2. IMPORTANT SAFETY INSTRUCTIONS**

- 2.1 SAVE THESE INSTRUCTIONS – This manual contains important safety and operating instructions for battery charger Models.
- 2.2 Before using battery charger, read all instructions and cautionary marking on battery charger, battery, and product using battery.
- 2.3 CAUTION – To reduce risk of injury, charge only Li-Ion battery pack rechargeable batteries. Other types of batteries may burst causing personal injury and damage.
- 2.4 This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- 2.5 If the supply cord is damaged, it must be replaced by a special cord or assembly available from the manufacturer or its service agent.
- 2.6 Don't charge non-rechargeable batteries.
- 2.7 During charging, the battery must be placed in a well-ventilated area.
- 2.8 The appliance is battery charger for indoor and household used.
- 2.9 Examine the battery charger regularly for damage, especially the cord, plug and enclosure. If the battery charger is damaged, it must not be used until it has been repaired.
- 2.10 The outlet jack of this battery charger is corrected connected to the intended used appliance.
- 2.11 After charging, disconnect the battery charger from the supply mains. Then remove the chassis connection and then the battery connection.
- 2.12 The use of the charger is not more than 40°C ambient temperature.

Note:

1. The height of lettering in the text and illustrations of the safety instructions shall be as follows:
 - a) Upper case letters shall be not less than 1/12 inch (2.1 mm) in height;
 - b) Lower case letters shall be not less than 1/16 inch (1.6 mm) in height;
 - c) The phrases "IMPORTANT SAFEGUARDS" and "SAVE THESE INSTRUCTIONS" shall be in letters no less than 3/16 inch (4.8 mm) in height.
2. French translation shall be provided for Canada market.

<p>Summary of testing:</p> <p>Model NB-58D8-5D0 was tested and fulfilled the test specifications.</p> <p>The tested model was complied with the test standard UL 1012 and C22.2 No. 107.1.</p> <p>The report is only evaluated the device intended to use in non- hazard location. Additional evaluation relating to hazard location shall be considered according to National Electrical Code when fire or explosion hazards may exist due to the accumulation of combustible dusts under abnormal operating conditions.</p> <p>Particulars: test item vs. test requirements:</p> <p>Equipment mobility : Charger</p> <p>Operating condition : Continuous</p> <p>Mass of equipment (kg)..... : N/A</p> <p>Test case verdicts</p> <p>Test case does not apply to the test object : N/A</p> <p>Test item does meet the requirement : P(ass)</p> <p>Test item does not meet the requirement .. : F(ail)</p>								
<p>Testing</p> <p>Date of receipt of test item : 2019-12-12</p> <p>Date(s) of performance of test : 2019-12-12 to 2020-03-04</p>								
<p>General remarks</p> <p>The test result presented in this report relate only to the object(s) tested.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> <p>"(see Enclosure #)" refers to additional information appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a point is used as the decimal separator.</p>								
<p>General product information:</p> <ol style="list-style-type: none"> 1. This product is a portable Li-ion battery charger have an output other than class 2, other type battery was not evaluated. 2. This product is provided with a detachable power supply and a polarized output connector, suitability shall be considered in end use. 3. For indoor use only. 								
<p>Electrical Rating</p> <table border="1"> <thead> <tr> <th>Model Name</th> <th>Input</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>NB-58D8-5D0</td> <td>100-240Vac 50-60Hz 4A max</td> <td>58.8Vdc 5A</td> </tr> </tbody> </table>			Model Name	Input	Output	NB-58D8-5D0	100-240Vac 50-60Hz 4A max	58.8Vdc 5A
Model Name	Input	Output						
NB-58D8-5D0	100-240Vac 50-60Hz 4A max	58.8Vdc 5A						

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
7	Frame and Enclosure		P
	General		-
7.1.1	A power unit shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it is subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse which results in a reduction of spacings, loosening or displacement of parts, or other serious defects.		P
7.1.2	A power unit shall be provided with an enclosure to house all parts other than the power supply cord or primary connector and the output leads or output connector that present a risk of fire, electric shock, or injury to persons under any condition of use.		P
7.1.3	A cast- or sheet-metal section of the enclosure shall have a thickness not less than that specified in Table 7.1.	Metal enclosure	P
	Exception: A part of an enclosure that complies with the Mechanical Strength Tests for Metal Enclosures, Section 45, need not comply with the thickness specified in Table 7.1.		P
7.1.4.	An enclosure or part of an enclosure that also serves as a compartment for a rechargeable vented battery shall be ventilated to permit dispersion of gases from the battery.		N/A
7.1.5	In addition to the criteria specified in this Standard, the following factors are to be considered when judging the suitability of a polymeric enclosure:	Metal enclosure	P
	a) Moisture absorptive properties;		P
	b) Material flammability properties; and		P
	c) Resistance to arcing properties.		P
	These properties shall comply with the requirements in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C. See also 39.4.	Metal enclosure, but done the test of Mold Stress Relief Distortion, Strain Relief Test after Mold Stress Relief Distortion for strain relief means	P
7.1.6	A conductive coating applied to a nonmetallic surface such as the inside surface of a cover, enclosure, and the like shall comply with the appropriate requirements in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C, unless it can be determined that flaking or peeling of the coating does not result in a reduction of spacings or the bridging of live parts that may result in a risk of fire, electric shock, or injury to persons.	No such coating	N/A
7.1.7	The enclosure of a power unit shall prevent molten metal, burning insulation, flaming particles, or the like from falling on combustible materials, including the surface upon which the power unit is supported. A barrier as mentioned in 7.1.10 shall:		P
	a) Be horizontal;	No barrier	N/A
	b) Comply with Figure 7.1; and		N/A
	c) Comply with 7.1.8 if it is made of a polymeric material.		N/A
	Openings for drainage, ventilation, and the like may be employed in the barrier provided such openings do not permit molten metal, burning insulation, or the like, to fall on combustible material.	No opening	N/A
7.1.8	With reference to 7.1.7, a barrier made of a polymeric material shall:	No such barrier	N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	a) Have a flammability classification of V-1 or better in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94; and		N/A
	b) Comply with the requirements for physical barriers specified in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.		N/A
7.1.9	The requirement in 7.1.7 necessitates that a switch, a relay, a solenoid, or the like, be completely and individually enclosed, unless it can be shown that:	Enclosed	P
	a) Malfunction of the component does not result in a risk of fire; or		N/A
	b) There are no openings in the enclosure through which molten metal, burning insulation, flaming particles or the like could fall.		N/A
	Exception No. 1: This requirement does not apply to terminals.		N/A
	Exception No. 2: Ventilation openings may be provided in the bottom of an enclosure if the openings incorporate a perforated metal plate as described in Table 7.2; a galvanized or stainless steel screen having a 14- by 14-mesh per inch (25.4-mm) constructed of wire with a diameter of 0.018 inch (0.5 mm) minimum; or other construction complying with the Hot, Flaming Oil Test, Section 57.		N/A
7.1.10	With regard to 7.1.7, if openings in the enclosure are provided, it will also necessitate the use of a barrier:		N/A
	a) Under wire, unless it is of the flame-retardant type, such as neoprene- or thermoplastic-insulated wire; and		N/A
	b) Under a fuse, unless a complete, unventilated enclosure is provided for each fuse.		N/A
	Exception: A barrier is not needed under:		N/A
	a) A supplementary fuse;		N/A
	b) A fuse connected in a Class 2 circuit;		N/A
	c) An individually enclosed fuse such as an extractor fuse; or		N/A
	d) A fuse within a complete unventilated enclosure.		N/A
	Consideration will be given to a fuse enclosed within a transformer winding.		N/A
7.1.11	A compartment or part of an enclosure that contains field-wiring splices in other than a Class 2 circuit shall not be provided with ventilating openings.	No opening	N/A
7.1.12	Glass or thermoplastic covering an opening for user servicing, such as replacing a pilot lamp, and enclosing live parts that are guarded in accordance with 7.6.3, 7.6.4, or 9.1.4 shall be securely retained in place, and shall comply with:		N/A
	a) Mechanical Strength Tests for Metal Enclosures, Section 45;		N/A
	b) Abnormal Tests, Section 54; and		N/A
	c) Flammability tests for thermoplastic enclosures as specified in 7.1.5.		N/A
7.1.13	The operating handle of a circuit breaker, the operating button of a manually-operable protector, the capped portion of an extractor-type fuseholder, or a similar part may project outside the enclosure.		N/A
7.2	Mounting means	No mounting means	N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
7.2.1	A power unit intended to be fastened in place shall have a means for securely mounting it in position. Bolts, screws, and other parts used for mounting the power unit shall be independent of those used for securing components.		N/A
7.2.2	A portable power unit intended for wall mounting shall employ a keyhole slot or the equivalent as a mounting means.		N/A
7.2.3	A barrier or the equivalent may be used to prevent wall-mounting screws from projecting into a compartment containing electrical parts and reducing spacings to less than that specified in Spacings, Section 35.		N/A
7.2.4	Mounting instructions shall be furnished with each power unit designed for permanent mounting. If special hardware is required, it shall be provided by the manufacturer.		N/A
7.3	Integral meters	No such meters	N/A
7.3.1	If an electrical instrument, such as a meter, forms part of the enclosure, the face or the back of the instrument housing, or both together, shall comply with the requirements for an enclosure.		N/A
	Exception No. 1: An electrical instrument connected in a secondary circuit need not comply with the requirements for an enclosure if damage or deterioration of the materials comprising the housing does not result in a risk of fire or electric shock.		N/A
	Exception No. 2: This requirement does not apply to a meter as described in 7.3.2.		N/A
7.3.2	A panel mounted analog meter shall comply with the Standard for Electrical Analog Instruments - Panelboard Types, UL 1437.		N/A
	Exception: An analog meter connected to an isolated circuit of not more than 42.4 n V peak or 60 V dc need not comply if the meter housing does not constitute part of the power unit enclosure.		N/A
7.4	Supporting material		P
7.4.1	Material supporting terminals or used as internal electrical insulation of an electrical instrument shall comply with Insulating Materials, Section 24.	Insulation materials are approved	P
	Exception: This requirement does not apply to an electrical instrument connected in a secondary circuit if damage to or deterioration of the materials does not result in a risk of fire or electric shock.		N/A
7.4.2	Supporting feet of a power unit that form part of the enclosure or that are needed for ventilation shall be reliably secured in place and the aging, physical, and flammability properties of the material shall be investigated. A rubber or neoprene material shall comply with the physical properties test requirements in 65.2.1.		N/A
	Exception: This requirement does not apply to a power unit subjected to the Temperature Test, Section 42, with the supporting means removed. See 42.9.		N/A
7.4.3	An adhesive used to attach a cover to a power unit shall be investigated with respect to exposure to environmental conditions, such as high and low temperatures, high and low humidity, and the like, to determine its ability to retain the cover in position.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	Exception: Methods utilizing fusion techniques, such as solvent cementing, ultrasonic welding, electromagnetic induction, and thermal welding are not required to be investigated.		N/A
7.5	Doors and covers	No such parts	N/A
7.5.1	A door or cover that provides access to a live part that can cause electric shock shall be securely held in place so that it can be opened or removed only by using a tool.		N/A
	Exception: A door or cover that provides access to a live part that does not involve risk of electric shock shall be securely held in place, but need not be secured so that it is necessary to use a tool to open or remove it.		N/A
7.5.2	A door or cover of an enclosure shall be hinged or attached in an equivalent manner if:	No door or cover	N/A
	a) It provides access to an overload-protective device the intended functioning of which requires renewal; or		N/A
	b) It is necessary to open the cover in connection with intended operation of the protective device.		N/A
	A door or cover providing access to a fuseholder shall be tight-fitting and shall be positively held closed. See 28.1.		N/A
	Exception: A hinged cover is not required if the only overload-protective devices enclosed are:		N/A
	a) Connected in control circuits, provided the protective devices and the circuit loads are within the same enclosure;		N/A
	b) Rate 2 amperes or less for loads not exceeding 100 d volt-amperes;		N/A
	c) Extractor fuses having an integral enclosure;		N/A
	d) Fuses connected in a low-voltage limited energy circuit; or		N/A
	e) In accordance with the Exception to 29.1.		N/A
7.6	Protection against injury to persons		P
7.6.1	If operation, maintenance, or reasonably foreseeable misuse of a power unit by the user involves a risk of injury to persons, protection shall be provided to reduce such risk to an acceptable degree.		P
7.6.2	Specific service functions of a power unit that are not intended to be performed shall be given appropriate consideration.		N/A
7.6.3	A part capable of causing injury to persons shall be enclosed or guarded.		P
7.6.4	A rotating member, such as a fan blade, the breakdown of which could result in a risk of injury to persons, shall be enclosed or guarded to reduce the likelihood of injury.	No rotating parts	N/A
7.6.5	With reference to 7.6.3, a part that is within the enclosure or casing of the power unit and that cannot be contacted by the probe illustrated in Figure 8.1 is considered to be acceptably guarded. An opening in a guard shall not exceed 1 inch (25.4 mm) in diameter.		P
7.6.6	A cover or guard for a moving part that involves a risk of injury to persons - such as a fan blade - is to be arranged so that if it is removed, it must be replaced before intended operation of the power unit. Other features of a cover or guard to be considered include:		N/A
	a) Removability without the use of a tool;		N/A
	b) Removability for servicing;		N/A
	c) Strength and rigidity;		N/A
	d) Completeness; and		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	e) Creation of additional risks of injury such as pinch points during servicing, replacement of fuses, and maintenance.		N/A
	Exception: A commercial or power unit may be provided with a marking - in lieu of other means - located adjacent to the part being guarded, to instruct the user that the cover or guard should be replaced before intended operation of the power unit. See 61.1.14.		N/A
7.6.7	A rotating or moving part that creates a risk of injury to persons if it should become disengaged shall be provided with a positive means to retain it in place under conditions of use.	No moving parts	N/A
7.6.8	An enclosure, a frame, a guard, a handle, or the like shall not be sharp enough to cause a risk of injury to persons in normal maintenance or use.		P
	Exception: This requirement does not apply to a sharp edge that might be exposed to enable the power unit to perform its intended function.		N/A
7.7	Modular units		N/A
7.7.1	Individual modules of a modular unit may be of the open construction - either no enclosure or a partial enclosure is supplied - provided that when the modules are assembled together in the field as intended, the unit complies with the requirements of this Standard. Identification of the modules and instructions for assembling shall be provided in accordance with 61.2.22 and 62.1.11. The provisions for electrical connection between modules shall comply with Section 14, Interconnections Between Sections.		N/A
8	Accessibility of Uninsulated Live Parts, Film-Coated Wire, and Moving Parts		P
8.1	An opening in the enclosure of a power unit shall not permit entrance of a 1-inch (25.4-mm) diameter rod. A smaller opening is acceptable if a probe as illustrated in Figure 8.1, when inserted through the opening, cannot be made to touch any uninsulated live part that may involve a risk of electric shock, film-coated wire that may involve a risk of electric shock, or moving part that may involve a risk of injury to persons.	No opening	N/A
8.2	The probe illustrated in Figure 8.1 is to be applied to any depth that the opening permits and with a force not greater than 1 pound (4.4 N), and is to be rotated or angled before, during, and after insertion through the opening to any position that is necessary to examine the power supply. The probe is to be applied in any possible configuration, and, if necessary, the configuration is to be changed after insertion through the opening.	No opening	N/A
8.3	A guard, baffle, or cover that can be removed without using a tool is to be removed when determining if a part is accessible to the user. A part that can be contacted by the probe illustrated in Figure 8.1 when inserted through an opening in a permanently-attached guard or baffle is considered to be accessible.	No such parts	N/A
8.4	A part on the back of a component mounting panel and a part located such that it requires major disassembly by using a tool are not considered to be accessible to the user; such parts are not considered accessible to the service personnel unless it is likely that servicing will be done while the parts are energized after disassembly.	No such parts	N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
8.5	An uninsulated live part that can cause electric shock shall be located or enclosed so that protection against unintentional contact is provided.		P
9	Protection of Service Personnel		N/A
9.1	General		N/A
9.1.1	These requirements apply to live parts used in circuits involving a risk of electric shock.		N/A
9.1.2	Live parts shall be so arranged and covers so located as to reduce the risk of electric shock when covers are being removed and replaced.	No cover	N/A
9.1.3	Consideration shall be given to a construction in which live parts are recessed at least 1/8 inch (3.2 mm) from the plane of the front of the fixed portion of the enclosure, and to an equivalent construction incorporating projections or guards.		N/A
9.1.4	An uninsulated live part involving a risk of electric shock and a moving part that involves a risk of injury to persons shall be located, guarded, or enclosed to reduce the likelihood of unintentional contact with such part by persons while changing a lamp or fuse, lubricating a motor, adjusting a control, or performing other like operations, including those performed only at the time of installation or during servicing procedures.		N/A
9.1.5	A live heat sink for a solid-state component, a live relay frame, a live part that can be mistaken for dead metal, and the like shall comply with the requirements in 9.2.2 and 9.3.1. Such a part shall also either be guarded to prevent contact by persons or be marked in accordance with 61.1.2.	No such construction	N/A
	Exception: This requirement does not apply to a heat sink mounted on a printed wiring board.		N/A
9.1.6	A means such as a bleeder resistor shall be provided to drain the charge stored in a capacitor to the extent that the potential, V, measured between the terminals of the capacitor 1 minute after the capacitor has been disconnected from its source of energy is less than 50 volts, and the energy stored, J, is less than 20 joules as determined by the following relation, in which C is in microfarads: $J = 5 \times 10^{-7} CV^2$		N/A
	Exception: The requirement does not apply if a tool is necessary to remove a panel to reach the capacitor and the power unit is marked to warn service personnel as specified in 61.1.15.		N/A
9.2	Mechanical servicing		N/A
9.2.1	The requirements in 9.2.2 are intended to provide a reasonable degree of protection to the service personnel performing mechanical functions on energized equipment. Such functions do not in themselves require exposure to live parts involving a risk of electric shock or to moving parts that involve a risk of injury to persons, but it is usually necessary to perform them with the equipment energized.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
9.2.2	An uninsulated live part involving a risk of electric shock and a moving part that involves a risk of injury to persons shall be located, guarded, or enclosed to prevent unintentional contact by service personnel adjusting or resetting controls, and the like, or performing mechanical service functions that may be performed with the equipment energized, such as lubricating a motor, adjusting the setting of a control with or without marked dial settings, resetting a trip mechanism, or operating a manual switch.		N/A
9.2.3	An adjustable or resettable electrical control or manual switching device may be located or oriented with respect to uninsulated live parts so that manipulation of the mechanism for adjustment, resetting, or operation can be accomplished in the normal direction of access if uninsulated live parts:	No such control	N/A
	a) Are not located in front - in the direction of access - of the mechanism; and		N/A
	b) Are not located near any side or behind the mechanism, unless guarded.		N/A
	Exception: This requirement does not apply to an uninsulated live part not involving a risk of electric shock.		N/A
9.3	Electrical servicing	No electrical servicing	N/A
9.3.1	An electrical component that may require examination, adjustment, servicing, or maintenance while energized shall be so located and mounted with respect to other components and with respect to grounded metal parts that it is accessible for electrical service functions without subjecting service personnel to the likelihood of electric shock or risk of injury to persons. Access to components in a power unit is not to be impeded by other components or by wiring in the direction of access.		N/A
9.3.2	Protection against the risk of electric shock and injury to persons may be obtained by mounting control components so that unimpeded access to each component is provided by an access cover or panel in the outer cabinet.		N/A
9.3.3	The electrical components referred to in 9.3.1 and 9.3.2 include the following: fuses, adjustable or resettable overload relays, magnetically operated relays, manual-switching devices, clock timers, and incremental voltage taps. Such components in a limited-energy circuit of 30 volts rms or less as defined in 6.13 and 6.15 shall comply with the requirements in 9.3.1 with respect to uninsulated live parts in a circuit of greater energy level and to moving parts involving a risk of injury to persons.		N/A
9.3.4	The following are not considered to be uninsulated live parts: coils and windings of relays, solenoids, and transformers that are provided with acceptable insulating overwraps at least 1/32 inch (0.8 mm) thick, or the equivalent; enclosed motor windings; terminals and splices with acceptable insulation; and insulated wire.		N/A
10	Assembly		P
10.1	An uninsulated live part shall be secured to the base or surface so that it is prevented from rotating or shifting in position as the result of stresses if such movement results in a reduction of spacings below the minimum acceptable values.	Uninsulated live part were secured to the base.	P

