CERTIFICATION Informs...
An INFORMATION Bulletin from CSA International

Ref No: I04-011 **Date: February 27, 2004**

WIRING PRODUCTS NO. 8

Existing Certification not affected

Call us today!
We can help you stay on top of changes that will affect your Certification!
1-800-463-6727

Publication of Technical Information Letter (T.I.L.) No. A-30 Covering Interim Certification Requirements for Power Table Systems for Residential And Commercial Use.

See Attachment 1 for affected Class Numbers

Who is affected?

Manufacturers of wiring systems and accessories.

What do you do?

1. Contact CSA engineering staff for information concerning the changes and how they apply to you.
2. Complete the attached CSA application for evaluation of your products if you decide to proceed.
3. Return the application to your CSA engineer with appropriate supporting documentation* and samples (if needed)

*Technical information as well as company name, address, factory locations and CSA file number or master contract number (if assigned) when applying.

Need additional technical information?

Contact Ziggy Psarski, P.Eng.
By phone (416) 747 4180, fax (416) 747-2476
or e-mail ziggy.psarski@csa-international.org

Introduction:

T.I.L. No. A-30 has been prepared to document construction and test requirements, adopted from applicable CSA Standards, for power table systems.

Background and Rationale:

- T.I.L. No. A-30 was developed at the request of manufacturers.
- The T.I.L. covers cord connected single circuit wiring systems for residential and commercial use and for use with free standing interconnected tables, provided with communication, video, and/or power receptacles.
- The T.I.L. covers powered tables connected to 15 A or 20 A, 120 V branch circuits, for use in non-hazardous locations, in accordance with the Rules of the Canadian Electrical Code, Part I.

Apply any time to have your products evaluated

Visit us at www.csa-international.org
Click on "Contact Us" for the online phone listing of our Offices and Partners
Visit us at www.csa.ca to purchase a Standard

CSA INTERNATIONAL

ATTACHMENT 1

Affected Class Numbers

Class	Class Description	Minor Class Description
6242-01	MULTI-OUTLET ASSEMBLIES	
6242-02	MULTI-OUTLET ASSEMBLIES	Fittings
6242-03	WIRING SYSTEMS AND ACCESSORIES	Modular
6242-04	WIRING SYSTEMS AND ACCESSORIES	Under-carpet
6242-05	MANUFACTURED WIRING SYSTEMS	
6242-06	WIRING SYSTEMS AND ACCESSORIES - Powered Table Systems	
6242-81	MULTI-OUTLET ASSEMBLIES	Certified to US Standards
6242-82	MULTI-OUTLET ASSEMBLIES	Fittings - Certified to US Standards
6242-83	WIRING SYSTEMS AND ACCESSORIES	Modular - Certified to US Standards
6242-85	MANUFACTURED WIRING SYSTEMS	Certified to US Standards

TECHNICAL INFORMATION LETTER NO. A-30

CSA International

PRODUCT GROUP: Wiring Products DATE: February 27, 2004

Prepared by: Doug Hawkes
Issued by: Ziggy Psarski
Approved by: Davey Li

EQUIPMENT: Powered Table Systems Power Table Systems

ITEM: Interim Certification Requirements for Cord-Connected Power Table Systems for Residential and Commercial Use and for Use with Free Standing Interconnected Tables

STANDARDS:

CAN/CSA-C22.2 No. 0-M91 (R2001)	-	General Requirements - Canadian Electrical Code, Part II
C22.2 No.0.4-M1982 (R1999)	-	Bonding and Grounding of Electrical Equipment (Protective Grounding)
CAN/CSA-C22.2 No. 0.17-00	-	Evaluation of Properties of Polymeric Materials
C22.2 No. 21-95 (R1999)	-	Cord Sets and Power Supply Cords
C22.2 No. 42-99 (R2002)	-	General Use Receptacles, Attachment Plugs and Similar Wiring Devices
C22.2 No. 49-98 (R2003)	-	Flexible Cords and Cables
C22.2 No. 214-02	-	Communication Cables
CAN/CSA-C22.2 No.235-M89 (R2001)	-	Supplementary Protectors

Background and Rationale

At the request of industry, CSA International has published this Technical Information Letter (T.I.L.) to cover interim certification requirements for cord-connected powered table systems for industrial and commercial use and for use with free standing interconnected tables.

1. Scope

1.1 This T.I.L. covers electrical safety requirements for cord-connected single circuit wiring systems for residential and commercial use and for use with free standing interconnected tables, provided with communication, video, and/or power receptacles that are intended for frequent setup and breakdown.

1.2 The requirements apply to powered tables connected to 15 A or 20 A, 120 V branch circuits, for use in non-hazardous locations, in accordance with the Rules of the Canadian Electrical Code, Part I.

1.3 The requirements do not apply to tables employing multi-circuit electrical systems, tables that are integral to an office panel system, kiosks, carts and utility stands, or wired cabinets.

1.4 The T.I.L. covers the requirements for protective routing of communication circuits.

2. Definitions

2.1 The following definitions apply in this T.I.L.:

CHANNEL — A passage intended for the routing and holding of communication wiring, low voltage wiring and wiring having functional insulation plus a layer of supplementary insulation. A channel may provide mechanical protection but has not been evaluated as a raceway.

CLASS 2 CIRCUIT — A circuit having power and voltage limitations as defined in the CEC Part I, section 16.

CONNECTING ASSEMBLY, UNIT-TO-UNIT ELECTRICAL — A component that is used to electrically connect unit raceways of two or more adjacent, mechanically connected tables.

CONNECTOR, UNIT-TO-UNIT, MECHANICAL — An assembly that is used to connect two or more adjacent tables for the purpose of providing mechanical support between the units.

END TABLE – The last table in a multi-table system. The end unit will have a single point for electrical connection to the rest of the table system.

POWERED TABLE SYSTEM — An arrangement of mechanically and electrically interconnected or individual tables provided with one or more general use receptacles with or without data and telephone ports.

STARTER TABLE — The table that is connected to the external supply source and that may have provision for electrical connection of additional portions of a powered table system. The starter unit is located as the first table in the system.

3. General Requirements

3.1 This T.I.L. shall be used in conjunction with the following CSA Standards:

CAN/CSA-C22.2 No. 0-M91	-	General Requirements - Canadian Electrical Code, Part II
C22.2 No.0.4-M1982	-	Bonding and Grounding of Electrical Equipment (Protective Grounding)
CAN/CSA-C22.2 No. 0.17-00	-	Evaluation of Properties of Polymeric Materials
C22.2 No. 21-95	-	Cord Sets and Power Supply Cords
C22.2 No. 42-99	-	General Use Receptacles, Attachment Plugs and Similar Wiring Devices
C22.2 No. 49-98	-	Flexible Cords and Cables
CAN/CSA-C22.2 No.235-M89	-	Supplementary Protectors

4. Construction

4.1 General

4.1.1 Electrical components shall conform to the particular Canadian Electrical Code, Part II Standard covering such components, as applicable, and shall be suitable for the application.

4.1.2 The voltage rating of an electrical device and insulated conductor shall be at least equal to the voltage that is applied to it during intended use.

4.1.3 The ampere rating of an electrical device and insulated conductor shall be at least the maximum current to which they are subjected during intended use.

4.1.4 Means shall be provided to mount the receptacles or raceway to the table surface. The means shall have strength and rigidity to reduce the risk of distortion that facilitates installation in a manner other than intended.

4.1.5 Where two or more tables are capable of being used in combination, a mechanical securement means between tables shall be provided, in accordance with Clause 4.11.

4.2 Frame and Enclosure

4.2.1 General

4.2.1.1 A furnishing shall be formed and assembled so that it has the strength, stability, and rigidity required to resist the abuses during normal use and maintenance to which it is subjected without increasing the risk of fire, electric shock, or injury to persons. The furnishing shall be subject to the mechanical strength of enclosure tests of Clause 7.1.

4.2.1.2 Raceways and components shall be free of sharp edges or projections when assembled as intended.

4.2.2 Metallic Electrical Enclosures

4.2.2.1 The thickness of a metal electrical enclosure employed as the enclosure for live parts and as the sole means of protecting electrical components against mechanical abuse shall be in accordance with Table 1.