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Clause	Requirement – Test	Result – Remark	Verdict
10.2	A component such as a control switch, a lampholder, an attachment-plug receptacle, or a plug connector shall be mounted securely and shall be prevented from turning by means other than friction between surfaces.		P
	Exception No. 1: A switch need not comply with this requirement if all of the following conditions are met:		N/A
	a) The switch is a plunger or other type that does not tend to rotate when operated - a toggle switch is considered to be subject to forces that tend to turn the switch;		N/A
	b) The means for mounting the switch makes it unlikely that operation of the switch will loosen it;		N/A
	c) Spacings are not reduced below the minimum acceptable values if the switch rotates; and		N/A
	d) Intended operation of the switch is by mechanical means rather than by direct contact by persons.		N/A
	Exception No. 2: A lampholder of the type in which the lamp cannot be replaced, such as a sealed neon pilot or indicator light, need not comply with this requirement if rotation cannot reduce spacings below the minimum acceptable value.		N/A
10.3	A small stem-mounted device having a single-hole mounting may be prevented from rotating by a properly applied lock washer.		N/A
11	Protection Against Corrosion		P
11.1	Iron and steel parts shall be protected against corrosion by enameling, painting, galvanizing, plating, or an equivalent means.	Painted	P
	Exception No. 1: This requirement does not apply to bearings, laminations, and other parts of iron or steel such as washers and screws.		N/A
	Exception No. 2: A part need not be protected against corrosion if the corrosion of the part does not result in a risk of fire, electric shock, or injury to persons.		N/A
12	Supply Connections		P
12.1	Permanently-connected power units	Not permanently connected	N/A
12.1.1	A fixed power unit shall have provision for the connection of a wiring system.		N/A
12.1.2	A knockout in a sheet-metal enclosure shall be secured and shall be removable without undue deformation of the enclosure.		N/A
12.1.3	A knockout shall be surrounded by a flat surface to accommodate for seating of a conduit bushing or locknut of the appropriate size.		N/A
12.1.4	If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, or if an equivalent construction is employed, there shall not be less than three nor more than five full threads in the metal, and the construction of the device shall be such that a conduit bushing can be properly attached.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
12.1.5	If threads for the connection of conduit are not tapped all the way through a hole in an enclosure wall, conduit hub, or the like, there shall not be less than 3-1/2 threads in the metal and there shall be a smooth, rounded inlet hole for the conductors that shall afford protection to the conductors equivalent to that provided by a standard conduit bushing and that shall have an internal diameter approximately the same as that of the corresponding trade size of rigid conduit.		N/A
12.1.6	For an enclosure not provided with conduit openings or knockouts, spacings not less than the minimum required in this standard shall be provided between uninsulated live parts and a conduit bushing installed at any location likely to be used during installation. Permanent marking on the enclosure, a template, or a full-scale drawing furnished with the power unit may be used to limit such a location.		N/A
12.1.7	A field-wiring compartment in which power unit connections are to be made shall be located so that the connections may be readily inspected after the power unit is installed as intended.		N/A
12.1.8	A field-wiring compartment intended for connection of a wiring system shall be attached to the power unit so that it is prevented from turning.		N/A
12.1.9	An outlet box, terminal box, wiring compartment, or the like in which connections to the power unit circuit are made in the field shall be free from any sharp edge, including screw threads, a burr, a fin, a moving part, or the like, that may abrade the insulation on conductors or otherwise damage the wiring.		N/A
12.2	Wiring terminals and leads	No Wiring terminals and leads	N/A
12.2.1	The field-wiring terminals mentioned in 12.2.2 - 12.2.12 are terminals to which supply, control, output, or other permanent connections are made in the field when the power unit is installed.		N/A
12.2.2	Field-wiring terminals or leads shall be sized for the connection of conductors having an ampacity appropriate for the rating of the power unit.		N/A
12.2.3	A wiring terminal shall be provided with a pressure terminal connector securely fastened in place - for example, firmly bolted or held by a screw.		N/A
	Exception No. 1: A wire-binding screw may be employed at a wiring terminal intended for connection of a 10 AWG (5.3 mm ²) or smaller conductor if upturned lugs or the equivalent are provided to hold the wire in position.		N/A
	Exception No. 2: A wiring terminal need not be provided with a pressure terminal connector if the terminal is intended for connection of a 8 AWG (8.4 mm ²) or larger conductor, and the power unit complies with the requirements in 12.2.11.		N/A
12.2.4	A wiring terminal shall be prevented from turning or shifting in position by a means other than friction between surfaces. This may be accomplished by two screws or rivets; by square shoulders or mortises; by a dowel pin, lug or offset; by a connecting strap or clip fitted into an adjacent part; or by an equivalent method.		N/A
12.2.5	A wire-binding screw at a field-wiring terminal shall not be smaller than No. 10 (4.8 mm diameter).		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Exception No. 1: A No. 8 (4.2 mm diameter) screw may be used at a terminal intended only for the connection of a 14 AWG (2.1 mm ²) conductor.		N/A
	Exception No. 2: A No. 6 (3.5 mm diameter) screw may be used for the connection of a 16 AWG (1.3 mm ²) or 18 AWG (0.82 mm ²) control-circuit conductor.		N/A
12.2.6	A wire-binding screw shall thread into metal.		N/A
12.2.7	A terminal plate tapped for a wire-binding screw shall be of metal not less than 0.050 inch (1.27 mm) thick.		N/A
	Exception No. 1: A plate not less than 0.030 inch (0.76 mm) may be used if the tapped threads will not strip when subjected to the tightening torque specified in Table 12.1.		N/A
	Exception No. 2: A plate less than 0.030 inch (0.76 mm) thick may be used in a Class 2 circuit, Class 3 circuit, or an isolated-limited-energy circuit if the tapped threads will not strip when subjected to the tightening torque specified in Table 12.1.		N/A
12.2.8	There shall be two or more full threads in the metal of a terminal plate. The metal may be extruded at the tapped hole to provide at least two full threads.		N/A
	Exception: Two full threads are not required for a terminal in a Class 2 circuit, Class 3 circuit, or an isolated limited-energy circuit if a lesser number of threads results in a secure connection in which the threads will not strip when subjected to the tightening torque specified in Table 12.1.		N/A
12.2.9	Upturned lugs, a cupped washer, or the equivalent shall be capable of retaining a conductor of the size specified in 12.2.5 under the head of the screw or washer.		N/A
12.2.10	The free length of a lead inside an outlet box or wiring compartment shall be 6 inches (152 mm) or more if the lead is intended for field connection to an external circuit.		N/A
12.2.11	With reference to Exception No. 2 to 12.2.3, a pressure terminal connector is not required to be provided with a wiring terminal when the following conditions are met:		N/A
	a) A terminal assembly shall be either:		N/A
	1) Supplied by the manufacturer - installed or shipped separately; or		N/A
	2) Specified in a marking on the power unit in accordance with 61.2.15 and 61.2.16.		N/A
	b) A fastening device, such as a stud, nut, bolt, spring or flat washer, or similar device, as required for an effective installation, shall either be provided as part of the terminal assembly or be mounted on or separately packaged with the power unit.		N/A
	c) The installation of the terminal assembly shall not involve the loosening or disassembly of parts other than the cover or other part giving access to the terminal location. The means for securing the terminal connectors shall be readily accessible for tightening before and after installation of conductors.		N/A
	d) When the pressure terminal connector provided in a terminal assembly requires the use of a special tool for securing the conductor, any required instructions shall be included in the assembly package or with the power unit. See 61.2.17.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	e) After installation of the pressure terminal connector in the intended manner, the power unit shall comply with the requirements in this standard.		N/A
12.2.12	A terminal intended for connection of a grounded power supply conductor shall be made of or plated with metal substantially white in color and shall be readily distinguishable from other terminals.		N/A
	Exception: This requirement does not apply if proper identification of that terminal is clearly shown in some other manner, such as on an attached wiring diagram.		N/A
12.2.13	The surface of a lead for the connection of a grounded power unit conductor shall be white or grey and shall be readily distinguishable from the other leads.		N/A
12.3	Cord-connected power units		P
12.3.1	A portable or stationary power unit shall be provided with a flexible cord in accordance with Table 12.2 and an attachment plug for connection to the power supply circuit. The supply cord shall be attached permanently to the unit or shall be in the form of a detachable power supply cord with a means for connection to male contacts affixed to the unit. The length of cord external to the power unit and including the attachment plug shall not be less than 6 feet (1.8 m) as measured from the face of the attachment plug to the point of attachment or entry.	SJT, 18AWG x 3C. Not less than 1.8m	P
	Exception No. 1: A power unit weighing 1 pound (454 g) or less need not comply with the cord length requirements if the total length of the input and output cords is 6 feet (1.8 m) or more and the length of the input cord is at least 3 feet (0.91 m).		N/A
	Exception No. 2: This requirement does not apply to rack mounted power units. See 12.3.2.		N/A
	Exception No. 3: A power unit marked in accordance with 61.2.20 and provided with instructions in accordance with 62.1.10 need not be provided with the detachable power supply cord.		N/A
	Exception No. 4: If a power unit is intended for use in a country other than the U.S.A., the detachable power supply cord shall comply with the requirements of the country of destination.		N/A
12.3.2	A rack mounted power unit shall be provided with the shortest length of flexible cord for the purpose.	Not a rack mounted power unit	N/A
12.3.3	A stationary power unit intended to be fastened in place may require a form of supply connection that facilitates the interchange of equipment to maintain continuous service or otherwise meet special conditions of use. For such service, a Type S, SE, or equivalent flexible cord may be employed and may be of a length appropriate for the purpose, but no longer than 10 feet (3 m). Normally, a 24 inch (610 mm) length of cord is sufficient for the plug and receptacle connection.	Not a stationary power unit	N/A
12.3.4	A supply cord shall be:		P
	a) Of a type that is acceptable for the usage; and	SJT	P
	b) Acceptable for use at a voltage and ampacity no less than the rated voltage and ampacity of the power unit.	300V, 18AWG	P
12.3.5	The ampacity of the attachment plug for a power unit intended to be continuously loaded for 3 hours or more shall not be less than 125 percent of the input rating.	NEMA 5-15P	P

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Clause	Requirement – Test	Result – Remark	Verdict
12.3.6	If a unit with a permanently attached power supply cord can be adapted for use on two or more different voltages by field alteration of internal connections, the attachment plug provided with the unit shall be of a type required for the voltage and current for which the unit is shipped from the factory. The power unit shall be provided with instructions as described in 62.1.4.		N/A
12.3.7	If a multiple voltage rated power unit is intended for use with a detachable power supply cord, the cord shall be provided with the unit if either of the following apply:	Not with a detachable power supply cord	N/A
	a) The power unit is provided with an operator adjustable voltage selector and complies with 54.5.1; or		N/A
	b) The power unit is capable of operating at different voltages without user adjustment.		N/A
	Instructions shall be provided as described in 62.1.5. The power unit shall also be marked in accordance with 62.1.6.		N/A
	Exception: A power unit marked in accordance with 61.2.20 and provided with instructions in accordance with 62.1.10 need not be provided with the detachable power supply cord.		N/A
12.3.8	A power unit intended for use by travelers shall comply with (a) - (e):	Not intended for use by travelers	N/A
	a) The power supply input shall be a125 volt, 15 amp configuration;		N/A
	b) The power unit shall employ a user adjustable voltage selector and comply with 54.5.1, or be capable of operating at different voltages without user adjustment;		N/A
	c) The input voltage rating shall include nominal120 volt;		N/A
	d) The power unit shall be marked as indicated in 61.2.21; and		N/A
	e) The power unit shall be provided with instructions per 62.1.7.		N/A
12.3.9	In a power unit rated 125 volts or less, 125/250 volts (three-wire) or less, or 277 volts, the screw shell of an Edison-screw-shell lampholder shall be electrically connected to the cord conductor intended to be grounded. A switch or overcurrent-protective device of the single-pole type, other than an automatic control without a marked off position, shall be connected in a circuit to the cord conductor not intended to be grounded.	No such device	N/A
12.3.10	A power unit shall employ a polarized or grounding-type attachment plug.	grounding-type attachment plug.	P
12.4	Strain relief		P
12.4.1	Strain relief shall be provided to prevent mechanical twisting or stress on the supply cord or output cord from being transmitted to terminals, splices, or interior wiring. The means for preventing twisting is to be evaluated by inspection. The suitability of the strain relief is to be evaluated in accordance with 45.1.	Both for input power cord and output cord	P
12.4.2	A metal strain-relief clamp or band is acceptable without supplementary protection on a Type SV, SVO, SJ, SJE, SJO, S, SO, SJT, SJTO, ST, or STO cord. A metal strain-relief clamp or band is acceptable on a Type SP-2, SPE-2, SPT-2, SVE, SVT, or SVTO cord only if supplementary nonconductive, mechanical protection is provided over the cord.	No metal clamp	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
12.4.3	If a knot in a flexible cord serves as strain relief, the surfaces that the knot may touch shall be free from burrs, fins, sharp edges, and projections that can damage the cord.	No knot	N/A
12.4.4	Means shall be provided to prevent the flexible cord or lead from being pushed into the enclosure through the cord-entry hole when such displacement results in:		P
	a) Subjecting the supply cord or lead to mechanical damage;		P
	b) Exposing the supply cord or lead to a temperature higher than that for which it is rated;		P
	c) Reducing spacings (such as to a metal strain-relief clamp) below the minimum required values; or		P
	d) Damaging internal connections or components.		P
	To determine compliance, the supply cord or lead shall be tested in accordance with Section 47, Push-Back Relief Test.		P
12.5	Bushings		P
12.5.1	A bushing or the equivalent shall be provided at a point where a flexible cord passes through an opening in a wall, barrier, or enclosing case. The bushing shall be substantial, mechanically secured in place, and shall have a smooth, rounded surface against which the cord may bear. If a Type SP-2, SPE-2, or SPT-2 cord is employed, the wall or barrier is of metal, and the construction is such that the cord may be subjected to stress or motion, the bushing shall be an insulating bushing.	Bushing used	P
	Exception: For a cord hole in wood, porcelain, phenolic composition, or other nonconductive material, a smooth, rounded surface is considered to be the equivalent of an insulating bushing.		N/A
12.5.2	Ceramic materials and some molded compositions are acceptable for insulating bushings.		N/A
12.5.3	A bushing molded integrally with the supply cord is acceptable on Type SP-2, SPE-2, or heavier cord provided it is not less than 1/16 inch (1.6 mm) thick in the area where the cord passes through the enclosure.		P
12.5.4	An insulated metal grommet is acceptable as an insulating bushing if the insulating material is not less than 1/32 inch (0.8 mm) thick and completely fills the space between the grommet and the metal in which it is mounted.		N/A
13	Output Connections		P
13.1	Output terminals shall not be exposed unless they are used for Class 2 output circuits.		P
	Exception: A power unit may employ exposed terminals if the terminals are located in an isolated secondary circuit and all of the following conditions are met:		P
	a) The maximum output voltage (V_{max}) does not exceed 42.4 volts peak ac or 60 volts dc.	60Vdc	P
	b) The output current rating does not exceed 8 amperes for ac or dc voltages up to 30 V rms, or $150/V_{max}$ amperes for dc voltages between 30 V and 60 V.		P
	c) The exposed terminals comply with the requirements in 12.2.1 - 12.2.9.	No Wiring terminals and leads	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	d) A nonmetallic terminal cover is employed to reduce the likelihood of bridging between terminals. The cover shall be close-fitting over the top and all sides of the terminal block, with no opening other than those necessary for entry of conductors. The cover shall be attached so that it cannot be discarded. The nonmetallic material shall comply with the requirements in 7.1.5, and shall also comply with the requirements for resistance to hot-wire ignition in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.	UL recognized output connector	P
	e) The power unit is marked as required by 61.1.5.	Appliance employed with output cord	N/A
13.2	A metal enclosure of a power unit shall not be used as an output-circuit current-carrying part.	Metal Enclosure	N/A
13.3	A power unit having a flexible power supply cord shall be provided with an integral output cord terminating in a connector, or with a connector directly attached to the enclosure.		P
	Exception No. 1: A stationary power unit intended to be fastened in place may be provided with output connections for permanent wiring if the connections are enclosed but readily accessible by means of a hinged cover, access opening, or the equivalent. A standard trade size conduit knockout shall be provided for connection of the output conduit system. See 12.3.3.		N/A
	Exception No. 2: This requirement does not apply to a power unit output circuit complying with Exception No. 1 to 13.1.		N/A
13.4	The output flexible cord required by 13.3, whether permanently attached to the power unit or provided in the form of a separate cord set, is to be equivalent to the power supply cord specified in Table 12.2.	SJTW	P
	Exception: Output wiring for Class2 circuits may be parallel cord insulated with rubber, neoprene, or thermoplastic having a wall thickness not less than 0.013 inch (0.33 mm).		N/A
13.5	A battery charger provided with output contacts in a recessed compartment to accommodate a battery or battery pack shall either:		P
	a) Employ recessed contacts that are not accessible to the articulate probe (see Figure 8.1);		N/A
	b) Employ an interlock to de-energize contacts that are accessible to the articulate probe (see Figure 8.1) with the battery fully removed; or		N/A
	c) Have an output not exceeding 60 volts dc and employ contacts that do not provide electrical energy - high current levels (See 6.10).		P
13.6	A special application battery charger shall be provided with a special use polarized connector complying with the requirements in the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977.		P
13.7	A connector for an output circuit, other than one intended for use with a Class 2 circuit, shall comply with the requirements in the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977, or the Standard for Attachment Plugs and Receptacles, UL 498.	Comply with UL 1977	P
13.8	A connector intended for use with other than line voltage shall have a nonstandard pin configuration.	Nonstandard pin connector used	P

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Clause	Requirement – Test	Result – Remark	Verdict
13.9	A connector for an output not exceeding 42.4 volts peak or 60 volts dc shall have no exposed current carrying pins that could be short-circuited when placed on a flat metal surface.		P
13.10	A strain-relief means and a bushing for the output cord shall comply with the requirements in 12.4 and 12.5.		P
13.11	A rubber or neoprene bushing intended for use with Class 2 or Class 3 field-installed output wiring shall not be less than:	No class 2 and class 3 outputs	N/A
	a) 1/8 inch (3.2 mm) thick with the opening in which the bushing is mounted free from rough or sharp edges that may damage the bushing; or		N/A
	b) 3/64 inch (1.2 mm) thick with an opening that is eyeletted or otherwise provided with smooth edges.		N/A
14	Interconnections Between Sections		N/A
14.1	The means provided for external connection between sections of a unit or between units of a system shall comply with the requirements described in 14.2 - 14.10.	Not such construction.	N/A
14.2	A flexible-cord or -cable assembly used for interconnection shall be of a type as specified in Table 12.2 and shall be provided with bushings and strain relief in accordance with 12.4.1 - 12.5.4.	No Interconnections Between Sections	N/A
	Exception No. 1: The strain relief for wires and cables that are part of the secondary circuits mentioned in 36.5 - 36.15 shall comply with the Exception to 46.1.		N/A
	Exception No. 2: When an interconnecting cable is used, it shall be constructed of a thermoplastic or thermoset jacketed appliance wiring material, required for the maximum voltage, current, and temperature involved and shall be rated VW-1, FT-1, or better. The cable employed shall be classified for use for external interconnection of electronic equipment and equivalent to the flexible cords specified in Table 12.2.		N/A
14.3	Inserting a male connector in a female connector other than the one intended to receive it, misalignment of male and female connectors, and other manipulations of parts that are accessible to the operator shall not result in a risk of electric shock or electrical energy - high current levels to persons. See 14.5.	No Interconnections Between Sections	N/A
14.4	If either end of an interconnecting cable terminates in a connector having one or more exposed contacts, a risk of electric shock or electrical energy - high current levels shall not result between contacts and between earth ground and any contact that is exposed on either the connector or its receptacle while the connector is out of its receptacle. See 14.5 and 14.6.		N/A
14.5	Inclusion of an interlock circuit in the cable to de-energize the exposed contacts whenever an end of the cable is disconnected constitutes compliance with the requirement in 14.3 and 14.4.		N/A
14.6	Unless acceptable cable assemblies are provided, each section of a unit shall be provided with acceptable field-wiring terminals or leads to facilitate interconnection by means of permanently installed wiring.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
14.7	Sections of a unit that are intended to be combined in field installations to form overall unified enclosures (modular units - see 7.7.1) may be acceptable if the modules provide complete enclosures or the equivalent that facilitate the routing or interconnecting cables or other wiring from one unit of the system to another. Such constructions shall provide substantially complete enclosures for all wiring.		N/A
14.8	If interconnection of sections of a unit involves Class 2 circuits, the Class 2 circuits may be terminated in field-wiring connections other than specified in 14.6, such as wire-wrap or crimp-on types, if the Class 2 circuits are permanently separated from all other circuits and if the mating parts and instructions for their method of attachment are provided.	No Interconnections Between Sections	N/A
14.9	A connector used for interconnection between modules or for connection to an external control circuit shall comply with 13.7.		N/A
14.10	Sections of a unit interconnected by flexible metal conduit or flexible metal tubing shall be bonded together by an equipment grounding conductor. The size of the grounding conductor shall not be less than the circuit conductors contained within the conduit.		N/A

15	Battery Charger Backfeed Protection		P
15.1	The requirements in this Section apply to battery chargers intended to charge portable equipment or batteries for use with portable equipment such as battery powered tools (drills, saws, screwdrivers, and similar tools), telephones, radios, and similar products where the charger output is by means of an output cord and connector, or a connector attached to or integral with the charger enclosure.		P
15.2	A battery charger shall be provided with a means to inhibit backfeed of current during a fault in the output circuit. The means of prevention shall protect each output and shall consist of an output cord (if provided) equivalent to that specified in Table 12.2. The battery charger shall comply with the test specified in 54.9.		P
	Exception No. 1: A means of protection is not required when a specific battery or battery pack, to be used with the charger, does not exceed Class 2 parameters at any level of charge condition. See 61.1.11.		N/A
	Exception No. 2: A battery charger employing integral batteries is not required to comply with 15.1.		N/A