4.2.2.2 An enclosure with sheet metal thickness other than that specified in Table 1 may be used if it provides the same protection for wiring as the metal enclosure specified in Table 1. The protection shall be determined using the mechanical strength of enclosure tests of Clause 7.1.

4.2.2.3 The thickness of a metal electrical enclosure that is recessed or otherwise protected from mechanical abuse such that a 51 mm (2 inch) diameter sphere is not able to contact the electrical enclosure, shall not be less than the minimum wall thickness shown in Table 1.

4.2.2.4 The thickness of a metal cap or cover for an electrical enclosure shall be not less than the minimum limit of Table 1 and shall comply with the applicable requirements in this section.

4.2.2.5 The thickness of a cast metal electrical enclosure shall be not less than the limits shown in Table 2.

4.2.2.6.1 Ferrous material, excluding sheared edges, used in a raceway system shall be protected against corrosion. The corrosion-resistance coating shall comply with the corrosion-resistance coating on steel surface raceway test of Clause 7.14.

4.2.2.6.2 Exposed non-current carrying metal parts shall be bonded to ground as in accordance with Clause 4.19.

4.2.2.6.3 Wiring space in enclosure shall comply with Rule 12-3034 of the Canadian Electrical Code Part I.

4.3 Electrical Enclosures of Polymeric Material

4.3.1 A polymeric electrical enclosure employed as the enclosure for live parts and as the sole means of protecting electrical components against mechanical abuse shall have the strength to resist the mechanical stresses to which it is subjected during intended use of the product.

4.3.2 A polymeric material that is intended to support an outlet, fitting, or other part shall have the strength and rigidity required for the application.

4.3.3 To determine compliance with Clauses 4.3.1 and 4.3.2, a polymeric enclosure part shall be subjected to the equivalence of thickness and mold stress tests of Clause 7.8, deflection test of Clause 7.7, compression test in Clause 7.6, and strength of enclosure tests of Clause 7.5, as applicable.

4.3.4 A polymeric material used as the sole enclosure for live parts (other than Class 2 circuits) shall be rated V-0, or 5VA or 5VB.

4.3.5 A non-metallic enclosure shall be provided with bonding connection and metal boxes, if used, shall be bonded to ground in accordance with Rule 10-404 of the Canadian Electrical Code Part I.

4.3.6 Wiring space in enclosure shall comply with Rule 12-3034 of the Canadian Electrical Code Part I.

4.4 Mechanical Connectors

4.4.1 Whether a release (provided on folding tables), a mechanical connector (joining two tables), or similar device is adequate shall be determined from an investigation of the complete powered table system, its operating characteristics, and the potential risk of injury to persons. The investigation shall include evaluation of the results of breakdown or malfunction of any one component, and not more than one component at a time, unless one event contributes to another. When the investigation shows that breakdown or malfunction of a particular component results in a risk of injury to persons, that component shall be investigated for reliability.

4.5 Metal Raceways

4.5.1 The requirements of Clause 4.2.2 apply to raceways and electrical enclosures constructed of metallic materials of powered conference tables.

4.5.2 Metal raceways shall be electrically continuous throughout and electrically secured to all equipment to which they are attached.

4.5.3 Raceways shall be mechanically continuous throughout and mechanically secured to all equipment to which they are attached.

4.6 Raceways of Polymeric Material

4.6.1 The requirements for electrical enclosures of polymeric material apply for raceways and electrical enclosures constructed of polymeric material used in powered conference tables with the supplemental requirements of clause 4.6.2.

4.6.1.1 With reference to 4.3.3, a polymeric raceway employed only as an enclosure of live parts and not the sole means of protection against mechanical abuse is not required to comply with clause 7.1, Strength of Enclosure Tests.

4.6.2 A polymeric material used as the sole enclosure for live parts (other than Class 2 circuits) shall be rated V-0, or 5VA or 5VB.

4.6.3 Raceways shall be mechanically continuous throughout and mechanically secured to all equipment to which they are attached.

4.7 Mounting Means

4.7.1 An opening provided for mounting a cabinet light, or other furnishing intended for mounting, shall be located or guarded so that a nail, hook, or similar part does not displace a part that creates a risk of fire or electric shock, and does not contact one of the following:

a) An uninsulated live part;
b) Internal wiring; or
c) Any other part that creates a risk of fire or electric shock.

4.8 Internal Wiring

4.8.1 All internal wiring, except for data or telephone signals, shall be No. 14 AWG minimum.

4.8.2 Internal wiring shall consist of wires of a type or types that are acceptable with respect to anticipated conditions of use, such as flexibility, temperature, ampacity, and voltage.

4.8.3 Wiring used for carrying data or telephone signals is not required to be No. 14 AWG; Communications wiring shall meet the requirements of CSA Standard C22.2 No. 214.

4.8.4 A hole through which insulated wires pass in a sheet-metal wall within the overall enclosure of a table system shall be provided with the following:

a) An insulating bushing so that wires do not contact sharp edges or burrs; or
b) A smooth, rounded surface upon which the wires may bear.

4.9 Protection Against Corrosion

4.9.1 Iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means, when corrosion of such parts results in a risk of fire, electric shock, or injury to persons.

4.9.2 This requirement does not apply to bearings, laminations, or minor parts of iron or steel, such as washers, screws, or similar parts.

4.10 Accessibility of Uninsulated Live Parts

4.10.1 Live parts of a powered table system shall be enclosed to reduce the risk of fire, electric shock, and injury to persons.

4.10.2 A contact opening in a connector employed for quick assembly of power between two tables, or the like is acceptable if a flat-faced, 6.4 mm (¼ in) diameter probe in accordance with Fig. 1 cannot be made to contact an insulated live part when the probe is inserted through the contact opening, or the mating plug is partially inserted into the connector.

4.10.3 A Class 2 part is not required to be enclosed.

4.11 Mechanical Assembly

4.11.1 General

4.11.1.1 Powered table systems shall be provided with means for mechanical attachment between each table in the system.

4.11.1.2 A powered table system shall be constructed so that when adjacent units are connected, disconnected, or moved as would occur during setup and breakdown, a risk of fire, electric shock, or injury to persons will not be introduced.

4.11.1.3 A switch, attachment-plug receptacle, or other component that is intended to be handled by the user shall be prevented from turning, loosening, or otherwise becoming disengaged from its mounting means by means other than friction. For example, a properly applied lock washer is acceptable as a means to prevent turning of a device having a single-hole mounting means.

4.11.2 Mechanical Connectors

4.11.2.1 A mechanical connector shall be constructed to withstand the strain to which it is subjected during normal use, in accordance with Clause 7.11, Tests on Mechanical Connectors.

4.11.3 Interconnecting Cords and Supports

4.11.3.1 An interconnecting cord shall be supported through individual tables and between mechanically contiguous tables. The cord supports shall be such that the cord is has a maximum unsupported distance of 0.6m, and does not hang down more than 152mm.

4.11.3.2 An interconnecting cord shall be a maximum of 51mm longer than the distance between electrical connection points.

4.11.3.3 An interconnecting cord that spans two tables shall be supported a maximum of 76mm from each table it spans.

4.11.3.3.1 An interconnecting cord 45.7 cm or less is not required to be supported provided it hangs 152mm or less from the bottom of the table.

4.11.3.4 Interconnecting cords shall be provided with a means of securement on at least one end of the cord.

4.11.3.5 An interconnecting cord that has securement means on each end of the cord shall have securement means comply with the requirements for mechanical connectors. See clause 4.11.4.

4.11.3.6 The securement of the cord shall be such that no strain will be transmitted to the interconnection contacts if the tables are pulled apart.

4.11.3.7 The total length of the system of all interconnecting cordage, exclusive of the supply cord, shall not exceed 12 meters.

4.11.3.8 At a point where a interconnecting cord passes through each table, a bushing or equivalent means shall be employed to provide a smooth, rounded surface against which the cord may bear.