16	Grounding Connections		P
16.1	Power units required to comply with applicable grounding requirements are:		P
	a) A fixed or stationary power unit;		N/A
	b) A portable outdoor or commercial power unit;		N/A
	c) A portable power unit for use in a circuit involving a potential of more than 150 volts to ground; and	Rated 100-240V	P
	d) A power unit provided with a grounding means, whether required or not.		P
16.2	A fixed power unit shall be provided with a terminal or lead for grounding all dead metal parts that are exposed or are likely:		P
	a) To be touched by a person during operation or adjustment of the power unit; and		P

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Clause	Requirement – Test	Result – Remark	Verdict
	b) To become energized through an electrical fault.		P
16.3	To determine if a part is likely to become energized, the following factors are to be evaluated:		P
	a) The proximity of wiring;		P
	b) The results of a dielectric voltage-withstand test after a test such as the overload or the endurance test; and		P
	c) The results of appropriate burnout tests.		P
16.4	The grounding connection shall be located so that it is unlikely to be removed during normal servicing. The grounding connection shall penetrate any nonconductive coating, such as paint or vitreous enamel, over the part to be grounded.		P
16.5	A wire-binding screw for the connection of a field-installed equipment grounding conductor shall have a green colored head that is either hexagonal, slotted, or both. A pressure wire connector intended for connection of such a conductor shall be plainly identified by:		P
	a) A marking, such as "G," "GR," "GND," "Ground," "Grounding," or the like;	Marked	P
	b) A wiring diagram attached to the power unit; or		N/A
	c) The grounding symbol illustrated in Figure 16.1, on or adjacent to the terminal.	Marked	P
	The wire-binding screw or pressure wire connector shall be located so that it does not require removal during intended servicing of the unit.		P
16.6	The grounding terminal shall be capable of securing a conductor of a size required for the application in accordance with Column 2 of Table 17.2.		P
	Exception: A grounding terminal capable of securing a conductor of a size specified in 61.2.11 may be used.		N/A
16.7	A soldering lug, a screwless (push-in) connector, a quick-connect, or other friction-fit connector shall not be used. A sheet metal screw shall not be used to connect a grounding conductor or connection device to an enclosure.	No such construction	N/A
	Exception: A quick-connect terminal may be used in conjunction with solder for securing the grounding conductor.		N/A
16.8	A grounding conductor shall be a size specified in Column 2 of Table 17.2 or larger. A grounding lead shall have a free length of at least 6 inches (152 mm), and the surface of the insulation shall be green with or without one or more yellow stripes. No other lead in a field-wiring compartment or visible to the installer shall be so identified.	Intergraed within power cord set, 18AWG. Complied with Grounding Connections test	P
	Exception: The color coding requirement does not apply to a Class 2 circuit when the low voltage leads or terminals are either:		N/A
	a) Located remote from the line-voltage connections and the segregation complies with the requirements in 23.1 - 23.3; or		P
	b) Specifically marked so that reference to a wiring diagram is not required.		N/A
16.9	The surface of any insulation on the grounding conductor of a flexible supply cord shall be green with or without one or more yellow stripes and no other conductor shall be so identified.	Complied	P

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Clause	Requirement – Test	Result – Remark	Verdict
16.10	The grounding conductor shall be connected to the grounding blade of a grounding attachment-plug and shall be connected to dead metal parts within the frame or enclosure by means such as a screw or stud, nut, and lockwasher. An external force applied to the power supply cord shall not transmit stress to the grounding connection on the frame or enclosure before the line-voltage connections are broken.	Complied	P
16.11	A grounding connection, grounding conductor, enclosure, frame, component mounting panel, or any other part connected to earth ground shall not carry current except during an electrical fault.	Complied	P
	Exception No. 1: A Class 2 or an isolated limited-energy circuit may be connected to a single-point reference ground. Current is not to be carried through the field-equipment-grounding connection, metallic raceway, or other grounding means.		N/A
	Exception No. 2: A line by-pass capacitive impedance circuit for a radio frequency signal circuit need not comply with this requirement.		N/A
16.12	A grounded circuit conductor shall not be connected to any grounding or bonding circuit or device in a power unit.	Complied	P

17	Bonding of Internal Parts		P
17.1	General		P
17.1.1	If grounding is required - see 16.1 - an exposed dead metal part that is likely to become energized by an electrical fault shall be bonded to the point of connection of the field-equipment-grounding means. See 16.2 and 16.3. See also Bonding Conductor Test, Section 57.	No bonding conductor	N/A
17.1.2	Uninsulated dead metal parts such as a cabinet, component enclosure, and cover shall be electrically bonded together if they might be contacted by the user or service personnel.		P
	Exception No. 1: A metal panel or cover need not be bonded if it is either:		N/A
	a) Insulated from electrical components and wiring by a barrier of vulcanized fiber, varnished cloth, phenolic composition, or other moisture-resistant insulating material not less than 1/32 inch (0.8 mm) thick and mechanically secured in place;		N/A
	b) Not likely to become energized because uninsulated live parts are enclosed and wiring is positively separated from the panel or cover; or		N/A
	c) Separated from live parts and wiring by a grounded or bonded interposing metal barrier or part such that the metal barrier will be the first to be subjected to an electrical fault.		N/A
	Exception No. 2: An internal dead metal part need not be bonded if it is marked as specified in 61.1.3.		N/A
17.1.3	A metal part, such as an adhesive-attached metal marking plate, a screw, or a handle, located on the outside of an enclosure or cabinet, need not be bonded if it is:	No such parts	N/A
	a) Isolated from electrical components and wiring by a grounded metal part so that it is not likely to become energized; or		N/A
	b) Separated from wiring and spaced from uninsulated live parts as if it were a grounded part.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
17.1.4	In addition to the parts mentioned in 17.1.3, other parts not required to be bonded are small internal assembly screws, rivets, or other small fasteners, a handle for a disconnect switch, and a relay or contactor magnet and armature.		N/A
17.1.5	Uninsulated live parts and wiring shall be separated from a moving or movable part, such as a relay or contactor armature, a panel, or a cover by clamping, positioning, or an equivalent means that maintains permanent separation.		P
17.1.6	An internal connection for bonding an internal part to the enclosure may employ a quick-connect terminal of the dimensions specified in Table 17.1 if the connector is not likely to be displaced and the component is limited to use in a circuit having a branch-circuit protective device rated 20 amperes or less. A quick-connect terminal is not acceptable for a connection to be made in the field.	No such construction	N/A
17.2	Bonding conductor	No bonding conductor	N/A
17.2.1	Bonding shall be accomplished by a metal-to-metal contact of parts or by a separate bonding conductor as specified in 17.2.6.	No bonding conductor	N/A
17.2.2	A bonding conductor shall be copper, copper alloy, or other acceptable material.		N/A
17.2.3	Ferrous metal in the grounding path shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means.		N/A
	Exception: Corrosion protection is not required at electrical connections.		N/A
17.2.4	A separate bonding conductor:	No bonding conductor	N/A
	a) Shall be protected from mechanical damage or located within the outer enclosure; and		N/A
	b) Shall not be secured by a removable fastener used for a purpose in addition to bonding unless the bonding conductor is not likely to be omitted if the fastener is removed and replaced as intended.		N/A
	A bonding conductor shall be in metal-to-metal contact with the parts to be bonded.		N/A
17.2.5	A splice shall not be employed in a bonding conductor.	No bonding conductor	N/A
17.2.6	A separate component-bonding conductor shall either:	No bonding conductor	N/A
	a) Be not smaller than the size specified in Column 2 of Table 17.2;		N/A
	b) Be not smaller than the conductor supplying the component; or		N/A
	c) Comply with the Bonding Conductor Test, Section 56.		N/A
	Exception: This requirement does not apply to component bonding conductors complying with 17.2.7.		N/A
17.2.7	If more than one size of branch-circuit overcurrent-protective device is used, the size of a component-bonding conductor is to be based on the rating of an overcurrent-protective device providing ground-fault protection for that component. For a component individually protected by a branch circuit overcurrent-protective device rated less than the overcurrent-protective device used in the power unit circuit, a bonding conductor is to be sized on the basis of the component overcurrent-protective device rating.		N/A
18	Identification for Connection of Grounded Conductors	No such application	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
18.1	A unit rated as follows shall have the grounded conductor connected to the components, when provided, and as specified in 18.2 (a) - (c):		N/A
	a) 120 volts, 2-wire;		N/A
	b) 120/240 volts, single-phase, 3-wire;		N/A
	c) 208Y/120 volts, two-phase, 3-wire;		N/A
	d) 208Y/120 volts, three-phase, 4-wire;		N/A
	e) 480Y/277 volts, three-phase, 4-wire in which the neutral is used as a circuit conductor;		N/A
	f) 240/120 volts, three-phase, 4-wire in which the midpoint on one phase is used as a circuit conductor; or		N/A
	g) 240 or 480 volts, three-phase, 3-wire, corner-grounded delta.		N/A
18.2	The following components, when provided, shall be connected to the grounded conductor of a unit rated as shown in 18.1:	No such application	N/A
	a) The identified terminal or lead of a receptacle as specified in 31.8 and 31.9, as appropriate;		N/A
	b) The screw shell of an Edison-base lampholder; and		N/A
	c) The screw shell of an Edison-base fuseholder.		N/A
	The grounded conductor of a fixed unit shall be connected to the field-wiring terminal intended for the connection of a grounded conductor or shall be connected to the field-wiring lead intended for the connection of a grounded conductor. The grounded conductor of a stationary or portable unit shall be connected to the blade of the attachment plug intended for connection to the grounded supply conductor. A single-pole switch or single-pole overcurrent protective device, other than an automatic control without a marked "off" position, shall be connected to the ungrounded conductor. See also 28.11.		N/A
	Exception: The grounded conductor may be connected to a single-pole overcurrent protective device under the conditions described in Exception No. 2 of 29.5.		N/A

19	Wire Bending Space	Not such construction	N/A
19.1	A permanently connected unit employing pressure terminal connectors for field connection of circuits shall be provided with space within the enclosure as specified in 19.3 - 19.7 for the installation of conductors, including grounding conductors, required by the installation.		N/A
19.2	The conductor size used in evaluating the wiring space shall be based on the use of a conductor sized in accordance with 12.2.2.		N/A
19.3	Wire bending space for field installed conductors shall be provided opposite any:		N/A
	a) Pressure wire connector as specified in 19.4 or 19.5; and		N/A
	b) Opening or knockout for a conduit or wireway in a gutter as specified in 19.9.		N/A
19.4	When a conductor is intended to enter or leave the enclosure surface opposite its wire connector, the wire bending space shall be as specified in Table 19.1. When there is an opening or knockout for a wireway or conduit in a top, back, bottom, or side surface, this wire bending requirement applies.		N/A
19.5	When a conductor is not intended to enter or leave the enclosure surface opposite its wire connector, the wire bending space shall be as specified in Table 19.2. The wire bending space complies with Table 19.2 when:		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	a) A barrier is provided between the connector and the opening; or		N/A
	b) Drawings are provided specifying that the conductors are not to enter or leave the enclosure directly opposite the wire connector. See Illustrations A, B, and C of Figure 19.1.		N/A
19.6	When a conductor is restricted by a barrier or other means from being bent where it leaves the connector, the distance shall be measured from the end of the barrier. See illustration D of Figure 19.1.		N/A
19.7	For a unit not provided with a conduit opening or knockout, the minimum wiring bending space specified in 19.4 - 19.6 shall be based on:		N/A
	a) Any enclosure wall intended to be used for installation of the conduit; or		N/A
	b) Only specific walls that are to be used as determined by a marking, drawing, or template furnished with the unit.		N/A
19.8	The distance specified in 19.3 - 19.5 shall be measured in a straight line from the edge of the wire terminal closest to the wall in a direction perpendicular to the box wall or barrier. See illustrations A - C of Figure 19.1. The wire terminal shall be turned so that the axis of the wire opening in the connector is as close to perpendicular to the wall of the enclosure as it is able to assume without defeating any means provided to prevent turning, such as a boss, shoulder, walls of a recess, multiple bolts securing the connector, or similar means. A barrier, shoulder, or similar means shall be disregarded when the measurement is being made, when it does not reduce the radius to which the wire must be bent. When a terminal is provided with one or more connectors for the connection of conductors in multiple, the distance shall be measured from the wire opening closest to the wall of the enclosure.	No construction of Wire Bending Space	N/A
19.9	The width of a wiring gutter in which one or more knockouts are provided shall be large enough to accommodate (with respect to bending) conductors of the maximum size associated with that knockout. The values of the minimum required width of a wiring gutter, with respect to conductors entering a knockout, are the same as the values of minimum required bending space given in Table 19.2. See illustration E of Figure 19.1.	No construction of Wire Bending Space	N/A
	Exception: The wiring space may be of less width when:		N/A
	a) Knockouts are provided elsewhere that are in compliance with these requirements;		N/A
	b) The wiring space at such other point or points is of a width that accommodates the conductors in question; and		N/A
	c) The knockout or knockouts at such other points are able to be conveniently used in the intended wiring of the unit.		N/A
20	Output Circuit Grounding		N/A
20.1	The requirements for circuit grounding specified in 20.2 - 20.12 apply to the output circuit of fixed units and of units having standard configuration grounding type receptacles for the output ac power connections.	Not fixed units and of units having standard configuration grounding type receptacles for the output ac power connections.	N/A
20.2	An output ac power circuit shall be grounded when:		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	a) The circuit has no electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another wiring system;		N/A
	b) The circuit is rated 50 - 600 volts; and		N/A
	c) The circuit is as described in (1) - (3). See requirements for Alternating-Current Circuits and Systems to Be Grounded in the National Electrical Code, ANSI/NFPA 70, for other circuits:		N/A
	1) A circuit that is grounded so that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts. This requires that one conductor of each of the following circuits be grounded:		N/A
	i) 120 volts, 2-wire;		N/A
	ii) 240/120 volts, single-phase, 3-wire;		N/A
	iii) 208/120 volts, two-phase, 3-wire;		N/A
	iv) 208/120 volts, three-phase, 4-wire.		N/A
	2) A circuit nominally rated 480wye/277 volts, 3-phase, 4-wire in which the neutral is used as a circuit conductor.		N/A
	3) A circuit-nominally rated 240/120 volts, 3-phase, 4-wire in which the midpoint of one phase is used as a circuit conductor.		N/A
	For other units, an output ac power circuit complying with (a) is able to be grounded when the construction complies with the requirements described in 20.3 and 20.11.		N/A
20.3	With reference to 20.2, the conductor to be grounded shall be as follows:	Not fixed units and of units having standard configuration grounding type receptacles for the output ac power connections.	N/A
	a) Single-phase ac system, 2-wire - one conductor.		N/A
	b) Single-phase ac system, 3-wire - the neutral conductor.		N/A
	c) Multiphase ac system having one wire common to all phases - the common conductor.		N/A
	d) Multiphase ac system where one phase is used as in (b) above - the neutral conductor.		N/A
20.4	An output dc power circuit shall be grounded when:		N/A
	a) The circuit has no electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another wiring system;		N/A
	b) The circuit is intended to extend to premises wiring; and		N/A
	c) The circuit is as described in (1) or (2):		N/A
	1) Two wire rated from 50 to 300 volts.		N/A
	2) Three wire.		N/A
20.5	With reference to 20.4, the conductor to be grounded shall be as follows:		N/A
	a) Two wire dc system - one conductor.		N/A
	b) Three wire dc system - the neutral conductor.		N/A
20.6	An output ac power circuit rated less than 50 volts shall be grounded when:		N/A
	a) The circuit has no electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another wiring system;		N/A
	b) The circuit is intended to extend to premises wiring; and		N/A
	c) The circuit is supplied by a transformer where the transformer primary circuit:		N/A
	1) Exceeds 150volts to ground; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	2) Is ungrounded.		N/A
20.7	With reference to 20.6, the conductor to be grounded shall be one of the output circuit conductors.		N/A
20.8	With reference to 20.6, when the primary circuit to the transformer is derived from the secondary of another transformer, that circuit shall either be:		N/A
	a) Grounded in accordance with 20.9 and 20.10;		N/A
	b) Evaluated as being ungrounded; or		N/A
	c) Ungrounded.		N/A
20.9	Grounding of the circuits specified in 20.2 - 20.8 shall be made by a bonding jumper connected between the conductor to be grounded and dead metal parts that are grounded via the equipment grounding conductor.		N/A
	Exception: The following provisions may be made so that the circuit is able to be grounded in the field:		N/A
	a) A field-wiring terminal intended for use with a conductor size specified in Column 4 of Table 17.2 and identified in accordance with 12.2.12 or 12.2.13 shall be connected to the circuit by a bonding jumper of a size not less than specified in Column 4 of Table 17.2; and		N/A
	b) A marking identifying the circuit as a separately derived source and referencing the instruction manual in accordance with 61.2.13.		N/A
20.10	The size of the bonding jumper specified in 20.9 shall be, based on the current rating of the circuit, not less than the value specified in Column 4 of Table 17.2.	Not fixed units and of units having standard configuration grounding type receptacles for the output ac power connections.	N/A
20.11	A fixed unit shall be provided with a terminal that complies with 12.2.3 - 12.2.9 for connection of the grounding electrode conductor to the metal enclosure or equipment grounding conductor described in 20.9 (a) and (b). The terminal shall be:		N/A
	a) Capable of securing a conductor size, based on the maximum current rating of the circuit, as specified in Column 3 of Table 17.2; and		N/A
	b) Marked as described in 61.2.14.		N/A
20.12	For a unit having a polarized receptacle, lead, or terminal identified as a grounded circuit (see 12.2.12 and 12.2.13) that is not grounded at the unit itself because of an electrical connection to supply conductors originating in another wiring system [see 19.2(c)(1), 19.4(c), and 19.6(c)], a risk of electric shock shall not exist between ground and the grounded circuit contact, terminal, or lead. Compliance with this requirement shall be determined by the test specified in 53.1.		N/A
	Exception: The test described in 53.1 is not required when the input neutral and output neutral conductors are solidly connected together, that is, no electronic components connected between the neutral conductors.		N/A
21	Live Parts		P
21.1	A current-carrying part shall be of silver, copper, a copper alloy, or other material acceptable for the application.		P

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Clause	Requirement – Test	Result – Remark	Verdict
21.2	Aluminum may be used as a current-carrying part if determined to be acceptable with respect to heating, oxidation, and connection of dissimilar metals. A connection between aluminum and a dissimilar metal in which corrosion can occur shall be evaluated by the heat-cycling test specified in the Standard for Wire Connectors, UL 486A-486B.	No aluminum used	N/A
21.3	Plated iron or steel may be used for a current-carrying part:	No such parts	N/A
	a) If acceptable in accordance with 2.1;		N/A
	b) Within a motor, or associated governor; and		N/A
	c) In a secondary circuit rated 42.4 volts peak (30 volts rms), 60 V dc, or less.		N/A
	Stainless steel and other corrosion-resistant alloys may be used for current-carrying parts regardless of temperature.		N/A
21.4	Friction between surfaces is not acceptable as a means to prevent shifting or turning of a live part, but a properly applied lock washer is acceptable.		P
21.5	A live screwhead or nut on the back of a base or panel is to be countersunk not less than 1/8 inch (3.2 mm) and covered with a waterproof, insulating sealing compound that will not melt at a temperature 15°C (27°F) higher than the normal operating temperature of the component, but not less than 65°C (149°F).		N/A
	Exception: A part that is staked, upset, or otherwise reliably prevented from loosening need not be recessed and may be insulated from the mounting surface by material other than sealing compound or it may be acceptably spaced.		N/A

22	Internal Wiring		P
22.1	General		P
22.1.1	Unless it is to be judged as an uninsulated live part, insulated internal wiring - including an equipment-grounding conductor - shall consist of wire of a type or types acceptable for the application, when considered with respect to:	Power cord and output cord served as internal wire	P
	a) The temperature and voltage to which the wiring is likely to be subjected;		P
	b) Exposure to oil, grease, cleaning fluid, or other substances likely to have a deleterious effect on the insulation; and		N/A
	c) Other conditions of service to which it is likely to be subjected.		N/A
22.1.2	If the use of a short length of insulated conductor, such as a short coil lead, is not practical, electrical insulating tubing may be used on each conductor. The tubing shall be located so as not to be subjected to sharp bends, tension, compression, or repeated flexing, nor to contact with sharp edges, projections, or corners. The tubing shall not be used in wet locations. The wall thickness shall comply with the requirements for the tubing as a component.		N/A
22.1.3	The length of power supply cord inside a power unit shall be limited to that needed for electrical connections.	Not such application	P
22.1.4	Flexible-cord jacket inside the enclosure shall not be stripped to expose the individual conductors unless:		P
	a) The insulation on the individual conductors is equivalent to that required by 22.1.1;		P
	b) The individual conductors are supported in a manner positively separating them from live and dead metal parts; or		P