4.11.4 Raceway Support

4.11.4.1 A raceway shall be supported through individual tables and between mechanically contiguous units.

4.11.5 Electrical Mating Connectors

4.11.5.1 Electrical mating connectors shall:

a) be reliably keyed by a physical or mechanical means to maintain correct polarity between power-feed and interconnected parts;
b) be rated 15 A;
c) connectors totally enclosed in a metal raceway shall be rated HB and connectors not so enclosed shall be rated V-2 or better;

   This requirement does not apply to connectors that comply with the requirements in CSA Standard C22.2 No. 42.
d) have the grounding-terminal conductors connect before mating supply conductors connect when two or more connectors are being mated as intended. During disconnection of mating connectors, the supply conductors shall disconnect before the grounding conductor disconnects;
e) not subject mating parts to tension during normal use of the product;
f) be latched or otherwise secured together to provide electrical continuity between mating parts. Connectors that are not provided with a mechanical latch shall be subjected to the minimum separation force portion of the Clause 7.10, Retention Tests On Mating Connectors; and
g) be subjected to Strain Relief Test in Clause 7.12, Strain Relief Test, between the cable and the connector housing.

4.12 Power Supply Connections

4.12.1 The table system shall be provided with only one power supply cord as the method of connection to a source of supply.

4.12.2 A starter unit shall be connected to a supply source so that all ungrounded supply (unidentified) conductors are at a maximum potential of 120 volts with respect to the grounded supply conductor and the bonding conductor.

4.12.3 A supply cord shall be constructed so that stresses on the table system that occur during installation and intended use of the product will not create a risk of fire or electric shock.

4.12.4 The attachment plug of a table system shall be a grounding type plug, 5-15P configuration.

4.12.5 The power supply cord shall be minimum size No. 14 AWG.

4.12.6 The power supply cord shall be at least the type intended for hard usage, for example Types SJ or SJT.

4.12.7 The length of supply cord from the point it exits the table to the end of the attachment plug shall be a minimum of 2.74m and a maximum of 4.6m.

4.12.8 The table system shall be constructed such that the cord and plug are not damaged when the powered table system is placed against a wall or similar structure.

4.12.9 At a point where a flexible cord passes through an opening, an insulating bushing or equivalent means shall be employed to provide a smooth, rounded surface against which the cord may bear.

4.13 Overcurrent Protection

4.13.1 All freestanding powered table systems shall be provided with supplementary overcurrent protection rated 15 amps maximum. The supplementary overcurrent protection shall be installed in the table provided with the power supply cord. For example, in a multi-table system, the starter table shall be provided with the supplementary overcurrent protector.

4.13.2 The overcurrent protective device shall not open under normal loading conditions. See clause 7.4, Temperature Test.

4.13.3 The overcurrent protective device shall be a supplementary protector of the automatic-trip-free or manual-reset type.

4.13.4 The overcurrent protective device shall comply with the requirements in CSA Standard C22.2 No. 235 for use with motor loads. Its short-circuit capacity shall be a minimum of 1000 A and it shall have the following calibration at 25°C: 100 percent hold, 125 percent/135 percent trip.

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

4.14 Convenience Receptacles

4.14.1 Receptacles (outlets) provided shall comply with the requirements in CSA Standard C22.2 No. 42-99 and shall be bonded to ground.

4.14.2 Receptacle outlet faces shall be flush with, or project from, faceplates or raceway covers of insulating material and shall project a minimum of 0.38mm from metal faceplates.

4.14.3 A maximum of 12 grounding-type receptacles or 6 duplex receptacles as specified in 4.14.1, rated 125 volts, 15-amperes shall be provided per system consisting of maximum 12 tables. Two (single) receptacles provided within a single enclosure, and that are within 0.3m of each other or one duplex receptacle, shall be considered as one receptacle.

4.14.4 A convenience receptacle shall be visible to the user.

The receptacle may be hidden if:

a) it can be made visible by opening a hinged door or the like; and
b) the supply cord to an appliance will not be subject to abrasion because of the location of the receptacle.

4.14.5 A convenience receptacle shall be oriented in a position so its face is vertical.
This requirement does not apply to a receptacle that is covered or otherwise protected from spillage while not in use. See Clause 7.13, Spill test.

4.15 Strain Relief

4.15.1 A strain-relief means shall be provided so that mechanical stress placed on a flexible cord or flexible conduit (such as a pull or twist) is not transmitted to terminals, splices, or internal wiring. When a clamp is employed with a cord, auxiliary insulation is required when the clamp is able to damage the cord insulation.

4.15.2 To determine compliance with 4.15.1, a strain relief means is to be subjected to the applicable tests described in Section 7.12, Strain-Relief Tests.

4.15.3 Means shall be provided so that the power cord and any interconnecting cords cannot be pushed into the raceway or receptacle housing through the cord-entry hole if such displacement:

a) subjects the cord to mechanical damage;
b) exposes the cord to a temperature higher than its rated value; or
c) reduces spacings below the minimum acceptable values.

4.16 Spacings

4.16.1 Spacings through air and over surface of insulation between uninsulated live parts of opposite polarity, and between uninsulated live parts and dead metal parts shall be at least 1.6mm.

4.16.2 This requirement does not apply to the internal spacings of components having individual requirements; for example, the internal spacings of a switch.

4.17 Flammability of Materials

4.17.1 Polymeric material used as mechanical protection shall comply with the requirements for material rated as V-2 when tested as described in Clause 4.2.2 of CSA Standard C22.2 No. 0.17.

4.17.2 Polymeric materials used as mating connectors shall comply with the requirements for material rated as HB when tested as described in Clause 4.2.3 of CSA Standard C22.2 No. 0.17 and shall comply with the requirements for material rated as V-2 when tested as described in Clause 4.2.2 of CSA Standard C22.2 No. 0.17.

4.17.3 Except as noted in 4.17.4, a molding connector, shelf, or the like, consisting of painted metal or varnished or painted wood is considered to be acceptable without test.

4.17.4 A polymeric material used to form a small decorative part or mechanical connector shall be rated HB or less flammable, in accordance with Clause 4.2.3 of CSA Standard C22.2 No. 0.17-00.

4.18 Separation of Circuits

4.18.1 Class 2 or communication conductors shall be separated from power, lighting, and Class I circuits in accordance with the applicable requirements of Section 16 and 60 of the Canadian Electrical Code, Part I.

4.18.2 Conductors that are insulated for the maximum AC power circuit voltage involved are not required to be separated from the AC power circuit conductors when breakage or loosening of a conductor at a terminal in either circuit cannot result in contact between uninsulated parts of one circuit and uninsulated or inadequately insulated parts of the other circuit.

4.19 Grounding and Bonding

4.19.1 The bonding of components of a powered table system and of interface devices shall comply with CSA Standard C22.2 No. 0.4-M1982, and also with Clauses 4.19.2 and 7.2.

4.19.2 All metal parts forming a part of the raceway shall have provision for connections to the bonding system.

5 Marking

5.1 A component, or unit insert of a powered table system shall be marked legibly and durably with:

a.) the company's name, trade name, or trademark;
b.) the date code;
c.) a catalog number or the equivalent.

The minimum letter height shall be 2.4mm (3/32 in).

5.2 The marking specified in 5.3 does not have to be visible after installation without the use of a tool if, as part of the normal installation and use, it is secured and enclosed by a cover that only a common tool is required to remove or open.

5.3 Each powered table system component (such as a table top or electrical accessory that is shipped separately from the major powered table unit to which it is to be connected) shall be identified with respect to its intended use and interrelationship with the powered table system; for example — "For Use with Powered table System Series _____" in which the appropriate series, or catalog number is designated. If separable components are factory-assembled and shipped together, only the complete assembly and not the component is required to be marked.

A component, the physical size of which is such that all the required markings cannot be physically placed on the body of the component while maintaining the minimum letter heights specified in Clause 5.1, shall be marked with the name, trade name, or trademark and the date or other dating period of manufacture; and all other required markings shall be provided on the smallest shipping container.

5.4 Each table shall be marked with the words “WARNING: Risk of Fire or Electric Shock,” and the following or the equivalent: “No powered table system shall be supplied by more than one source” and “Do not connect more than twelve tables together”.

5.5 Any electrical accessory that provides a load on a circuit (such as a lighting attachment, a motor, or the like) shall be marked with its electrical rating in volts and current or watts in a location visible after installation without the use of tools.

6 Installation and Operating Instructions

6.1 Operating, maintenance, and installation instructions shall be provided for each portion of a powered table system and shall be included in the smallest shipping carton for each powered table or accessory.