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Clause	Requirement – Test	Result – Remark	Verdict
	c) Supplementary insulation equivalent to that required by 22.1.1 is provided on each individual conductor.		P
22.2	Protection of wiring		P
22.2.1	Internal wiring shall be protected if, when judged in accordance with 8.1, it is accessible.	Not accessible	N/A
	Exception: Internal wiring need not be protected if it is located and secured within the enclosure so that it is not likely to be subjected to stress or mechanical damage.		P
22.2.2	Wires within an enclosure, compartment, raceway, or the like shall be located or protected to prevent contact with any sharp edge, burr, fin, moving part, or the like that can damage the conductor insulation.		P
22.2.3	A hole through which insulated wires pass in a sheet metal wall within the overall enclosure of a power unit shall be provided with smooth, rounded surfaces upon which the wires may bear, to prevent abrasion of the insulation.		N/A
22.3	Electrical connections		P
22.3.1	Aluminum conductors, insulated or uninsulated, used as internal wiring, such as for interconnection between current-carrying parts or in a component winding, shall be terminated at each end by a method acceptable for the combination of metals involved at the connection points.	No AL conductor	N/A
22.3.2	With reference to 22.3.1, a wire-binding screw or a pressure wire connector used as a terminating device shall be acceptable for use with aluminum under the conditions involved - for example, temperature, heat cycling, and vibration.	No wire-binding screw or a pressure wire connector	N/A
22.3.3	A splice or connection shall be mechanically secure and shall make acceptable electrical contact.	No splice or connection	N/A
22.3.4	A soldered connection shall be mechanically secured before being soldered.		P
	Exception: A wave- or lap-solder connection to a printed-circuit board is considered acceptable without any further mechanical security. A hand-soldered connection shall be mechanically secured, by a means such as bending or the equivalent, prior to being soldered.		N/A
22.3.5	A splice shall be provided with insulation equivalent to that of the wires involved unless permanent spacings are maintained between the splice and other metal parts.	No splice	N/A
	Exception: This requirement does not apply to a splice within a coil winding.		N/A
22.3.6	A splicing device such as a pressure wire connector may be employed if it provides mechanical security and insulation acceptable for the voltage and temperature to which it is subjected.	No splice	N/A
22.3.7	If the voltage involved is less than 250 volts, insulation consisting of two layers of thermoplastic tape, of two layers of friction tape, or of one layer of friction tape and one layer of rubber tape that has been investigated and found acceptable may be used on a splice. In determining if splice insulation consisting of coated fabric, thermoplastic, or other tubing is acceptable, consideration is to be given to such factors as its electrical and mechanical properties and its flammability. Thermoplastic tape wrapped over a sharp edge is not acceptable.	No splice	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
22.3.8	The means of connecting stranded internal wiring to a wire-binding screw shall be such that loose strands of wire will be prevented from contacting other live parts not always of the same polarity as the wire, and from contacting dead metal parts. This may be accomplished by the use of a pressure terminal connector, a soldering lug, a crimped eyelet, soldering of all strands together, or other acceptable means.	No such construction	N/A
22.3.9	An open-end spade lug is not acceptable unless an additional means, such as upturned ends on the lug, or bosses or shoulders on the terminal, is provided to hold the lug in place if the binding screw or nut loosens.		N/A
23	Separation of Circuits		P
23.1	Factory wiring		P
23.1.1	Insulated conductors of different circuits (see 23.1.2) within a unit, including wires in a terminal box or compartment, shall be either separated by barriers or segregated and shall be so separated or segregated from uninsulated live parts connected to different circuits.		P
	Exception: When each insulated conductor is provided with insulation rated for the highest of the circuit voltages, no barrier or segregation is required.		N/A
23.1.2	For the purpose of the requirement in 23.1.1, different circuits include:		P
	a) Circuits connected to the primary and secondary windings of an isolation transformer;		P
	b) Circuits connected to different isolated secondary windings of a multi-secondary transformer;		P
	c) Circuits connected to secondary windings of different transformers;		N/A
	d) Input and output circuits of an optical isolator;		P
	e) AC input power and output ac power circuits;		N/A
	f) AC input power and dc power circuits; and		P
	g) AC output power and dc power circuits.		N/A
	Exception: Power circuits specified in (e), (f), and (g) that are derived from the taps of an autotransformer or similar components which do not provide isolation are not different circuits.		N/A
23.1.3	Segregation methods which satisfy 23.1.1 include clamping, routing, or an equivalent means that maintains permanent separation from insulated and uninsulated live parts and from conductors of a different circuit.		P
23.1.4	An insulated live part is able to touch any insulated or uninsulated live part of the same circuit when one of the live parts is insulated for the higher potential.		N/A
23.2	Separation barriers	Not Separation barriers used	N/A
23.2.1	A barrier used to provide separation between the wiring of different circuits shall be mechanically supported and reliably held in place to prevent displacement, and it shall be:		N/A
	a) Grounded metal with a minimum thickness as specified for small surfaces in Table 7.1; or		N/A
	b) Insulating material complying with 35.3.1 of such thickness such that deformation does not occur to defeat its purpose.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
23.2.2	A barrier used to provide separation between field wiring of one circuit and field or factory wiring or uninsulated live parts of another circuit shall be spaced no more than 1/16 inch (1.6 mm) from the enclosure walls and interior mechanisms, component-mounted panels, and other parts that serve to provide separated compartments.		N/A
23.3	Field wiring	No field wiring	N/A
23.3.1	A unit shall be constructed so that a field-installed conductor of a circuit is capable of being separated as specified in 23.3.2 or separated by barriers as specified in 23.2.1 and 23.2.2 from:		N/A
	a) Factory-installed conductors connected to any other circuit, where the conductors are not insulated for the field-wiring voltage rating.		N/A
	b) An uninsulated live part of another circuit, and from an uninsulated live part when short circuit with it results in a risk of fire, electric shock, electrical energy involving high current levels, or injury to persons.		N/A
	c) Field-installed conductors connected to any other circuit unless both circuits are Class 2 or Class 3, or both circuits are other than Class 2 or Class 3.		N/A
	Exception: A field-installed conductor is not required to be separated from a field wiring terminal of a different circuit when the field wiring is insulated for the maximum voltage of either circuit and both circuits are Class 2 or Class 3.		N/A
23.3.2	Separation of a field-installed conductor from another field-installed conductor, and from an uninsulated live part connected to another circuit, is able to be accomplished by locating an opening in the enclosure for the conductor opposite to the conductor terminal so that, when the installation is complete, the conductors and parts of different circuits are separated by a minimum of 1/4 inch (6.4 mm). In determining whether a unit having such openings complies with this requirement, it is to be wired as in service including 6 inches (152.4 mm) of slack in each conductor within the enclosure. No more than average care is to be exercised in routing the wiring and stowing the conductor slack into the wiring compartment. Provisions for maintaining a minimum 1/4 inch spacing between field-installed Class 2 or Class 3 conductors and power, light, or Class 1 conductors are able to be in the form of a marking in accordance with 61.2.19.		N/A
23.3.3	With reference to 23.3.2, when the number of openings in the enclosure does not exceed the minimum required for the proper wiring of the unit, and when each opening is located opposite a set of terminals, it shall be assumed that a conductor entering an opening connects to the terminal opposite that opening. When more than the minimum number of openings are provided, the possibility of a conductor entering an opening other than the one opposite the terminal to which it is intended to be connected and the likelihood of it contacting insulated conductors or uninsulated current-carrying parts connected to a different circuit, are to be investigated.		N/A
24	Insulating Materials		P

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Clause	Requirement – Test	Result – Remark	Verdict
24.1	A barrier or integral part, such as an insulating washer or bushing, and a base or a support for mounting live parts, shall be moisture-resistant material that is not adversely affected by the temperature and stresses to which it is subjected under conditions of use.	Insulating material UL approved	P
24.2	Insulating material is to be judged with respect to its acceptability for the application. Materials such as mica, some molded compounds, and certain refractory materials are usually acceptable for the sole support of live parts. If an investigation is necessary to determine whether a material is acceptable, consideration is to be given to:		P
	a) Its mechanical strength, resistance to ignition, dielectric strength, insulation resistance, and heat-resistant qualities, in both the aged and unaged conditions;		P
	b) The degree to which it is enclosed; and		P
	c) Any other feature affecting the risk of fire, electric shock, or injury to persons.		P
	All factors are to be considered with respect to conditions of actual service.		P
24.3	Ordinary vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but not as sole support for uninsulated live parts.		N/A

25	Motors	No motor	N/A
25.1	A motor shall be protected from overheating due to overload and locked-rotor conditions.		N/A
	Exception: A motor that is used for air-handling only - direct drive blower or ventilating fan - is to be protected against locked-rotor conditions but need not be protected against overload conditions.		N/A
25.2	The overload protection required by 25.1 may be accomplished by one of the following:		N/A
	a) Thermal protection complying with the applicable requirements in the Standard for Overheating Protection for Motors, UL 2111 or the Standard for Thermally Protected Motors, UL 1004-3;		N/A
	b) Impedance protection complying with the requirements in the Standard for Impedance Protected Motors, UL 1004-2; or		N/A
	c) Protection equivalent to that specified in (a).		N/A
25.2	revised May 14, 2014. UL 1004-3 will replace Part III of UL 2111 effective September 15, 2014.		N/A
25.3	A shaded-pole motor having a difference of 1 ampere or less between no-load and locked rotor currents and having a 2 to 1 or smaller ratio between locked-rotor and no-load currents is considered to have acceptable overload protection if it is protected against locked-rotor conditions only.		N/A

26	Transformers		P
26.1	General		P
26.1.1	A transformer coil, unless inherently moisture resistant, shall be treated with an insulating varnish and baked, or otherwise impregnated to exclude moisture or acid vapor. Film-coated magnet wire is identified as moisture resistant.	Film-coated	P

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Clause	Requirement – Test	Result – Remark	Verdict
26.1.2	A thermal cutoff or other device employed to reduce the risk of fire or electric shock due to overheating of a transformer during abnormal operation shall comply with the requirements applicable to such a device in addition to the applicable requirements in this standard. For example, a thermal cutoff shall comply with the applicable requirements in this standard and those in the Standard for Thermal-Links - Requirements and Application Guide, UL 60691.		N/A
26.1.3	A transformer shall be of the isolating type and comply with 26.1.4 when it supplies:	Isolating Type	P
	a) LVLE circuits which exit the enclosure; or		N/A
	b) Accessible signal circuits as described in Section 37, Accessible Signal Circuits.	No accessible signal circuits.	N/A
	The acceptability of an insulation system in a transformer used to supply circuits other than noted in (a) or (b) is to be determined by the applicable abnormal tests specified in 54.1, 54.2, 54.7, and 54.10.	Transformer complies	P
26.1.4	A transformer used where isolation is required, in accordance with 26.1.3, shall have its windings electrically isolated from separate windings and shall be constructed as specified in 26.2.1 - 26.2.4 so that there is no electrical connection - under normal and overload conditions - between the primary and secondary windings, between the primary winding and the core, or between separate adjacent secondary windings, when such connection results in a risk of fire or electric shock.		P
26.1.5	With reference to the requirement in 26.1.4, a transformer complying with the requirements in one of the following standards meets the intent of this requirement:		N/A
	a) The Standard for Low Voltage Transformers - Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers, UL 5085-3;		N/A
	b) The Standard for Class 2 Power Units, UL 1310; or		N/A
	.c) The Standard for Transformers and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances, UL 1411.		N/A
26.2	Coil insulation		P
26.2.1	A transformer winding including the start, all taps, finish, and crossover leads up to the point where insulated leads are provided shall be constructed, when used, as specified in Table 26.1.		P
26.2.2	Insulating material, such as outer-wrap and crossover-lead insulation, employed to reduce the risk of live parts from becoming accessible through openings in the outer enclosure in accordance with Accessibility of Uninsulated Live Parts, Film-Coated Wire, and Moving Parts, Section 8, shall comply with note (a) or (c) of Table 26.1.		P