6.2 The instructions mentioned in 6.1 shall include, but need not be limited to, the directions and information necessary to cover the mechanical and electrical limitations of the system and the intended installation, maintenance, operation, and use of the product.

6.3 The instructions shall specify that the powered tables shall be mechanically contiguous.

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

7 Tests

7.1 Mechanical Strength of Enclosures Tests

7.1.1 General

7.1.1.1 A component shall be subjected to the applicable tests described in this section, when supported by a Powered Table System as recommended in the instruction manual. The component shall not collapse or deform to a degree that presents a risk of injury to persons or present a risk of fire, electric shock, or injury to persons by causing the supporting legs to collapse or deform to such a degree that components are damaged or electrical spacings are reduced below minimum acceptable levels.

7.1.1.2 With reference to 7.1.1.1, a risk of injury to persons is considered to exist if the component is completely displaced from its support system or if the component or support system is damaged to the extent that there are sharp edges or corners exposed.

7.1.1.3 Electrical components within the component and supporting unit shall comply with the requirements in clause 4.10, Accessibility of Uninsulated Live Parts and clause 7.3, Dielectric Voltage-Withstand test.

7.1.1.4 Additional tests may be necessary to take into consideration particular components, combinations of components, configurations of systems, alternate supporting means, and the like, that may involve unusual loading conditions.

7.1.2 Loading Test

7.1.2.1 The largest table, the least supported, and least stable tables provided by the manufacturer shall be tested as described in 7.1.2.3.

7.1.2.2 The tables shall be assembled in accordance with the manufacturer's instructions.

7.1.2.3 A test load shall be equal to the following, whichever results in the greatest load:

a) the magnitude of the width of the work surface in inches times 3.18 kg (7 pounds);
b) 136 kg (300 pounds); or
c) four times the maximum recommended load in the manufacturer's instructions.

The load is to be gradually applied to an area along the entire usable width of the work surface, centered along a line located 203mm (8 in) in from the least-supported edges of the work surface. The load is to be maintained for 15 minutes after complete loading is attained.

7.2 Bond Impedance Test

7.2.1 The impedance of two electrically interconnected electrical enclosures, between the point of connection of the equipment-grounding terminal means and other metal parts that are likely to become energized, shall be measured in accordance with Clauses 7.2.2 to 7.2.3. The impedance shall be not more than 0.1 ohm.

7.2.2 An alternating current of at least 25 A from a source of supply of not more than 6 V shall be passed from the point of connection of the bonding (equipment grounding) terminal means to a metal part in the grounding circuit, and the resulting drop in potential shall be measured between these two points. The resistance in ohms shall be determined by dividing the drop in potential in volts by the current in amperes passing between these two points.

7.2.3 The two widest furnishings or separable furnishing electrical enclosures shall be electrically and mechanically connected as intended. For a flexible electrical enclosure system, the test is to be conducted with the flexible conduit in a relaxed straight-line position. The current source specified in Clause 7.2.2 is to be connected to any point on the ground-return path of one furnishing and connected to any point on the adjacent electrical enclosure. This procedure shall be repeated a minimum of three times; each time the point or points of supply connection shall be changed. The ground path shall be allowed to cool between each test.

7.2.4 The impedance to be measured is between the point of connection of the equipment grounding means and other metal parts that are likely to become energized.

7.2.5 With respect to the requirements in Clauses 7.2.2 and 7.2.3, a pass-through-unit raceway or electrical connecting assembly shall be considered to be a single-furnishing raceway.

7.3 Dielectric Strength Test

7.3.1 Each electrical component shall withstand, without breakdown, for a period of 1 min, the application of an ac voltage of suitable power frequency, between live parts and non-current-carrying metal parts. The test voltage shall be 1000 V plus twice the rated voltage.

7.3.2 Compliance with the requirements of Clause 7.3.1 shall be determined by means of a suitable testing transformer the output of which can be regulated. Starting at zero the applied voltage shall be increased gradually and at a uniform rate until the required test value is reached or until breakdown occurs.

7.4 Temperature Test

7.4.1 A powered table system shall be subjected to the temperature test described in Clauses 7.4.2 – 7.4.13.

7.4.2 During the temperature test, the temperatures shall not exceed the limits specified in Table 3. Additionally, the overcurrent protective device shall not open the circuit during the temperature test specified in Clause 7.4.4.