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Clause	Requirement – Test	Result – Remark	Verdict
26.2.3	A flanged bobbin-wound transformer shall be constructed so as to maintain physical separation between the primary and secondary windings. Physical separation shall be accomplished by employing a 3-flange bobbin for winding the primary and secondary windings adjacent to each other or using a telescoping bobbin construction with each section containing an individual winding where the primary winding is wound over the secondary winding or the secondary winding is wound over the primary winding. The bobbin insulation shall comply with note (a), (b), (c), or (d) of Table 26.1.	Not flanged bobbin-wound transformer	N/A
	Exception No. 1: A 2-flange bobbin having the primary winding wound over the secondary winding, or the secondary winding wound over the primary winding with the primary winding insulated from the secondary winding by means of tape insulation, may be used when:		N/A
	a) The tape insulation complies with note (a) or (c) of Table 26.1;		N/A
	b) The tape insulation provides a continuous 1/32 inch (0.8 mm) overlap on the bobbin flanges; and		N/A
	c) The transformer complies with the tests described in the Flanged Bobbin Transformer Abnormal Test, Section 55 (see 26.2.4).		N/A
	Exception No. 2: A 2-flange bobbin having the primary winding wound over the secondary winding, or the secondary winding wound over the primary with the primary winding insulated from the secondary winding by means of tape insulation, may be used when:		N/A
	a) The tape insulation complies with note (a) or (c) of Table 26.1;		N/A
	b) The coils are layer wound; and		N/A
	c) All windings have end turns retained by a positive means and the spacing between end margins of the primary and secondary windings comply with Table 26.1(d).		N/A
	Exception No. 3: A transformer complying with the requirements in the Standard for Class 2 Power Units, UL 1310; the Standards for Low Voltage Transformers - Part 1: General Requirements, UL 5085-1, and Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers, UL 5085-3; or the Standard for Transformers and Motor Transformers for Use in Audio-, Radio-, and Television Type Appliances, UL 1411, meets the intent of this requirement.		N/A
	Exception No. 4: Physical separation of the primary and secondary windings is not required for units employing multiple layered wire which has been evaluated to the requirements for miscellaneous insulating devices and materials of the Standard for Polymeric Materials - Short Term Property Evaluations, UL 746A, the Standard for Polymeric Materials - Long Term Property Evaluations, UL 746B, and the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.		N/A
26.2.4	With reference to Exception No. 1(c) to 26.2.3, the Flanged Bobbin Transformer Test of Section 55 is not required when the transformer:		N/A
	a) Is supplied from a LVLE circuit in accordance with 6.15, or a limited energy circuit in accordance with 6.13; or		N/A
	b) Complies with the requirements in 36.5 - 36.13.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
27	Resistors		N/A
27.1	The assembly of a power resistor such as a wire-wound type requiring a separate support shall be prevented from loosening or rotating by means other than friction between surfaces.	No such resistors	N/A
27.2	An assembly employing lock washers may be considered to comply with the requirement in 27.1.		N/A
28	Switches and Controls	No switch	N/A
28.1	A switch or other control device shall have current and voltage ratings not less than those of the circuit that it controls when the power unit is operated in its intended manner.		N/A
	Exception: A switch or other control device not having an inductive rating that is connected in a transformer secondary circuit of 50 volts rms or less and that complies with the requirements for Overload of Switches and Controls, Section 48, need not comply with this requirement.		N/A
28.2	A primary-circuit switch that controls an inductive load having a power factor less than 75 percent, such as a transformer or some ballasts and that does not have an inductive rating, shall be rated not less than twice the full-load current rating of the load, or the switch shall be investigated for the application.		N/A
28.3	Unless acceptably rated, a switch or other device that controls a motor and is not interlocked so that it will not break the locked-rotor motor current shall be subjected to the overload test required by 48.3 and described in 48.4.	No motor	N/A
28.4	A switch that controls a tungsten-filament lamp shall have a tungsten-filament-lamp current rating not less than the maximum current it will control.	Not such construction	N/A
	Exception: A switch not having a tungsten-filament-lamp current rating and rated 3 amperes or more may be used to control a 15-watt or smaller lamp.		N/A
28.5	A fixed power unit that is intended for connection to more than one source of supply shall be provided with one manually operable disconnect control device (separate switch or breaker, set of contacts, or the like) of an indicating type for each source of supply entering the power unit that involves a risk of electric shock or electrical energy-high current levels. If more than one such disconnect switch or other control is provided on the power unit, all of the following conditions shall apply:	Not such construction	N/A
	a) All such devices shall be grouped together;		N/A
	b) Each device shall be marked to identify its function;		N/A
	c) There shall be a prominent and permanent marking with the group of devices to indicate the switches and controls that must be off to completely disconnect the power unit.		N/A
	Exception: A clock or timing device on or remote from the power unit may remain energized if there is a marking indicating that the clock remains energized while the power unit is off.		N/A
28.6	Both the "on" and "off" positions of the disconnect control devices mentioned in 28.5 and of the main disconnect switch on portable or stationary equipment, if provided, are to be marked with the words "ON" and "OFF." The symbols illustrated in Figure 28.1 may be used for this purpose. Identification by illumination only is not acceptable.	Not such construction	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
28.7	A switch provided as part of a power supply shall be acceptable for the maximum potential to ground of the circuit. A nominal 208-volt, single- or 3-phase, or a 120/240-volt, single-phase product is considered to involve a potential to ground of less than 150 volts. A 2-wire, single-phase or a 3-wire, 3-phase product with a rating in the range from 220 - 240 volts is considered to involve a potential to ground in excess of 150 volts.		N/A
	Exception: A2-wire, single-phase or a 3-wire, 3-phase product with a rating in the range of 220 - 240 volts may be connected to a supply circuit having a potential to ground of 150 volts or less if marked as described in 61.1.12.		N/A
28.8	If unintentional operation of a switch results in a risk of injury to persons, the switch shall be located or guarded so that such operation is unlikely.	Not such construction	N/A
28.9	The actuator of a switch may be guarded by recessing, ribs, barriers, or the like.		N/A
28.10	An on-off switch shall have a marked "off" position so that the operator can readily determine by visual inspection when the power unit is de-energized.	Not such construction	N/A
	Exception No. 1: This requirement does not apply to a switch complying with 28.6.		N/A
	Exception No. 2: The on-off switch may be marked with both of the symbols in Figure 28.1 in lieu of the marked "off" position.		N/A
28.11	A switch shall not disconnect the grounded conductor of a circuit.		N/A
	Exception No. 1: The grounded conductor may be disconnected by a switch that simultaneously disconnects all conductors of the circuit.		N/A
	Exception No. 2: The grounded conductor may be disconnected by a switch that is so arranged that the grounded conductor is not able to be disconnected until the ungrounded conductors of the circuit have been disconnected.		N/A
29	Overload-Protective Devices		P
29.1	A protective device, the intended functioning of which requires renewal, replacement, or resetting, shall be accessible:	Fuse are used and does not require replace by the user	P
	a) From outside of the enclosure; or		N/A
	b) Behind a hinged cover (see 7.5.2).		N/A
	Exception: A protective device that is unknown to the user because of its location and omission of reference to the device in the operating instructions, circuit diagrams, and other instructional materials provided with the power unit is not required to comply with this requirement.		N/A
29.2	With reference to the requirement in 28.1, a control-circuit fuse is not considered to require renewal as an intended function provided the fuse and the load are contained within the same enclosure.		N/A
29.3	A circuit breaker connected in the input circuit shall open all ungrounded conductors.	No circuit breaker	N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	Exception: If the power unit has provision for connection of a grounded neutral conductor, individual single-pole circuit breakers are acceptable as the protection for each ungrounded conductor of a 3-wire single phase circuit or for each ungrounded conductor of a 4-wire, 3-phase circuit, provided that no conductor involves a potential to ground in excess of 150 volts. See 61.1.9.		N/A
29.4	For a vertically mounted circuit breaker, the down position shall be the "off" position.	Not such construction	N/A
29.5	An overcurrent protective device shall not be connected in the grounded (neutral) side of the line.		P
	Exception No. 1: Additional overcurrent protection may be provided in the grounded side of the supply circuit when the protective device simultaneously disconnects the grounded and ungrounded conductors of the supply circuit.		N/A
	Exception No. 2: A unit may incorporate a single-pole overcurrent protective device connected in the grounded (neutral) side of the line when:		N/A
	a) The grounded circuit conductor is not depended on to carry a current imbalance, such as in a unit supplied by a 3-phase, 4-wire or a single-phase, 3-wire system;		N/A
	b) Each ungrounded circuit conductor is provided with an overcurrent protective device having a current rating no higher than that of the overcurrent protective device in the grounded circuit conductor;		N/A
	c) The screw shell of a plug fuseholder and the accessible contact of an extractor fuseholder located in the grounded circuit conductor is connected toward the grounded supply line; and		N/A
	d) The unit is marked in accordance with 61.1.10.		N/A
30	Fuses and Fuseholders		P
30.1	A fuse and a fuseholder shall have voltage and current ratings acceptable for the circuit in which they are connected.	250Vac, 6.3A	P
30.2	A fuse that is used to provide short-circuit protection for output circuits in a household power unit shall not be interchangeable with a fuse of a higher ampere rating.		N/A
30.3	A fuse that is used to provide short circuit protection for output circuits in a commercial power unit shall be marked in accordance with 61.1.7.		N/A
30.4	The screw shell of a plug-type fuseholder and the upper terminal of an extractor-type fuseholder shall be connected toward the load.		N/A
30.5	Unless acceptable for the application, a fuse and fuseholder combination connected, but not required, in an output circuit having an open-circuit voltage not exceeding 50 volts rms shall be subjected to the test described in 54.4.1.		N/A
31	Output Alternating Current Power Circuits		N/A
31.1	Each ac output power circuit shall be provided with overcurrent protection for all ungrounded conductors as described in 31.3 - 31.5. The voltage rating of the overcurrent protection shall not be less than the rating of the circuit with which it is used. The overcurrent protection device shall be a circuit breaker or a fuse suitable for use as branch circuit protection.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	Exception No. 1: Overcurrent protection is not required to be provided for an output where the current is limited to not more than 110 percent of the receptacle rating by construction of a transformer, one or more resistors, or a regulating network complying with 54.8.1.		N/A
	Exception No. 2: An appliance protector complying with the requirements in the Standard for Supplementary Protectors for Use in Electrical Equipment, UL 1077, may be used in the output circuit of a unit supplied by a transformer in lieu of a branch circuit protection fuse or circuit breaker when all of the following are met:		N/A
	a) The protector is an overcurrent type or a shunt trip overcurrent type;		N/A
	b) The protector tripping current rating is not greater than 135 percent of the protector amp rating;		N/A
	c) The protector complies with the UL 1077 short-circuit test conducted without series overcurrent protection;		N/A
	d) The protector complies with the UL 1077 recalibration test following short-circuit testing; and		N/A
	e) The protector short circuit current rating is not less than the maximum fault current available.		N/A
	Exception No. 3: A fuse having a short-circuit interrupting rating not less than the maximum fault current available from the unit and complying with the requirements in the Standard for Low-Voltage Fuses - Part 14: Supplemental Fuses, UL 248-14, may be used in the output circuit of a unit supplied by a transformer in lieu of a branch circuit protection fuse or circuit breaker.		N/A
	Exception No. 4: Overcurrent protection is not required to be provided with a unit having provision for permanent wiring connection of the output circuit and provided with an instruction manual indicating that the overcurrent protection is to be provided by others.		N/A
31.2	The voltage rating mentioned in 31.1 for a 3-phase circuit shall be based on the phase-to-phase voltage.		N/A
31.3	For a unit having provision for permanent wiring connection of the ac output power circuit, the rating of the overcurrent protection shall not exceed the ampacity of the conductors intended to be connected to the unit, as determined in accordance with 12.2.2.		N/A
31.4	For a unit provided with a cord and receptacle for connection of the output, the rating of the overcurrent protection shall not exceed the ampacity of the cord or the current rating of the receptacle, whichever is less.		N/A
31.5	Overcurrent protection shall be provided for each standard configuration output receptacle. A single overcurrent protection device with a rating not exceeding the ampere rating of any receptacle to which it is connected may be used in conjunction with multiple receptacles if all receptacles are connected in parallel.		N/A
	Exception No. 1: Two or more 15 ampere rated receptacles may be protected by a 20 ampere overcurrent protection device.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Exception No. 2: A stationary unit having an input ac attachment plug that has both, a current and voltage rating not exceeding the current and voltage rating of any of the output ac receptacles, need not be provided with overcurrent protection.		N/A
	Exception No. 3: A unit having provisions for permanent input wiring connections need not be provided with overcurrent protection provided that the current and voltage ratings of the output ac receptacles do not exceed the current and voltage ratings of the intended input branch circuit overcurrent protection device.		N/A
31.6	A standard configuration receptacle in a power unit provided with means for grounding shall be of the grounding type. See 31.9.		N/A
31.7	A standard configuration receptacle in a power unit provided with a polarized nongrounding type attachment plug shall be of the polarized nongrounding type when the receptacle is connected to the primary circuit.		N/A
31.8	When a standard configuration receptacle is supplied from the input ac supply circuit, the white or silver terminal of the receptacle shall be connected to the grounded supply conductor, and the grounding terminal of the receptacle, when applicable (see 31.7), shall be conductively connected to the equipment grounding means per the requirements specified in Section 17, Bonding of Internal Parts. See also 18.1 and 16.7.		N/A
31.9	With reference to 31.6 and 31.8, when a grounding type receptacle other than an isolated-grounding type is supplied from the secondary of a transformer:		N/A
	a) The side of the secondary winding connected to the white or silver terminal of the receptacle shall be grounded per the requirements in 20.1, 20.2, and 20.3; and		N/A
	b) The grounding terminal of the receptacle, when applicable (see 31.7) shall be conductively connected to the equipment grounding means per Section 17, Bonding of Internal Parts, and 16.7.		N/A
31.10	For an isolated-ground receptacle, the grounding terminal intended for connection to an insulated grounding conductor shall not be conductively connected to the equipment grounding means. See 31.11.		N/A
31.11	With reference to the 31.10, a unit provided with an isolated-ground receptacle shall comply with the following:		N/A
	a) Provisions for permanent wiring connections shall be provided for the ac supply conductors; and		N/A
	b) Provisions for connection of two equipment grounding conductors - one for grounding dead metal parts of the unit specified in 16.1 - 16.3 and the other for grounding the grounding terminal of the isolated-ground receptacle - shall be provided. These provisions shall comply with the requirements in Section 16, Grounding Connections.		N/A
32	Lampholders	No lampholder	N/A
32.1	A lampholder shall be designed or installed so that uninsulated live parts, other than a screw shell, will not be exposed to contact by persons removing or replacing the lamp in intended service.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
32.2	A medium-base screw-shell lampholder shall not be used in a circuit involving a potential of more than 150 volts.		N/A
33	Capacitors		P
33.1	A capacitor connected across the line, such as a capacitor for radio-interference elimination or power-factor correction, shall be housed within an enclosure or container that protects the plates against mechanical damage and prevents the emission of flame or molten material resulting from breakdown of the capacitor.		P
33.2	The container of a capacitor shall be of metal providing strength and protection not less than that of uncoated steel having a thickness of 0.020 inch (0.51 mm).		N/A
	Exception: The container may be of thinner sheet metal or may be of material other than metal, if mounted inside a power unit having an enclosure that complies with the requirements in 7.1.1 - 7.1.5.		N/A
33.3	A container of an electrolytic capacitor having a thickness less than that required by 33.2 shall employ a means for venting.		N/A
34	Printed Wiring	UL recognized PCB	P
34.1	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. The use of material classed V-2 requires the use of a closed bottom in the equipment beneath the material or an equivalent barrier.	V-0	P
34.2	A resistor, capacitor, inductor, or other part that is mounted on a printed-wiring board to form a printed circuit assembly shall be secured so that it cannot be displaced to cause a risk of electric shock or fire by a force likely to be exerted on it during assembly, intended operation, or servicing of the power unit.		P
34.3	With reference to 34.2, consideration is to be given to a barrier or a partition that is part of the power unit assembly and that provides mechanical protection and electrical insulation of a component connected to the printed-wiring board.		N/A
35	Spacings		P
35.1	General		P
35.1.1	The spacings for a unit intended for use in a general environment shall not be less than the applicable values specified in Table 35.1. Spacings for a unit intended for use in a controlled environment (see 6.8 and 35.1.3) shall not be less than the applicable values specified in Table 35.2. For the purpose of this requirement, a general environment is an environment other than a controlled environment.	Line Voltage to isolated circuit: Through air and oversurface measured: min 6.6mm. Live part to enclosure: min 7.2mm Complied with table 35.1	P
	Exception No. 1: The spacings of 35.1.1 are not required when the unit complies with 35.3.1 and when liners and barriers are used.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Exception No. 2: The spacing requirements of 35.1.1 shall not apply to the area between adjacent foils on printed-wiring boards provided with a conformal coating complying with the requirements in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.		N/A
	Exception No. 3: On printed-wiring boards having a flammability classification of V-0 in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, spacings (other than spacings to dead metal traces, between primary and secondary circuits, and at field wiring terminals) are not specified between traces of different potential connected in the same circuit when:		N/A
	a) The spacings are adequate to comply with the requirements in 54.11, Evaluation of reduced spacings on printed-wiring boards; or		N/A
	b) An analysis of the circuit indicates that no more than 12.5 mA of current is available between short-circuited traces having reduced spacings.		N/A
	Exception No. 4: For multilayer-printed wiring boards, the minimum spacing between adjacent internal foils of opposite polarity and between an internal foil and a plated-through hole is 1/32 inch (0.79 mm). When these foils are in circuits described in 35.1.11 or 35.1.12, no spacing is specified.		N/A
	Exception No. 5: The spacing requirements in Tables 35.1 and 35.2 are not required to apply to inherent spacings of a component such as a switch, lampholder, power switching semiconductor, or a motor. See 35.1.6.		N/A
	Exception No. 6: Spacings within a transformer shall be provided in accordance with Table 26.2 at locations that are not insulated, including those with film-coated magnet wire.		P
	Exception No. 7: Spacing requirements do not apply between adjacent terminals of a power switching semiconductor device including the connection points of the terminals of the device.		N/A
	Exception No. 8: The spacing requirements of 35.1.1 do not apply when the alternative spacings of 35.2 are met.		N/A
	Exception No. 9: The spacing requirements of 35.1.1 shall not apply to areas between live parts potted in epoxy or equivalent material. See 35.1.2.		N/A
35.1.2	With reference to Exception No. 9 to 35.1.1, epoxy or equivalent material is able to be used to reduce spacings, when all of the following are met:		N/A
	a) Spacings of minimum 1/32 inch (0.8 mm) are maintained prior to application of the encapsulant;		N/A
	b) There are no significant voids in the encapsulant;		N/A
	c) The encapsulant is minimum 1/32 inch thick;		N/A
	d) The area of reduced spacing, with encapsulant applied, withstands the applicable Dielectric Voltage Withstand Test described in Section 43; and		N/A
	Exception: When the normal operating potential between the parts under consideration does not exceed 600 V rms, the dielectric test is not required to be conducted.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	e) The encapsulant temperature during the Temperature Test of Section 42 does not exceed 65°C (117°F) rise [based on an assumed operating ambient rating of 25°C (45°F)] or 90°C (194°F) limit (when tested at an ambient rating of greater than 25°C).		N/A
	Exception: When the encapsulant has been investigated and rated for a higher operating temperature, the temperatures shall not exceed the material temperature rating.		N/A
35.1.3	Units investigated for use in a controlled environment indicated in 35.1.1 shall be marked as described in 61.1.6.	Not for controlled environment	N/A
35.1.4	When an uninsulated live part is not rigidly secured in position by means other than friction between surfaces, or when a movable dead metal part is in proximity to an uninsulated live part, the construction shall be such that, for any position resulting from turning or other movement of the parts in question, at least the minimum required spacings are maintained.	Secured in place	N/A
35.1.5	With reference to 35.1.4, a properly applied lock washer rigidly secures a part.		N/A
35.1.6	Inherent spacings of the components specified in Exception No. 5 to 35.1.1 shall comply with the requirements for the component in question, when the spacings are less than the values specified in this standard. Spacings from such components to another component and to the enclosure shall comply with the appropriate spacings specified in this standard.		N/A
35.1.7	With respect to evaluating spacings, spacings between uninsulated parts of different circuits shall be based on the highest of the circuit voltages. See 43.3.1 - 43.3.3.		P
35.1.8	For the purpose of evaluating spacings, film-coated wire is an uninsulated live part.		P
35.1.9	Spacings at field-wiring terminals shall be measured with conductors installed in the terminals. The gage of these conductors is based on the rating of the circuit containing the terminals. See 12.2.2.		N/A
35.1.10	Spacings between uninsulated live parts of different potential and between such parts and dead metal that are able to be grounded in service are not specified for parts of LVLE circuits, in accordance with 6.15, nor in accessible signal circuits described in Section 37, Accessible Signal Circuits.		N/A
35.1.11	Spacings between uninsulated live parts of different potential and between such parts and dead metal that is able to be grounded in service are not specified for parts of limited-energy circuits, in accordance with 6.13. Spacings in these circuits are judged by the applicable dielectric voltage-withstand test described in Section 43, Dielectric Voltage-Withstand Test.		P
35.1.12	When a circuit is not a safety circuit, spacings within the circuit are not specified for isolated secondary circuits supplied by a source with:		P
	a) A maximum output of 200 VA; or		P
	b) A maximum output of 100 volts.		P
	The spacings in these circuits shall be judged on the basis of the Dielectric Voltage-Withstand Test, Section 43. See 35.1.13.		P
35.1.13	With reference to 35.1.12, spacings within a circuit derived from a source capable of exceeding the maximum limits are not specified, when:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	a) The VA or voltage within the circuit is limited to 200 VA or 100 volts by a regulating network complying with the requirement in 36.12; or		P
	b) A fuse or other overcurrent-protective device, other than an automatically reset type, having a current rating in amperes not exceeding $(100VA)/(V_{max})$, where V_{max} is the maximum rms voltage of the secondary in question.		P
	Maximum available volt-amperes or voltage is to be measured using a variable resistor connected in place of the circuit in question, with the primary connected in accordance with 39.1. For a transformer having multiple secondary windings, all measurements on one secondary-winding circuit are to be made with all other windings unloaded.		P
35.1.14	The acceptability of spacings between live and dead metal parts connected to the enclosure within an instrument shall be judged by conducting the applicable dielectric voltage-withstand test described in Section 43, Dielectric Voltage-Withstand Test.	No dead metal part	N/A
	Exception: A meter complying with the requirements in the Standard for Electrical Analog Instruments - Panel Board Types, UL 1437, is not required to be subjected to a Dielectric Voltage-Withstand Test.		N/A
35.2	Alternative Spacings		N/A
35.2.1	With reference to 35.1.1 Exception No. 8, the spacing requirements in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840, may be used. The spacing requirements of UL 840 shall not be used for field wiring terminals or for spacings to a dead metal enclosure. In determining the pollution degree and overvoltage category, the end-use application is to be evaluated and is able to modify those characteristics given in 35.2.2 and 35.2.3.		N/A
35.2.2	The level of pollution expected or controlled for indoor use equipment is pollution degree 2. For outdoor use equipment, pollution degree 3 is expected. Hermetically sealed or encapsulated enclosures, or coated printing wiring boards in compliance with the Printed Wiring Board Coating Performance Test in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840, are pollution degree 1.		N/A
35.2.3	It is anticipated the equipment is rated overvoltage category II and overvoltage category I as defined in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840.		N/A
35.2.4	In order to apply Clearance B (controlled overvoltage) clearances, control of overvoltage shall be achieved by providing an overvoltage device or system as an integral part of the product.		N/A
35.2.5	For the purpose of applying this alternative, all printed wiring boards are evaluated as having a minimum comparative tracking index of 100 without further investigation.		N/A
35.3	Insulation liners and barriers		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
35.3.1	An insulating liner or barrier of material such as vulcanized fiber or thermoplastic used in lieu of required spacings specified in Exception No. 1 to 35.1.1 shall not be less than 0.028 inch (0.71 mm) thick. The material shall not be used as the sole support of uninsulated live parts involving a risk of fire, electric shock, or electrical-energy/high current. Other insulating materials used as a barrier or as either direct or indirect support of uninsulated live parts involving a risk of fire, electric shock, or electrical-energy/high current shall comply with the requirements in the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C.		N/A
	Exception No. 1: Vulcanized fiber not less than 0.013 inch (0.33 mm) thick is capable of being used:		N/A
	a) In conjunction with an air spacing of not less than 50 percent of the minimum required through air spacing; and		N/A
	b) Between a heat sink and a metal mounting surface, including the enclosure, of an isolated secondary circuit rated 50 volts rms or less.		N/A
	Exception No. 2: A generic material as noted in 35.3.5 and Table 35.3 is capable of being used as an insulating liner when the material:		N/A
	a) Does not serve as sole support of live parts; and		N/A
	b) Is not subject to inadvertent mechanical stresses by a user or a field installer.		N/A
	Exception No. 3: An insulating material having a thickness less than that specified is capable of being used when, upon investigation, it is found to be capable of being used for the application and has a dielectric breakdown strength of not less than 5000 volts or 2500 volts in the thickness used for equivalency to 0.028 inch or 0.013 inch thick vulcanized fiber, respectively, as determined by the equivalent insulation test described in Tests of Insulating Material, Section 44.		N/A
35.3.2	Other than as indicated in 35.3.3, insulating tubing complying with the requirements in the Standard for Extruded Insulating Tubing, UL 224, may be used as insulation of:		N/A
	a) A conductor including bus bars in lieu of the minimum required spacings; and		N/A
	b) A capacitor case in lieu of bonding the case for grounding, providing that the following conditions are met:		N/A
	1) The conductor is not subjected to compression, repeated flexure, or sharp bends;		N/A
	2) The conductor or case covered with the tubing is well rounded and free from sharp edges;		N/A
	3) The tubing is used in accordance with the manufacturer's instructions; and		N/A
	4) The conductor or case is not subjected to a temperature or voltage higher than that for which the tubing is rated.		N/A
35.3.3	Insulating tubing complying with the Standard for Extruded Insulating Tubing, UL 224, shall not be used as insulation over parts subject to maintenance, such as bolts that are periodically tightened.		N/A
35.3.4	A wrap of thermoplastic tape, complying with the requirements in the Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, UL 510, may be used when all of the following conditions are met:		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	a) The wrap is not less than 0.013 inch (0.33 mm) thick, is applied in two or more layers, and is used in conjunction with not less than one-half the required through air spacing;		N/A
	b) The wrap is not less than 0.028 inch (0.71 mm) thick when used in conjunction with less than one-half the required through air spacing;		N/A
	c) Its temperature rating is not less than the maximum temperature observed during the Temperature Test of Section 42;		N/A
	d) The tape is not subject to compression;		N/A
	e) The tape is not wrapped over a sharp edge; and		N/A
	f) The tape is not wrapped over parts subject to maintenance, such as bolts that are periodically tightened.		N/A
35.3.5	$T \leq A1 (EF1) + A2 (EF2) + A3 (EF3) \dots$		N/A
36	Control Circuits		N/A
36.1	An LVLE circuit as described in 6.15, or a limited-energy circuit as described in 6.13 is able to be connected to the frame of the unit.	No LVLE circuit or limited-energy circuit	N/A
36.2	When the frame is used as a current-carrying part of a secondary circuit, a hinge or other movable part shall not be relied upon to carry current.	Not used as current carry parts	N/A
36.3	Except as indicated in 36.4, an LVLE circuit (see 6.15) is not required to be investigated. Printed-wiring boards and insulated wire used in such circuits shall be types that are required for the application. See 22.1.1 and 34.1.		N/A
36.4	Safety circuits shall comply with the requirements for primary circuits.	No such construction	N/A
36.5	A control circuit, including associated electronic components on printed-wiring boards, that does not extend out of the unit is not required to be investigated when the maximum voltage and current are limited as specified in (a) and (b):		N/A
	a) A voltage limit of 42.4 volts peak for ac, 60 volts for dc; and		N/A
	b) 8 amperes for 0 - 42.4 volts peak ac, or 0 - 30 volts dc, or amperes equal to 150 divided by the maximum voltage for 30 - 60 volts dc. See 36.6.		N/A
	Printed-wiring boards, insulated wires, and motors used in such circuits shall be types that are required for the application. See 22.1.1, 25.1, 25.2, and 34.1.		N/A
	Exception: The current is able to exceed the value specified in (b) when the circuit includes an overcurrent protection device as described in 36.9 and 36.10.		N/A
36.6	With reference to the current specified in 36.5(b), the maximum current is to be measured under any condition of loading, including short circuit. This is to be accomplished using a resistor that is continuously readjusted during the 1-minute period to maintain maximum load current. This current shall not exceed the value indicated in 36.5(b).		N/A
36.7	With reference to the voltage limit specified in 36.5(a), measurement is to be made with the unit connected to the voltage specified in 39.1 and with all loading circuits disconnected. When a tapped transformer winding is used to supply a full-wave rectifier, voltage measurement is to be made from either end of the winding to the tap.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
36.8	When the control circuit specified in 36.5 is not limited as to available short-circuit current by the construction of a transformer, and the circuit includes either one or more resistors, a fuse, a nonadjustable manual-reset protective device, or a regulating network (see 36.12), the circuits in which the current is limited, in accordance with 36.9, 36.10, or 36.11, is not required to be investigated.		N/A
36.9	A fuse or circuit-protective device provided in the control circuit used to limit the current in accordance with 36.8 shall be rated or set at not more than the values specified in Table 36.1.		N/A
36.10	A fuse or circuit-protective device is able to be connected in the primary of a transformer to limit the current, in accordance with 36.8, when the protection is equivalent to that specified in 36.9. This shall be determined by conducting the Overcurrent Protection Calibration Test, Section 52.		N/A
36.11	One or more resistors, or a regulating network, used to limit the current in accordance with 36.8 shall be such that the current under any condition of load, including short circuit, does not exceed the values indicated in 36.5(b).		N/A
36.12	When a regulating network is used to limit the voltage or current, in accordance with 36.5 - 36.11, and the performance is affected by malfunction, either short circuit or open circuit, of any single component - excluding a resistor - the network shall comply with the following:		N/A
	a) The environmental tests specified in 36.14 are to be performed; and		N/A
	b) Critical components shall be derated in accordance with the Electronic Reliability Design Handbook, Military Handbook Number 338-1A.		N/A
36.13	In a circuit of the type described in 36.8, the secondary winding of the transformer, the fuse or circuit protective device, or the regulating network, and all wiring up to the point at which the current and voltage are limited, shall be evaluated to the applicable requirements in this standard.		N/A
36.14	When it is determined that environmental tests in accordance with 36.12(a) are required, the control is to be subjected to the following tests, in accordance with the method described in the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991:		N/A
	a) Transient Overvoltage Test;		N/A
	b) Ramp Voltage Test;		N/A
	c) Electromagnetic Susceptibility Tests;		N/A
	d) Electrostatic Discharge Test;		N/A
	e) Thermal Cycling Test;		N/A
	f) Humidity Test for a unit intended for a general environment; and		N/A
	g) Effects of Shipping and Storage Test.		N/A
	Before and after each test, the control is to be checked for normal operation. See 36.15.		N/A
36.15	The following test parameters are to be used in the investigation of the control covered by 36.14 for compliance with the Standard for Tests for Safety-Related Controls Employing Solid State Devices, UL 991:		N/A
	a) Critical components are able to be electrically supervised;		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	b) Audibility is capable of being used as a trouble indicator for an electrical supervision circuit;		N/A
	c) A field strength of 3 volts per meter (0.91 volts per foot) is to be used for the Radiated EMI Test; and		N/A
	d) Exposure Class H5 is to be used for the Humidity Test.		N/A
37	Accessible Signal Circuits	No Accessible Signal Circuits	N/A
37.1	The requirements in 37.2 and 37.3 apply to accessible signal circuits having provision for external connections such as RS232 communication ports and similar equipment.		N/A
37.2	A signal circuit that extends out of a unit shall be isolated from internal circuits having a voltage involving a risk of electric shock by any of the following or the equivalent:		N/A
	a) An optical isolator having an isolation voltage rating of not less than the dielectric voltage-withstand test potential required in 43.1.1 and complying with the requirements in the Standard for Optical Isolators, UL 1577;		N/A
	b) An isolation transformer complying with the requirements in the Standard for Class 2 Power Units, UL 1310, or the Standards for Low Voltage Transformers - Part 1: General Requirements, UL 5085-1, and Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers, UL 5085-3;		N/A
	c) An isolation transformer complying with the requirements in 26.1.4 - 26.2.4;		N/A
	d) An electro-mechanical relay complying with the requirements in the Standard for Industrial Control Equipment, UL 508; or		N/A
	e) A voltage regulating network when:		N/A
	1) The voltage being isolated is not derived from the ac input circuit; and		N/A
	2) The network does not show a risk of electric shock at the external signal circuits as a result of a failure mode and effect analysis, in accordance with the method described in the Standard for Tests for Safety Related Controls Employing Solid-State Devices, UL 991.		N/A
37.3	The maximum voltage and current available from an accessible signal circuit shall comply with the requirements in 36.5 - 36.12.	No Accessible Signal Circuits	N/A
37.4	The maximum power available from an accessible signal circuit that employs an overcurrent protection device to limit the current, as described in the Exception to 36.5, shall not exceed the values specified in Table 37.1.	No Accessible Signal Circuits	N/A
38	Class 2 and Class 3 Output Circuits	No Class 2 and Class 3 Output Circuits	N/A
38.1	When an output is marked or otherwise identified as being Class 2, that output shall comply with the construction, performance, and marking requirements described in the Standard for Class 2 Power Units, UL 1310.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
38.2	When an output is marked or otherwise identified as being Class 3, and the output is ac supplied from a linear transformer, that output shall comply with the construction, performance, and marking requirements described in the Standard for Low Voltage Transformers - Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers, UL 5085-3. When the output is dc or supplied from other than a linear transformer, that output shall comply with the requirements in Sections 79 - 87.		N/A

PERFORMANCE			P
39	General		P
40	Leakage Current Test		P
41	Power Input Test		P
42	Temperature Test		P
43	Dielectric Voltage Withstand Test		P
43.1	General		P
43.2	Induced potential test		N/A
43.3	Maximum-voltage measurements		P
44	Tests on Insulating Materials		P
45	Mechanical Strength Tests for Metal Enclosures		P
46	Strain Relief and Bushing		P
47	Push-Back Relief Test		P
48	Overload of Switches and Controls		N/A
49	Static Load Test		N/A
50	Stability Test		P
51	Isolated Limited Energy Circuit Capacity		N/A
52	Overcurrent Protection Calibration Test		N/A
53	Neutral to Ground Potential Measurement Test		N/A
54.	Abnormal Tests		P
54.1	General		P
54.2	Output short-circuit test		P
54.3	Blocked fan test		N/A
54.4	Fuse short circuit test		N/A
54.5	Voltage selector test		N/A
54.6	Relay and solenoid burnout		N/A
54.7	Transformer overload tests		P
54.8	Component short- and open-circuit test		P
54.9	Backfeed protection		P
54.10	Autotransformer		N/A
54.11	Evaluation of reduced spacings on printed-wiring boards		N/A
54.12	Reverse polarity test		N/A
55	Flanged Bobbin Transformer Abnormal Test		N/A
56	Capacitor Test		P
57	Bonding Conductor Test		N/A
58	Hot, Flaming Oil Test		N/A

MANUFACTURING AND PRODUCTION TESTS			P
59	Dielectric Voltage Withstand Test	Conducted during factory inspection	P
60	Grounding Continuity Test	Conducted during factory inspection	P

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
MARKING			P
61	Details		P
61.1	Cautionary markings	See labels	P
61.1.1	A cautionary marking shall be prefixed by the word "CAUTION," "WARNING," or "DANGER " in letters not less than 1/8 inch (3.2 mm) high. The remaining letters shall not be less than 1/16 inch (1.6 mm) high.		P
61.1.2	A live heat sink or other part shall be marked "CAUTION - Risk of Electric Shock. Plates (or other word describing the type of part) are live. Disconnect power unit before servicing. " if the part:		N/A
	a) Is likely to be mistaken for dead metal;		N/A
	b) Is at a potential that exceeds 30 volts rms (42.4 volts peak) or 60 volts dc; and		N/A
	c) Is not guarded as specified in 9.1.5.		N/A
	The marking shall be located on the live part so as to make the risk of electric shock known before the part is likely to be touched. See 61.1.13 and 61.1.14.		N/A
61.1.3	With reference to Exception No. 2 of 17.1.2, ungrounded dead metal parts shall be plainly marked with the word "CAUTION " and the following or the equivalent: "(Identify part or parts not earth grounded) (is) (are) not grounded - (it) (they) may present risk of electric shock. Test before touching. " The marking shall be provided on or adjacent to the ungrounded dead metal parts and shall be visible so that each part or group of parts is positively identified.		N/A
	Exception: This requirement does not apply to an inductor core, a transformer core, and a heat sink mounted on a printed wiring board.		N/A
61.1.4	A portable household power unit shall be marked "CAUTION - Do not expose to rain " or "CAUTION - Indoor use only."	See labels	P
61.1.5	A power unit with output connections in accordance with 13.1 shall be marked "CAUTION " and the following or the equivalent: "Risk of Fire. Use only type SPT-2 cord or heavier duty cord, minimum __ AWG copper. " The minimum acceptable gauge size is 18 AWG. The marking shall be adjacent to the terminals, connectors, or wiring compartment.		N/A
61.1.6	With reference to 35.1.3, a power unit shall be marked with the word "WARNING " and the following or the equivalent: "To reduce the risk of fire and electric shock, install in a temperature- and humidity-controlled indoor area relatively free of conductive contaminants. "		N/A
	Exception No. 1: This requirement does not apply to a power unit provided with its own equivalent environment as described in 6.8.		N/A
	Exception No. 2: When the marketing of the unit is such that the unit is intended for use in a controlled environment, this marking is not required.		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
61.1.7	There shall be a legible and durable marking for each interchangeable fuse as described in 30.3, indicating the ampere rating and the voltage rating of the fuse to be used for replacement. The marking shall be located so that it is obvious as to which fuse or fuseholder the marking applies. A single marking is acceptable for a group of fuses. The marking shall be adjacent to the fuseholder and shall consist of the word "CAUTION " and the following or the equivalent: "For continued protection against risk of fire, replace only with same type and ratings of fuse. "		N/A
61.1.8	A commercial fixed power unit that exceeds the temperature limits specified in Table 42.1 - see footnote k to Table 42.1 - shall be legibly marked where readily visible after installation with the word "CAUTION " and the following or the equivalent "Hot surfaces - To prevent burns - Do not touch. "		N/A
61.1.9	A power unit provided with single-pole circuit breakers in the input circuit in accordance with the Exception to 29.3 shall be marked with the word "CAUTION " and the following or the equivalent: "Risk of Electric Shock and Fire. Do not connect to a circuit operating at more than 150 Volts to ground. "		N/A
61.1.10	A unit incorporating an overcurrent protective device in the grounded circuit conductor as specified in Exception No. 2, item (d) to 29.5 shall be plainly marked with the word "CAUTION " and the following or equivalent: "Risk of Electric Shock. Grounded circuit conductor (neutral) provided with overcurrent protection. Test components before touching. " The marking shall be readily visible to service personnel servicing the unit.		N/A
61.1.11	A battery charger shall be marked, where readily visible to the user when charging batteries, with the word "CAUTION " and the following or equivalent: "Charge only ___ type rechargeable batteries. Other types of batteries may burst causing personal injury and damage. "	See labels	P
	Exception: A reference to a specific rechargeable battery or battery pack for which the charger is intended may be used in lieu of marking the type of batteries to be charged.		N/A
61.1.12	A power supply intended to be connected as described in the Exception to 28.7 shall be marked on an inside or outside surface or in a separate operating manual as follows:		N/A
	a) A2-wire, 220 - 240-volt power unit intended for connection to a circuit operating at 150 volts or less to ground shall be marked with the word "DANGER " and the following or the equivalent: "Risk of Electric Shock - Do not connect to a circuit operating at more than 150 volts to ground. "		N/A
	b) A3-wire, 3-phase, 220 - 240-volt power unit intended for connection to a circuit operating at 150 volts or less to ground shall be marked with the word "DANGER " and the following or the equivalent: "To reduce the risk of electric shock - Do not connect to a circuit operating at more than 150 volts to ground. " The marking shall identify the leads or terminals that are to be supplied by circuit conductors of 150 volts or less to ground.		N/A
61.1.13	A cautionary marking shall be permanent and shall be located on a part that cannot be removed without impairing the operation of the power unit. See 61.3.1.	Complied	P

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
61.1.14	A cautionary marking to instruct the operator shall be visible and legible to the operator during the intended operation of the power unit. With reference to the Exception to 7.6.6, a marking shall be located adjacent to the part being guarded to indicate that the cover or guard is to be replaced before operation of the power unit.		P
61.1.15	A warning to the serviceman that a removable panel covering a capacitor should not be removed for whatever time - 5 minutes maximum - is required for the capacitor to discharge to the values specified in 9.1.6 after the power unit has been disconnected from its source of power shall be clearly marked on or near the panel.		N/A
61.2	General markings		P
61.2.1	A power unit shall be plainly and permanently marked where it is readily visible - after installation in the case of a fixed power unit - with the following:	See labels	P
	a) The manufacturer's name, trade name, or trademark.		P
	b) A distinctive catalog number or the equivalent.		P
	c) The input and output ratings in voltage, frequency, and amperes, watts, or volt-amperes.		P
	Exception No. 1: The output ratings are not required to be included on a unit complying with 13.1.		N/A
	Exception No. 2: The output rating need not be included in a power unit intended to charge a specific battery or battery pack provided the unit is marked to indicate the battery or battery pack to be used.		N/A
	d) The date or other dating period of manufacture not exceeding any three consecutive months.	See labels	P
	Exception: The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer provided that the code:		N/A
	1) Does not repeat in less than 20years; and		N/A
	2) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.		N/A
	e) The number of phases if the product is intended for use on a polyphase circuit. The symbol "∅" may be used in place of the word "phase."		N/A
61.2.2	With respect to the frequency marking mentioned in 61.2.1:	See labels	P
	a) Equipment intended to operate only from a direct-current supply shall bear markings indicating that the supply shall be direct current. The symbol illustrated in Figure 61.1 may be used for this marking.		N/A
	b) Equipment intended to operate only from an alternating-current supply shall bear markings indicating that the supply shall be alternating current. The symbol illustrated in Figure 61.2 may be used for this marking. The markings shall include the equipment supply-circuit frequency or supply-circuit frequency-range rating (cycles per second, cycles/second, hertz, c/s, cps, or Hz).		P

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	c) Equipment intended to operate from either direct- or alternating-circuit supplies shall bear markings indicating that the supply may be either direct current or alternating current. The symbol illustrated in Figure 61.3 may be used for this marking. The markings shall include the equipment supply-circuit frequency or supply-circuit frequency-range rating (cycles per second, cycles/second, hertz, c/s, cps, or Hz).		N/A
61.2.3	If a duty cycle is necessary for proper performance, the time relationship shall be marked on the product.		N/A
61.2.4	A duty cycle marking may consist of a maximum on and a minimum off time; or a maximum on time and an on/off ratio. The time may be indicated in seconds or minutes, or fractions thereof.		N/A
61.2.5	The polarity of the output leads shall be plainly indicated by:		N/A
	a) The words "positive " and "negative ";		N/A
	b) The signs "+ " for positive and "- " for negative;		N/A
	c) The abbreviations "pos " for positive and "neg " for negative; or		N/A
	d) Color coding of red for positive and black for negative.		N/A
61.2.6	Unless provided with a polarized termination, the polarity of a direct-current output shall be plainly indicated.	Specific output connector, the polarity is fixed	N/A
61.2.7	If a manufacturer produces or assembles a power unit at more than one factory, each power unit shall have a distinctive marking - which may be in code - by which it may be identified as the product of a particular factory.		N/A
61.2.8	If any point within a terminal box or wiring compartment of a fixed power unit in which the power unit conductors are intended to be connected, including such conductors themselves, attains a temperature of more than 60°C (140°F) during the normal temperature test, the power unit shall be marked "For supply connection, use wires suitable for at least ___°C (___°F)," or with an equivalent statement, and the temperature value shall be in accordance with Table 61.1. This statement shall be located at or near the point where the supply connections are to be made, and shall be clearly visible both during and after installation of the power unit.		N/A
61.2.9	A power unit shall not be marked "charger " or the equivalent unless it employs a rectifying component.		N/A
61.2.10	A battery charger with backfeed protection in accordance with 15.1 shall be marked "Backfeed Protection", "BFP", or the equivalent.	See labels	P
61.2.11	A power unit shall be permanently marked in accordance with 61.2.12 with "For Grounding Conductor, Use ___ AWG Minimum " or with an equivalent statement if the power unit:		N/A
	a) Has a metal enclosure;		N/A
	b) Has an ac output rating; and		N/A
	c) Is intended to supply a Class1 circuit having an output rating of 1000 volt-amperes or less.		N/A
	Exception No. 1: A power unit is not required to be marked as specified if provided with a cord and plug for input connections in which the size of the grounding conductor is not less than that specified in 61.2.12(a) or 61.2.12(b).		N/A
	Exception No. 2: A power unit is not required to be marked as specified if all of the following conditions are met:		N/A

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
	a) The power unit is intended to be permanently connected electrically; and		N/A
	b) The input conductors and the equipment-grounding conductor intended for such connection, with the conductor ampacity based on 125 percent of the input rating of the power unit, would not be smaller than that specified in 61.2.12(a) or 61.2.12(b).		N/A
	Exception No. 3: In lieu of the specified marking a power unit may be marked "CAUTION " and with the following or the equivalent: "Risk of Fire. Do not ground the secondary circuit to the enclosure of this power unit. "		N/A
61.2.12	The marking required by 61.2.11 shall be located at or near the point where the equipment-grounding connection is to be made, and shall be clearly visible both during and after installation of the power unit as intended. The grounding conductor size marked in the indicated space shall be:		N/A
	a) Based on Column 2 of Table 17.2, using the rating of the secondary circuit overcurrent protective device when provided; or		N/A
	b) Not less than the size of the internal wiring employed for the output power circuits when no secondary overcurrent protection is provided.		N/A
61.2.13	A unit having an output circuit intended to be grounded in the field shall be marked with the following or equivalent words: "The output circuit is considered a separately-derived source. If local codes require grounding of this circuit, use terminal (identify terminal) for bonding this circuit to the enclosure. Ground the enclosure to a suitable grounding electrode in accordance with local code requirements. "		N/A
61.2.14	A terminal in a fixed unit, as described in 20.11, intended for connection to the grounding electrode conductor shall be marked "Grounding Electrode Terminal."		N/A
61.2.15	In accordance with 12.2.11(a)(2), if a pressure terminal connector is not provided with the power unit as shipped, the power unit shall be marked to indicate which pressure terminal connector or component terminal assembly packages are to be used with the power unit. This marking may be provided on the unit or on a tag attached to the unit.		N/A
61.2.16	The terminal assembly packages specified in 61.2.15 shall be marked with an identifying marking, wire size, manufacturer's name, and trade mark or other descriptive marking by which the organization responsible for the product is able to be identified.		N/A
61.2.17	If a pressure terminal connector provided with the power unit [or in a terminal assembly as mentioned in 12.2.11(d)] for a field installed conductor requires the use of a special tool for securing the conductor, necessary instructions for using the tool shall be provided. The instructions shall be included in a readily visible location such as on the connector, on a wiring diagram, on a tag secured to the connector or in an assembly package provided with the power unit.		N/A
61.2.18	If Class 2 and Class 3 limited-energy circuits terminate in the same wiring compartment, a marking shall be provided adjacent to the wiring terminals indicating that all output circuits are to comply with the requirements for Class 3 wiring.	Not class 2 and class 3	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
61.2.19	With reference to 23.3.2, a unit that relies on the installing electrician to maintain the 1/4 inch (6.4 mm) spacing associated with Class 2 or Class 3 conductors shall be marked with the following or equivalent: "Dress ___ circuits at least 1/4 inch away from ___ circuits," where the blanks are to be completed appropriately with power, light, or Class 1 and Class 2 or Class 3, respectively.		N/A
61.2.20	A power unit not furnished with a detachable power supply cord as described in the Exceptions to 12.3.1 and 12.3.7 shall be marked adjacent to the appliance coupler to inform the user to see the instruction manual (see 61.1.10) for proper selection of the power supply cord.		N/A
	Exception: The marking may be in the form of a tag, nonpermanent label, or product insert that is provided on or packaged with the unit so that the marking is visible at the time of installation.		N/A
61.2.21	In accordance with 12.3.8, a power unit intended for use by travelers shall be marked with the following or equivalent:	Not used for travelers	N/A
	a) "See instruction manual for use in countries other than the U.S.A. ";		N/A
	b) "See instructions for input voltage conversion"; or		N/A
	c) "See instructions if the input plug does not fit the power outlet."		N/A
61.2.22	In accordance with 7.7.1, individual modules of a modular power unit shall be marked with:		N/A
	a) Information identifying the module consistent with its function in the assembled system, such as "voltage regulation section of Model XYZ POWER SUPPLY"; and		N/A
	b) A reference to the installation instructions.		N/A
	The marking may be in the form of a paper tag or any other nonpermanent material. See 62.1.11.		N/A
61.3	Application		P
61.3.1	Unless stated otherwise, markings required by this Standard shall be permanent. A permanent marking shall be molded, die-stamped, paint-stenciled; stamped or etched metal that is permanently secured; or indelibly stamped on a pressure-sensitive label secured by adhesive. The marking means shall comply with the Standard for Marking and Labeling Systems, UL 969. Ordinary usage, handling, storage, and the like of the unit are to be considered in determining whether a marking is permanent.		P
62	Instructions		P
62.1	General		N/A
62.1.1	Instructions for mounting shall be furnished with each power unit intended for permanent mounting.		N/A
62.1.2	A commercial stationary or fixed power unit that exceeds the temperature limits specified in Table 42.1 [see footnote (k) to Table 42.1] shall be provided with instructions specifying that "The power unit is to be installed so that it is not likely to be contacted by people " or equivalent wording.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
62.1.3	Multiple-voltage equipment intended for permanent connection to the branch circuit supply shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking shall be on a paper tag or other equivalent nonpermanent material.		N/A
62.1.4	Multiple-voltage cord-connected equipment shall be provided with instructions to indicate the type of attachment plug that is to be used for connection to the alternate voltage in accordance with 12.3.6.		N/A
62.1.5	Multiple voltage equipment intended for use with a detachable power supply cord shall be provided with instructions to indicate the type of detachable power supply cord that is to be used for connection to the alternate voltage in accordance with 12.3.7.		N/A
62.1.6	With reference to 12.3.7, a product with an operator adjustable voltage selector shall be marked to instruct the operator to set the voltage selector to the voltage to which the product will be connected.	No voltage selector	N/A
62.1.7	With reference to 12.3.8, the instructions for a power unit intended for use by travelers shall include (a) - (c) or the equivalent, as appropriate. The items shall be preceded by "IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS " and "DANGER - TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, CAREFULLY FOLLOW THESE INSTRUCTIONS" in letters of 1/8 inch (3.18 mm) high or in a readily visible contrasting text:		N/A
	a) "Be sure voltage selector is in correct voltage position before plugging in. " The instructions shall also specify the procedures to follow for changing the voltage selector.		N/A
	b) "For use in the U.S.A., the voltage selector switch must be placed in the 120 volt position. For use in countries other than the U.S.A, the voltage selector may need to be placed in other than the 120 volt position. Confirm the voltage available at each country location before using the product. "		N/A
	c) "For connection to a supply not in the U.S.A., use an attachment plug adapter of the proper configuration for the power outlet, if needed. " Or, "If the shape of the plug does not fit the power outlet, use an attachment plug adaptor of the proper configuration for the power outlet."		N/A
62.1.8	In accordance with 54.1.7, if an abnormal test is terminated by operation of the intended branch-circuit overcurrent protective device, the power unit shall have the following statement, or the equivalent, in an installation manual provided with the unit: "CAUTION - To reduce the risk of fire, use only on circuits provided with ___ ampere branch-circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70. " The blank space is to be filled in with the appropriate ampere rating of branch-circuit overcurrent protection described in 54.1.3.		N/A
62.1.9	For a power unit judged in accordance with item b of the Exception to 40.1, the instruction manual shall include all the following conditions of installation:		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	a) An insulated grounding conductor that is identical in size, insulation material, and thickness to the grounded and ungrounded branch-circuit supply conductors except that it is green with or without one or more yellow stripes is to be installed as part of the branch circuit that supplies the unit or system.		N/A
	b) The grounding conductor described in (a) is to be grounded to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set.		N/A
	c) The attachment-plug receptacles in the vicinity of the unit or system are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.		N/A
62.1.10	In accordance with the Exceptions to 12.3.1 and 12.3.7, the instructions for a power unit intended for use with a detachable power supply cord which is not provided with the unit shall contain complete details concerning proper selection of the power supply cord. The instructions shall specify selection of a cord complying with the requirements in 12.3.1 - 12.3.5 and 12.3.10.		N/A
	Exception: For a power unit intended for use in a country other than the U.S.A., the instructions shall specify the appropriate cord to be used (see Exception No. 4 to 12.3.1).		N/A
62.1.11	In accordance with 7.7.1 and 61.2.22, instructions for field assembly of modules of a modular unit, including an interconnection wiring diagram, shall be either:		N/A
	a) Packaged with the modules; or		N/A
	b) Contained in the instruction manual provided that the marking on the module makes reference to the instruction manual.		N/A
62.2	Battery chargers		P
62.2.1	A battery charger shall be provided with explicit important safety, operation, and maintenance instructions for the user; and, if applicable, with assembly and moving and storage instructions.	See instruction pages	P
62.2.2	The important safety instructions and instructions for user assembly, operation, maintenance, and moving and storage shall be in the same manual. The important safety instructions shall appear before the instructions for user assembly, operation, maintenance, and moving and storage.		P
62.2.3	In an instruction manual intended for use with more than one model or type of battery charger, the instructions applicable to each model or type of battery charger shall be explicitly identified.		P
	Exception: This requirement does not apply to instructions that are exactly the same for more than one model or type of battery charger, and that could not result in confusion or misunderstanding due to different location of controls, operating modes, and the like.		P
62.2.4	Instructions shall be legible and shall contrast with the background.		P

UL 1012			
Clause	Requirement – Test	Result – Remark	Verdict
62.2.5	The headings for the user assembly, operation, maintenance, moving and storage, and important safety instructions, and the opening statements of the instructions specified in 61.2.11 - "IMPORTANT SAFETY INSTRUCTIONS " and "SAVE THESE INSTRUCTIONS " - shall be entirely in upper case letters not less than 3/16 inch (4.8 mm) high or emphasized to distinguish them from the rest of the text. Upper case letters in the instructions shall not be less than 5/64 inch (2.0 mm) high, and lower case letters shall not be less than 1/16 inch (1.6 mm) high.	See instruction pages	P
62.2.6	There shall be no substitute for the word "CAUTION," "WARNING," or "DANGER " in the text of the instructions.	See instruction pages	P
62.2.7	The text of the instructions required by 62.2.11 shall be verbatim, or in equally definitive terminology.		P
	Exception: When a specific conflict in the application to a battery charger exists, or when the wording is inappropriate, variations from the specified wording are able to be used.		N/A
62.2.8	An illustration may be used with a required instruction to clarify the intent, but shall not replace the instruction.		N/A
62.2.9	Important safety instructions shall warn the user of reasonably foreseeable risks of fire, electric shock, or injury to persons; and shall state the precautions that should be taken to reduce such risks.		P
62.2.10	The items listed in 62.2.11 shall be numbered, and other instructions deemed necessary by the manufacturer to reduce the risk of fire, electric shock, or injury to persons may be included.		P
62.2.11	The important safety instructions shall include those items in the following list that are applicable to the particular battery charger. The statement "IMPORTANT SAFETY INSTRUCTIONS," shall precede the list and the statement "SAVE THESE INSTRUCTIONS " shall either precede or follow the list. The word "CAUTION," "WARNING," or "DANGER " shall be entirely in upper case letters.	See instruction pages	P
	Exception: With reference to item number 1 in the Important Safety Instructions, the specific model numbers are not required to be included when the instructions are identical for all models.		N/A
	IMPORTANT SAFETY INSTRUCTIONS	See instruction pages	P
	1. SAVE THESE INSTRUCTIONS - This manual contains important safety and operating instructions for battery charger Models _____.	See instruction pages	P
	2. Before using battery charger, read all instructions and cautionary markings on battery charger, battery, and product using battery.	See instruction pages	P
	3. CAUTION - To reduce risk of injury, charge only _____ type rechargeable batteries. Other types of batteries may burst causing personal injury and damage.	See instruction pages	P

SPECIFIC POWER UNITS	N/A
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OUTDOOR-USE POWER UNITS	N/A
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PLUG-IN POWER UNITS	N/A
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Clause	Requirement – Test	Result – Remark	Verdict
SCHOOL-LABORATORY POWER SUPPLIES			N/A
POWER SUPPLIES RATED MORE THAN 10 KILOVOLT-AMPERES			N/A
CLASS 3 OUTPUTS – DC, OR AC DERIVED FROM NON-LINEAR SOURCES			N/A
FOREIGN VOLTAGE ADAPTERS			N/A
RECHARGEABLE BATTERIES WITH INTEGRAL CHARGERS			N/A
POWER UNITS FOR INSTALLATION IN AIR-HANDLING SPACES			N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4	Constructions		P
4.1	Electrical Components and Equipment		P
4.2	Enclosures		P
4.2.1	General		P
4.2.2	Thickness of Sheet Metal Enclosures for Live Parts		P
4.2.3	Thickness of Cast Metal Enclosures for Live Parts Minimum thickness of metal for cast enclosures shall comply with Table 3.	Complied with impact test	P
4.2.4	Polymeric Enclosures Polymeric enclosures shall comply with the requirements of (a) flame test specified in Clause 6.11 unless the polymeric compounds used in the construction of the enclosure are classified as 5-V•A material in accordance with CSA Standard C22.2 No. 0.17; and (b) impact test specified in Clause 6.12.1.	Metal enclosure	N/A
4.2.5	Openings in Enclosures	No openings in Enclosures	N/A
4.2.5.1	The enclosure shall have no openings through which the articulated probe (see Figure 1) can be inserted so as to touch moving parts (e.g. fan blades), or any uninsulated live parts (including film-coated wire) operating at a voltage of more than 42.4 V peak to any other part or to ground (see Clause 4.2.6.1).		N/A
4.2.5.2	The probe of Figure 1 shall be inserted to any depth that the opening will permit, using an applied force of not greater than 4.4 N. The probe shall be rotated or angles before, during, and after insertion through the opening to any necessary position, using any possible configuration. If necessary, the configuration shall be changed after insertion through the opening.		N/A
4.2.5.3	Openings in the top of an enclosure that are directly over uninsulated live parts involving a risk of shock or energy hazard shall not exceed 5 mm in any dimension unless the construction is such that straight access to those uninsulated live parts is prevented. See Figure 2 for examples of top cover designs that prevent straight access. This requirement shall not apply to a UPS over 1.8 m high.		N/A
4.2.5.4	Openings in the vertical sides of an enclosure for cord-connected power supplies rated 120 V, 1500 W and less shall (a) not exceed 5 mm in any dimension; (b) not exceed 1 mm in width regardless of length; (c) be provided with louvers that are shaped to deflect outwards an external vertically falling object (see Figure 3 for examples); or (d) be so located that an object, upon entering the enclosure, is unlikely to fall on uninsulated live parts, resulting in a shock or energy hazard (see Figure 4).		N/A
4.2.5.5	A PCE having an enclosure with openings that are located directly beneath live parts shall be (a) provided with a barrier or bottom panel complying with Clause 4.2.5.7, located beneath such live parts so as to prevent molten or flaming particles from falling on the surface on or over which the PCE is mounted; or (b) marked as specified in Clause 5.11, if intended for floor mounting.		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.5.6	If a portion of a vertical side panel falls within the area D of the required bottom enclosure as traced out by the 5° angle in Figure 5, that portion of the vertical panel shall be evaluated as a bottom enclosure.	No openings in Enclosures	N/A
4.2.5.7	<p>If a barrier is provided to comply with Clause 4.2.5.5, the barrier shall</p> <p>(a) be made of metal or nonmetallic material complying with the flame test of Clause 6.1 2;</p> <p>(b) not contain perforations or openings except as specified in Items (d) and (e);</p> <p>(c) be so located and be of such extent as to conform to Figure 5 and the legend appended thereto;</p> <p>(d) have one of the following constructions, if made of perforated metal:</p> <p style="padding-left: 20px;">(i) a metal screen, or the equivalent, that has a mesh* not greater than 2 x 2 mm (1 4 x 14 mesh per inch) and wire with a minimum diameter of 0.46 mm;</p> <p style="padding-left: 20px;">(ii) a panel in accordance with Table 4; or</p> <p style="padding-left: 20px;">(iii) a perforated metal panel that complies with the flaming oil test of Clause 6.1 5; and</p> <p>(e) be permitted to have openings not larger than 6.4 mm² if the barrier is located under areas containing only materials classified at least V-1 in accordance with CSA Standard C22.2 No. 0.1 7. Openings that are not square can be provided if they do not have an area greater than 40 mm² (see also Clause 4.1 6.4).</p> <p>*A mesh or screen described in Clause 4.2.5.7(d)(i) cannot be used to form the side of an enclosure.</p>	No openings in Enclosures	N/A
4.2.5.8	<p>The diameter of the wires of a metal screen used for other than the bottom of an enclosure shall be not less than</p> <p>(a) 1.2 mm when the screen openings are 320 mm² or less in area; and</p> <p>(b) 2 mm for larger screen openings.</p>		N/A
4.2.5.9	<p>Sheet metal employed for expanded metal mesh and perforated sheet metal used for other than the bottom of an enclosure shall have an uncoated thickness of not less than</p> <p>(a) 1.2 mm if the mesh openings or perforations are 320 mm² or less in area; and</p> <p>(b) 2 mm for larger openings.</p>		N/A
4.2.5.10	Glass that covers openings shall be reliably secured in place so that the glass cannot be readily displaced, shall provide mechanical protection for the enclosed parts, and shall comply with the impact test specified in Clause 6.1 3.2.	No openings in Enclosures	N/A
4.2.5.11	Material other than glass employed as a sole covering over an opening that forms part of the enclosure, and relied upon to prevent contact with bare live parts, shall be of adequate mechanical strength and shall comply with the requirements of the flame test specified in Clause 6.1 2 and the impact test specified in Clause 6.1 3.2.		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.5.12	<p>Components that have a flammability classification of, at least, HB and that form part of the enclosure need not comply with Clause 4.2.4</p> <p>(a) under any one of the following conditions:</p> <p>(a) the component covers an opening that has no dimension greater than 25 mm;</p> <p>(b) the component covers an opening that has no dimension greater than 100 mm, and there is no source of fire hazard closer than 100 mm from the surface of the enclosure; or</p> <p>(c) there is a barrier or a device that forms a barrier having a flammability classification of, at least, V-0 between the component and a source of fire hazard.</p>	No openings in Enclosures	N/A
4.2.6	Doors, Covers, and Guards	No Doors, Covers, and Guards	N/A
4.2.6.1	Doors and covers of enclosures shall be provided with means for securing them firmly in place. If bare live parts that may cause electric shock are exposed by the opening of such doors or covers, as determined by the use of the probe (Figure I), means requiring the use of a tool shall be provided to hold such doors or covers closed.		N/A
4.2.6.2	If it is necessary to open a door to perform operational maintenance, the door shall be hinged or secured in an equivalent manner and all parts that present a shock or energy hazard shall be located or guarded so that the operator is protected from accidental contact while performing such maintenance. Any barriers or guards that are provided to comply with this requirement shall be secured in place so that the use of a tool or other deliberate action is required for their removal.		N/A
4.2.6.3	When a hinged door is required by Clause 4.2.6.2, means shall be provided to keep the door closed.		N/A
4.2.6.4	An uninsulated live part at which a shock or energy hazard may exist and a moving part that involves a risk of injury shall be located, guarded, or enclosed so as to prevent unintentional contact by service personnel adjusting or resetting controls, or the like, or performing mechanical service functions that may be performed with the equipment energized (eg, lubricating a motor, adjusting the setting of a control, resetting a trip mechanism, or operating a manual switch).		P
4.2.6.5	A component that may require examination, resetting, adjustment, servicing, or maintenance while energized shall be so located and mounted with respect to other components and with respect to grounded metal parts that it is accessible for electrical service functions without subjecting service personnel to a possible shock or energy hazard, or injury by adjacent moving parts. Access to a component shall not be impeded by other components, including wiring.		N/A
4.2.6.6	When determining compliance with Clause 4.2.6.5, misalignment of a screwdriver or similar tool with the adjustment means shall be taken into account. Protection against inadvertent contact with adjacent uninsulated hazardous live parts shall be provided by (a) location of the adjustment means away from uninsulated hazardous live parts; or (b) a guard to reduce the likelihood of the tool contacting uninsulated hazardous live parts.	No Doors, Covers, and Guards	N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.6.7	A live heat sink for a solid-state component (eg, one mounted on a printed circuit board), a live relay frame, and the like, that may pose a shock or energy hazard or be mistaken for an unenergized part shall be guarded to reduce the risk of unintentional contact by service personnel or be marked in accordance with Clause 5.1 4.	No Doors, Covers, and Guards	N/A
4.2.6.8	Moving parts that can cause injury to service personnel and must be in motion during service operations that do not invoke the moving parts shall be so located or protected that unintentional contact with the moving parts is not likely.		N/A
4.2.7	Special Purpose Enclosures	No Special Purpose Enclosures	N/A
4.2.7.1	Special purpose enclosures for nonhazardous locations shall comply with the requirements of CSA Standard CAN/CSA-C22.2 No. 94.		N/A
4.2.7.2	When a supplementary housing is used to comply with Clause 4.2.7.1, the temperature rise of the enclosed equipment shall be investigated.		N/A
4.2.8	Protection Against Corrosion Enclosures shall be protected against corrosion as required by CSA Standard CAN/CSA-C22.2 No. 0.		N/A
4.2.9	PCE mounting means		N/A
4.3	Mechanical Assembly	All components are secured in place	P
4.4	Supply Connections		P
4.4.1	Permanently Connected PCE		N/A
4.4.2	Cord-Connected PCE		P
4.5	Terminal Parts and Leads		N/A
4.5.1	Terminal parts and the identification of terminal parts and leads intended for connection to circuit conductors shall conform to the requirements of CSA Standard CAN/CSA-C22.2 No. 0.		N/A
4.5.2	Field wiring terminals shall be secured to their supporting surface by a method other than friction between surfaces so that they will be prevented from turning or shifting in position, if such motion may result in a reduction of spacings less than those specified in Clause 4.16. A pressure terminal connector need not be prevented from turning provided that no spacings less than those required result when the terminals are turned 30° toward each other, toward uninsulated live parts of opposite polarity, or toward grounded metal parts.		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.5.3	Field wiring provisions for PCE intended for field connection of conductors larger than No. 10 AWG need not include wiring terminals, provided that (a) the PCE is provided with instructions in accordance with Clause 5.13; (b) a fastening device such as a stud, nut, bolt, spring, or flat washer, or the like, as required for an effective installation, is provided as part of the terminal assembly or is specified in the installation instructions; (c) the installation of the terminal assembly does not involve the loosening or disassembly of parts other than the cover or other parts giving access to the terminal location; (d) the means for securing the terminal connectors is readily accessible for tightening before and after the installation of the field conductors; and (e) after installation of the terminal in the intended manner, the PCE complies with the requirements of this Standard.		N/A
4.5.4	If the terminal connector provided in or specified for use with a terminal assembly requires the use of a special tool for securing the conductor, necessary instructions for using the tool shall be included with the PCE in accordance with Clause 5.41		N/A
4.6	Current-Carrying Parts		P
4.6.1	Current-carrying parts shall have adequate mechanical strength and current-carrying capacity for the service and shall be nonferrous or stainless steel, except that for Class 2 circuits the material is not specified.		P
4.6.2	Bare live parts (including conductors) shall be secured to their bases or mounting surfaces so that they will be prevented from turning or shifting so as to reduce the spacings required by Clause 4.16. Friction between surfaces is not an acceptable means of preventing the turning of live parts, but a suitable lockwasher will be acceptable if properly applied.	Live parts are secured in place	P
4.6.3	The securement of contact assemblies shall be such as to ensure the continued alignment of contacts.	Adequately secured	P
4.6.4	Misalignment of male and female connectors, insertion of a multipin male connector in a female connector other than one intended to receive it, and other manipulations of parts that are accessible without the use of a tool shall not result in a hazardous condition. Note: The intent of Clause 4.6.4 is to address the concerns of mechanical damage, risk of fire, electric shocks, or injury to persons.	Such connectors only can be connected in one way	P
4.7	Internal Wiring		P
4.7.1	The space within enclosures of equipment shall provide ample room for the distribution of wires and cables required for the proper wiring of the equipment to prevent overheating and damage to the insulation.		P
4.7.2	The wire connections and wires between parts of equipment shall be protected or enclosed as required by CSA Standard CAN/CSA-C22.2 No. 0.		P
4.7.3	Wireways shall be smooth and entirely free from projections, burrs, and sharp edges that may cause abrasion of the insulation on the conductors.		P
4.7.4	Bare conductors shall be so supported that spacings will be maintained as required by Clause 4.1.7.		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.7.5	Wiring other than that of printed circuits shall consist of wire of a type or types that are suitable for the particular application when considered with respect to (a) conductor size (consideration shall be given to the effects of vibration, impact, and handling for wires smaller than No. 24 AWC); (b) temperature and voltage to which the wiring is liable to be subjected; (c) exposure to oil, grease, or other substances liable to have a deleterious effect on the insulation; (d) exposure to moisture; and (e) other conditions of service to which the wire is liable to be subjected.		P
4.7.6	All wiring joints shall be provided with insulation equivalent to that of the conductors themselves unless they are held securely and rigidly so that the spacings required by Clause 4.16 are maintained.		N/A
4.7.7	Cords and insulated conductors, either single or bunched, or cabled, when passing through openings in sheet metal walls , shall be effectively protected by suitable bushings or well-rounded surfaces against which the cords or conductors may bear.		N/A
4.7.8	Conductors identified by green or the colour combination green/yellow shall be used only for grounding or bonding connections.		P
4.8	Electrical Insulation		P
4.8.1	Heat-resistant, moisture-absorption-resistant insulating material, such as phenolic composition, porcelain, and cold-moulded composition, that will withstand the most severe conditions likely to be met in service shall be used for the support of bare, live parts and for barriers used to obtain required spacings (as specified in Clause 4.16), and shall comply with the test specified in Clause 6.18.	All components are approved and rated for intended use	P
4.8.2	Insulating material relied on for compliance with this standard and that can be subject to the influence of the arc formed by the opening of a set of contacts shall be suitable for the particular application with regards to resistance to arcing.		P
4.9	Transformers		P
4.9.1	Compliance with 22.2 CNo. 66		P
4.9.2	Extra-low voltage circuits		N/A
4.9.3	Transformer enclosure	Housed within the main enclosure of the equipment	P
4.10	Motors	No motor	N/A
4.11	Capacitors		P
4.11.1	Capacitors shall not create a hazard when tested in accordance with Clause 6.6.	Capacitor is part of the filter unit and rated for intended use	P
4.11.2	Capacitors shall not be affected adversely by the temperatures attained by the device under the most severe conditions of normal use.		P
4.11.3	Electrolytic or other special types of capacitors and capacitors intended for connection directly across the line shall be made the subject of investigation		P

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.11.4	Provision shall be made for the safe discharge of the energy stored in capacitors if the safety of an area to which a service worker has access for routine maintenance is dependent upon de-energization of the PCE, unless (a) the covers by which access is gained require the use of tools for removal; and (b) the PCE is marked with clear instructions specifying the time required for a safe discharge (see Clause 5.42 and 6.19. In cord-connected power supplies, the pins of the attachment plug shall be considered as bare live parts unless there is an isolating transformer between the supply cord and the capacitors (see Clause 6.20).		P
4.12	Fuses and Fuseholders		P
4.12.1	Plug fuses shall not be used in circuits exceeding 150 V to ground.	No plug fuse	N/A
4.12.2	Screwshells of plug fuse fuseholders shall be connected to the "load" side of the circuit.		N/A
4.12.3	Fuses and fuseholders shall have voltage and current ratings suitable for the circuit in which they are connected. Fuses shall have an interrupting rating suitable for the circuits in which they are connected.		P
4.12.4	When fuseholders are accessible to the operator, shall be provided or the design shall be such that bare live parts of a fuse or fuseholder that may be a shock hazard cannot be contacted by the probe shown in Figure 1 when the fuse is completely inserted or when the fuse is tilted at any angle during insertion or removal, or has been completely removed, except for a plug fuse in accordance with Clauses 4.12.1 and 4.12.2. Where a plug fuse is ...clause 5.7...	No fuseholder	N/A
4.12.5	A panel-mounted, in-line fuseholder shall be wired such that the line end is connected to the terminal that is the least accessible from outside the enclosure.		N/A
4.13	Overload Relays	No overload relays	N/A
4.14	Switches and Controllers	No switch	N/A
4.15	Printed Circuit Boards		P
4.15.1	Except as specified in Clauses 4.15.2 and 4.15.4, printed circuit boards shall have a flammability classification equivalent to V-2, as determined by the test specified in CSA Standard C22.2 No. 0.17.	V-0	P
4.15.2	The requirements of Clause 4.15.1 shall not apply to a printed circuit board on which components connected only in Class 2 circuits are mounted.		N/A
4.15.3	Printed circuit boards involving primary circuits, or those located in secondary circuits where failure of the bond between the conductor and the base material could result in contact with uninsulated primary circuit parts, shall be of a type that is acceptable for the application.		P
4.15.4	Printed circuit boards used in enclosures that have openings in accordance with the requirements of Clause 4.2.5.7(e) shall have a flammability classification of at least V-1 in accordance with CSA Standard C22.2 No. 0.17.		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
4.16	Spacings	Line Voltage to isolated circuit: Through air and oversurface measured: min 6.6mm. Live part to enclosure: min 7.2mm	P
4.17	Alternative approach to spacings		N/A
4.18	Separation of Circuits	All wires are rated for the highest voltage	P
4.19	Overcurrent protection		N/A
4.20	Disconnecting Means		N/A
4.21	Protection of Receptacles		N/A
	An output receptacle shall be protected by an overcurrent device rated or set at not more than the rating of the receptacle unless (a) the circuit is not capable of delivering current in excess of the rating of the receptacle under any conditions of loading; or (b) electronic protection is provided that cannot be defeated by a single fault.		N/A
4.22	Battery Supplies	No battery	N/A
4.22.1	Except as permitted by Clause 4.22.2, the batteries intended for use with a PCE shall be supplied with the PCE.		N/A
4.22.2	Subject to the conditions specified in Clause 4.22.3, batteries need not be supplied with a (a) PCE that is intended to be permanently connected to the source of supply; (b) cord-and-plug-connected PCE having an input rating of more than 20 A or 125 V ac and that is intended to be fastened in place or located in a dedicated space; or (c) a battery cabinet.		N/A
4.22.3	For PCE that are not supplied with batteries, or that contain replaceable batteries, the instruction manual shall specify the relevant parameters of the batteries that may be used in accordance with Clause 5.23(e).		N/A
4.22.4	The interior of a metallic enclosure or compartment housing a wet cell battery, such as a lead acid or nickel iron (alkaline) storage battery, shall be protected by two coats of acid (or alkali, as applicable) resistant paint, two coats of enamel individually baked on, or the equivalent		N/A
4.22.5	A polymeric enclosure or compartment housing a wet cell battery, such as a lead-acid storage battery, shall be resistant to corrosion by acids or alkalis, as applicable.		N/A
4.22.6	The enclosure or compartment housing a wet cell battery, such as a lead-acid storage battery, shall be constructed so that spillage or leakage of the electrolyte from the volume of one battery container will be contained within the enclosure and prevented from (a) reaching the outer surfaces of the PCE where contact with the user is possible; (b) contaminating adjacent electrical components or materials; and (c) bridging required electrical spacings.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
4.22.7	A battery shall be so located and mounted that the terminals of cells will be prevented from coming in contact with the terminals of adjacent cells, or with the metal parts of the battery compartment, as the result of shifting of the battery.		N/A
4.22.8	.Vented wet cell batteries may be integral with the PCE provided that all the following conditions are met: (a) the enclosure or compartment housing the batteries is vented; (b) arcing parts such as the contacts of switches, circuit breakers, and relays are not located in the battery compartment; and (c) the battery compartment does not vent into compartments with enclosed spaces that contain arcing parts. Note: The requirements of Clause do not apply to sealed-cell or valve-regulated batteries.		N/A
4.22.9	If vented wet cell batteries are housed in an enclosure or compartment, the ventilation shall provide four changes of air per hour and the PCE shall be marked in accordance with Clause 5.18.		N/A
4.22.10	A metal case or container of a battery, such as an alkaline battery, shall be insulated or spaced away so as not to contact uninsulated live parts of the PCE if such contact may result in a short circuit.		N/A
4.22.11	An enclosure or compartment housing batteries having metal containers or cases that are conductively connected to a battery electrode shall be such that the batteries are insulated or spaced from each other, or otherwise physically arranged, to prevent short-circuiting of part or all of the battery supply after installation in the PCE.		N/A
4.22.12	A battery that requires the addition of water shall have a means to determine the fluid level.		N/A
4.22.13	If transformer isolation is not provided between the ac input circuit of the PCE and the battery circuit (a) the batteries shall be located in a compartment that cannot be accessed without the use of a tool; (b) the battery terminals shall be guarded to reduce the likelihood of unintentional contact with the battery terminals by service personnel; and (c) the marking specified in Clause 5.21 shall appear adjacent to the batteries where visible before removing the guard; the warning shall not be located on the guard.		N/A
4.22.14	If the battery voltage under any normal condition including charging exceeds 42.4 V, a battery cabinet for external connection to a PCE shall (a) be bonded to ground to the frame of the bonded PCE or be double-insulated in accordance with CSA C22.2 No.0.1; (b) if cord-connected, have all external plug and receptacle connectors (i) provided with a guard to prevent accidental contact with bare live parts of such connectors including any not required for operation of the PCE, unless a tool is required for their separation; and (ii) marked in accordance with Clause 5.25; and (c) if for nonpermanent connection, have interconnecting wiring not more than 2 m long, if unjacketed conductors are used		N/A
4.23	Bonding to ground		P
4.24	Dielectric-Liquid-Filled Equipment	Not such type of equipment	N/A
4.24.1	General		N/A

CSA C22.2 No. 107.1			
Clause	Requirement – Test	Result – Remark	Verdict
	Clauses 4.24.2 to 4.24.11 apply to all types of liquid preservation systems; Clause 4.24.12 applies to conservator tank systems; Clause 4.24.13 applies to sealed tank systems; and Clause 4.24.14 applies to nonsealed tank systems.		N/A
4.24.2	Liquid Level	Not Dielectric-Liquid-Filled Equipment	N/A
	The cold-liquid level at 25°C shall be clearly marked on the liquid-level gauge of PCE so equipped, and on the inside of the tank on PCE not so equipped. For PCE with welded covers, internal markings shall not be required.		N/A
4.24.3	Liquid Drain Valve	Not Dielectric-Liquid-Filled Equipment	N/A
	A drain valve shall be installed such that liquid may be drained out to within 13 mm of the tank bottom.		N/A
4.24.4	Terminal Compartment	Not Dielectric-Liquid-Filled Equipment	N/A
	A separately enclosed terminal box or compartment shall be provided to enclose field wiring connections.		N/A
4.24.5	Components	Not Dielectric-Liquid-Filled Equipment	N/A
	Internal wiring and other components inside the tank shall be of a type suitable for oil immersion.		N/A
4.24.6	Lifting	Not Dielectric-Liquid-Filled Equipment	N/A
	Provision shall be made for lifting the PCE, and shall be such that no permanent deformation of the tank or cover will occur when the PCE is lifted. Lifting lugs shall have smooth, rounded surfaces in locations of contact with lifting slings. Lifting lugs shall be positioned such that the slings do not exert pressure on any accessory.		N/A
4.24.7	Mounting	Not Dielectric-Liquid-Filled Equipment	N/A
	For wall- or pole-mounted PCE, the PCE tank and mounting brackets shall comply with the mechanical loading test of Clause 6.21.		N/A
4.24.8	Gaskets	Not Dielectric-Liquid-Filled Equipment	N/A
	Casket material shall not be affected by the insulating liquid. Cover gaskets shall be retained in position so that they will not be damaged when the cover is removed or replaced.		N/A
4.24.9	Dielectric Liquid	Not Dielectric-Liquid-Filled Equipment	N/A
	Insulating liquid used in, or recommended for use with, equipment covered by this Standard shall conform to CSA Standard CAN/CSA-C50, or the equivalent.		N/A
4.24.10	Emergency Pressure-Relief Device	Not Dielectric-Liquid-Filled Equipment	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	A pressure-relief device shall be supplied on tanks and liquid-filled compartments that are subjected to pressure in the event of abnormal or fault conditions (such as an arcing fault). This device may be a pressure-relief vent for use on transformers equipped with a conservator tank or a self-resealing mechanical relief device. The design of the device shall reduce the risk of the continued flow of liquid following its operation. The pressure-relief device shall have a hood or be directed, or both, so that any liquid discharged will be directed downwards and away from the operational controls. The opening pressure of the pressure-relief means shall be less than the withstand pressure of the tank structure. Note: The objective of the pressure-relief device is to prevent or at least minimize tank or compartment rupture in the event of an internal fault.		N/A
4.24.11	Grounding		P
	A suitably sized ground stud shall be provided on the outside of the enclosure. In the case of transformers, the transformer core shall be grounded internally to the tank.	Not such construction	N/A
4.24.12	Conservator Tank System	Not provided with conservator tank system	N/A
4.24.13	Sealed Tank System		N/A
	Sealed power supplies shall be of sufficient strength to withstand a pressure of 50 kPa without leakage or permanent distortion of the tank.		N/A
4.24.14	Nonsealed Tank Systems		N/A
	The dielectric liquid shall have room to expand without overflowing, or without leakage during normal operation, at the highest rated ambient temperature.		N/A
4.25	Equipment with high voltage input or output circuits	No such circuit	N/A
4.26	External signal, control and communication circuits		N/A
5	MARKING		P
	Note: see Annex C for equivalent French markings		P
5.1	The equipment shall be plainly marked, in a permanent manner, in a place where the details will be readily visible after installation, with the following:		P
	(a) Manufacturer's name, trade mark, or other recognized symbol of identification;		P
	(b) Catalogue, style, model, or other type designation;		P
	(c) Rated input voltage		P
	(d) An indication whether the equipment is rated for ac or dc, or both, and, when necessary, the input and output frequency;		P
	(e) Number of phase, except for equipment obviously intended for single-phase use only;		N/A
	(f) Input in amperes, volt-ampere, or kilovolt-amperes;		P
	(g) Rated output voltage;		P
	(h) Output in amperes, volt-amperes, or watts;		P
	(i) Output power factor, if less than unity, unless output is expressed in watts and volt-amperes, or watts and amperes		N/A
	(j) The month and year of manufacture (date coding, serial numbers, or the equivalent may be used);		P
	(k) The maximum and minimum rated ambient operating temperatures;		P

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Clause	Requirement – Test	Result – Remark	Verdict
	(l) For liquid-filled equipment, identification of the dielectric liquid used and quantity in litres.		N/A
	(m) For disconnect switches identification of ...		N/A
	(n) Where relevant for safety, the functions ...		N/A
5.2	Markings shall comply with the requirements of CSA standard CAN/CSA-C22.2 No.0		P
5.3	The polarity of the output leads shall be plainly marked unless the PCE is provided with a polarized termination.	Polarized termination in connector	P
5.4	Unless the proper wiring connections are plainly evident, wiring terminals shall be marked, or the markings or installation shall include a suitable wiring diagram to indicate the proper connections. If additional information is necessary for the proper use of the wiring terminals, the information shall be provided in the installation instructions		N/A
5.5	Markings and instructions relating to conductor insulation temperature and the temperature used for ampacity calculations shall be in accordance with the following: a)... b)... c)...		N/A
5.6	For all fuses, the required voltage and current ratings and type of fuse shall be marked, along with the wording: WARNING:.....		N/A
5.7	When required by clause 4.12.4, the following marking or its equivalent shall be provided: CAUTION: DISCONNECT SUPPLY BEFORE CHANGING FUSE.		N/A
5.8	If the complete equipment consists of two or more separate units, the specified marking shall appear on the basic unit and each of the other units shall be marked with the name, trade mark, or other recognized symbol of identification of the manufacturer and the catalogue designation or equivalent. A unit such as a plug-in assembly that is incomplete in itself and that is not intended for separate sale shall be marked with the name, trademark or other recognized symbol of identification of the manufacturer, and the catalogue number or equivalent.		N/A
5.9	When required by clause 4.23.3, the equipment shall be marked with the following or equivalent: WARNING: BONDING BETWEEN CONDUIT CONNECTIONS IS NOT AUTOMATIC AND MUST BE PROVIDED AS A PART OF THE INSTALLATION or alternatively WARNING: NONMETALLIC ENCLOSURE DOES NOT PROVIDE GROUNDING BETWEEN CONDUIT CONNECTIONS. USE GROUNDING TYPE BUSHINGS AND JUMPER WIRES.		N/A
	This marking may be on a paper tag, or equivalent, inside the equipment.		N/A
5.10	Enclosures that require hubs to be attached at the time of installation shall have installation information regarding the use of suitable hubs and the location of the conduit entry.		N/A
	(1) Information regarding conduit entry may include the location, eg, the necessary flat surface clearance around a conduit opening (see CAN/CSA-C22.2 No.0) where the wall thickness is suitable for threading or where the requirements in clause 4.4.1.6 apply.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	(2) This marking may be on a paper tag inside the equipment or equivalent.		N/A
5.11	Notwithstanding clause 5.18.2 of CAN/CSA-C22.2 No.0, PCE for floor mounting that do not conform with clause 4.2.5.5 shall be marked with the following or equivalent statement: DO NOT INSTALL ON OR OVER COMBUSTIBLE SURFACES		N/A
5.12	Power supplies that are intended for use in controlled environments shall be marked with the following or equivalent: CAUTION: FOR USE IN A CONTROLLED ENVIRONMENT. REFER TO MANUAL FOR ENVIRONMENT CONDITIONS.		N/A
5.13	If terminals for the connection of field conductors are not provided with the PCE, as permitted by clause 4.5.3, the PCE.....		N/A
5.14	When required by clause 4.2.6.7, the live part such as a heat sink or relay frame shall be identified. The following or equivalent caution shall be located on or near the live part and shall be readily visible: CAUTION: ___ IS LIVE. RISK OF ELECTRIC SHOCK. DISCONNECT POWER BEFORE SERVICING.		N/A
	Note: Space for insertion of the name of the part that is live...		N/A
	Note: one label may be suitable to identify a number of such live parts.		N/A
5.15	A PCE that is intended to be permanently secured to a structure and is provided with a supply cord in accordance with clause 4.4.1.1 shall be marked with the following or equivalent: THE SUITABILITY OF THE USE OF FLEXIBLE CORD PER THE CANADIAN ELECTRICAL CODE, PART I IS TO BE DETERMINED BY THE LOCAL INSPECTION AUTHORITY HAVING JURISDICTION.		N/A
5.16	PCE that is energized from more than one circuit shall be permanently marked on the outside with the following or equivalent wording: WARNING: DISCONNECT ALL SOURCES OF SUPPLY BEFORE SERVICING Or WARNING: MORE THAN ONE LIVE CIRCUIT. SEE DIAGRAM.		N/A
5.17	Individual modules of a modular PCE shall be identified (eg, rectifier/charger section, inverter section, or the equivalent) and instructions for field assembly of each module, including an interconnection diagram, shall be packaged with the module or contained in the instruction manual.		N/A
5.18	When required by clause 4.22.9, the following marking or equivalent shall appear on the cabinet or compartment housing the batteries: WARNING: THIS CABINET (COMPARTMENT) CONTAINS VENTED WET CELL BATTERIES. VENTILATION OF THE ROOM IN ACCORDANCE WITH THE RULES OF THE CANADIAN ELECTRICAL CODE, PART 1, IS REQUIRED.		N/A
5.19	A remote battery supply/cabinet assembly shall be marked to show the nominal dc circuit rating (volts and amperes)		N/A
5.20	When required by clause 4.23.5 b), the following marking or equivalent shall appear on the PCE: NEUTRAL FLOATING.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
5.21	When required by clause 4.22.13, the following marking or equivalent shall be provided adjacent to the batteries: CAUTION: RISK OF ELECTRIC SHOCK. BATTERY CIRCUIT IS NOT ISOLATED FROM AC CIRCUIT. HAZARDOUS VOLTAGE MAY EXIT BETWEEN BATTERY TERMINALS AND GROUND. TEST BEFORE TOUCHING.		N/A
5.22	Explicit battery safety instructions (see clause 5.23) shall be provided for a		N/A
	(a) PCE having internal batteries;		N/A
	(b) Remote battery supply investigated under the requirements of this standard; and		N/A
	(c) PCE intended for use with batteries to be located in a remote battery room when the batteries are furnished with the PCE.		N/A
	Note: these instructions may appear on the PCE or in an instruction manual accompanying the PCE.		N/A
5.23	The safety instructions for batteries that are required by clause 5.22 shall include those items on the following list. The statement “IMPORTANT SAFETY INSTRUCTIONS” shall precede the list. Equivalent wording of the listed instructions is acceptable.		N/A
	(a) SAVE THESE INSTRUCTIONS – THIS MANUAK CONTAINS IMPORTANT SAFETY INSTRUCTIONS;		N/A
	(b) WARNING: A BATTERY CAN PRESENT A RISK OF ELECTRICAL SHOCK, BURN FROM HIGH SHORT-CIRCUIT CURRENT, FIRE OR EXPLOSION FROM VENTED GASES. OBSERVE PROPER PRECAUTIONS;		N/A
	(c) WHEN REPLACING BATTERIES USE THE SAME NUMBER AND THE FOLLOWING TYPE BATTERIES;		N/A
	(d) PROPER DISPOSAL OF BATTERIES IS REQUIRED. REFER TO YOUR LOCAL CODES FOR DISPOSAL REQUIREMENTS;		N/A
	(e) The safety relevant battery parameters shall be specified.....		N/A
	(f) For batteries that require the addition of water.....		N/A
5.24	Multiple voltage power supplies intended for permanent connection shall have a marking (eg, paper tag) stating the particular voltage for which the PCE has been wired when shipped from the factory.		N/A
5.25	When required by clause 4.20.8.2c or 4.22.14, the following marking or equivalent shall appear adjacent to the external battery connectors: DO NOT DISCONNECT UNDER LOAD.		N/A
5.26	The installation instructions shall include all information (cooling, mounting, etc) necessary for the proper function of the PCE.....		N/A
5.27	When required by clause 4.19., 9.3.2.2, 10.3.1, or 13.5.2.5, the instructions manual shall specify that overcurrent protection for the ac output circuit is to be provided at the time of installation.....		N/A
5.28	When required by clause 4.4.2.7(b), the supply cord of a PCE having a rating of 208V, single phase, and an attachment plug rated at 250V shall be provided with a permanently attached tag bearing the following or equivalent marking: CAUTION: RISK OF ELECTRIC SHOCK AND FIRE. CONNECT TO A RECEPTACLE WIRED FOR 208V AC.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
5.29	When required by clause 4.4.2.7(C), a PCE having a rating of 208V, single phase, and an output receptacle or cord connector rated 250V shall be marked with the following or equivalent marking: CAUTION: OUTPUT OF THIS POWER SUPPLY IS RATED AT 208V AC.		N/A
5.30	A PCE having an internal battery supply shall be marked with the following or equivalent caution on the outside of the PCE unless it is prominently visible with any cover or panel opened: CAUTION: RISK OF ELECTRIC SHOCK. HAZARDOUS LIVE PARTS INSIDE THESE POWER SUPPLY ARE ENERGIZED FROM THE BATTERY SUPPLY EVEN WHEN THE INPUT AC POWER IS DISCONNECTED.		N/A
5.31	When required by clause 4.23.6, the following shall be marked on the unit or in the accompanying instructions: WARNING: PROVIDE GROUND DETECTION DEVICE DURING INSTALLATION.		N/A
5.32	The maximum allowable load, in amperes, shall be marked adjacent to receptacles supplying ac output power if the allowable load is less than the rating of the receptacle.		N/A
5.33	Where the equipment is liquid filled, the instruction manual shall include particulars of the dielectric liquid and handling, storage, and filling instructions.		N/A
5.34-5.46	Where the		N/A
5.47	The installation instructions shall include an explanation of any symbols in the markings on the PCE required by this standard.		

6	Tests		P
6.1	Test conditions		P
6.2	Ratings		P
6.3	Temperature(Normal)		P
6.4	Leakage Current		P
6.5	Dielectric strength		P
6.6	Abnormal operation		P
6.7	Overload(Control Devices)		N/A
6.8	Endurance(Control Devices)		N/A
6.9	Compression(Metal Enclosure)		N/A
6.10	Deflection(Metal Enclosure)		N/A
6.11	Flame(Polymeric Enclosure)		N/A
6.12	Resistance to Impact	Metal enclosure	N/A
6.13	Conduit Connection(Polymeric Enclosure)		N/A
6.14	Flaming Oil(perforated panels)		N/A
6.15	PWB Coating		N/A
6.16	Securement of Components		P
6.17	Strain Relief		P
6.18	Insulating Material		N/A
6.19	Capacitor Discharge(Energy and Shock Hazards)		P
6.20	Tank pressure test		N/A
6.21	Mounting Bracket Vertical Loading test-Liquid filled equipment		N/A
6.22	Mounting means Vertical Loading test-other than Liquid filled equipment		N/A

7	Industrial dc PCE		N/A
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8	PCE for use in recreational vehicles		N/A
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Clause	Requirement – Test	Result – Remark	Verdict
9	Transfer switches		N/A
10	Inverters		N/A
11	Telecommunication equipment PCE		N/A
12	Cable TV PCE		N/A
13	PCE for use in photovoltaic(PV) systems		N/A
14	Interactive inverters and PCE		N/A
15	DC charge controllers		N/A
16	Electric vehicle chargers		N/A
17	PVIPCE		N/A
18	Inverters for use in vehicles		N/A
19	PCE for use in marine applications		N/A