7.4.3 A powered table system provided with overcurrent protection (OCP) rated greater than the powered table system rating, shall be subjected to additional temperature test at the OCP rating with the OCP bypassed. The temperatures shall not exceed the temperatures specified in Table 3.

7.4.4 The temperatures of a powered table system, tested at the rated voltage and current of the table system shall not adversely affect any materials employed, or exceed the temperatures indicated in Table 3.

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

7.4.6 Measurements are to be made until there is thermal equilibrium as demonstrated by three successive temperature readings indicating no change taken at intervals of 15 minutes, or more.

7.4.7 The temperatures specified in Table 3 are based on an assumed ambient temperature of 25°C. A test may be conducted at an ambient temperature within the range of 20 to 30 °C and the observed temperature corrected for a room temperature of 25°C.

The temperature shall be corrected to the marked ambient if the table system is for use in an ambient other than 25°C.

7.4.8 During a test conducted at an ambient temperature of 25°C, an observed temperature shall not exceed the required values specified in Table 3.

7.4.9 When a test is conducted at an ambient temperature other than 25°C an observed temperature shall be corrected as described in 7.4.7.

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

7.4.11 Temperature readings are to be obtained by means of thermocouples consisting of No. 28 – 32 AWG (0.08 – 0.032 mm) iron and constantan wires. Number 30 AWG (0.05 mm) iron and constantan wires and a potentiometer-type indicating instrument are to be used whenever referee temperatures are required.

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

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

7.5 Strength of Enclosure Tests

7.5.1 Impact Test — All enclosures

7.5.2 An enclosure is to be tested as specified in Clauses 7.5.3 and 7.5.4. There shall be no distortion of parts that:

a) reduces spacings between live parts of opposite polarity below the minimum specified level in clause 4.16, spacings;
b) interferes with the intended operation of the product; or
c) makes live parts accessible when investigated by the probe illustrated in Figure 1.

7.5.3 Three samples of the complete raceway enclosure, including decorative and snap-fit covers and similar parts, are to be subjected to the test specified in 7.5.4. Each sample is to be impacted at least three times, with each impact at a different location determined to be vulnerable to impact. At least one impact on each sample is to be at a point adjacent to (and not directly on) a general-use receptacle, when provided.

7.5.4 A solid steel sphere 51mm in diameter and weighing 0.54 kg is to fall, as in a pendulum, through the distance required to strike the surface with an impact of 6.8 J (5 foot-pounds). The sample is to be supported by a furnishing or clamped in a position simulating intended use without restricting possible movement of components on the side opposite the impacts.

7.6 Compression Test

7.6.1 A metallic electrical enclosure having a thickness less than the applicable value specified in Table 1 or a polymeric electrical enclosure shall be subjected to the test specified in 7.6.5. The electrical enclosure shall have strength and rigidity at least equivalent to that of a reference electrical enclosure of sheet metal complying with the thickness specifications in Table 1.

7.6.2 The reference electrical enclosure is to be constructed as follows:

a) the electrical enclosure is to have the same overall dimensions as the electrical enclosure to be tested.
b) all seams, joints, or splices at corners or back edges of the electrical enclosure are to be closed by overlapping flanges formed of sheet metal from which the electrical enclosure is made, metal surfaces overlapping adjacent surfaces or supporting frame, separate overlapping flanges, or continuous welding that provides a construction equivalent to an integral-flanged construction.
c) a flange joining adjacent sides, including top and bottom, of the electrical enclosure is to have at least one fastening for every 76.2mm (3 in), or fraction thereof, of electrical enclosure depth. One such fastening is to be located not more than 38.1mm (1.5 in) from the front edge of the electrical enclosure.

An electrical enclosure having integral flanges and that is not over 102mm (4 in) deep is able to employ a single fastening at each corner of the electrical enclosure to secure adjacent sides, including top and bottom.

d) a flange at the back of the electrical enclosure (the side opposite the cover) is to have fastenings located not more than 38.1mm (1.5 in) from each end and not more than 152mm apart.

e) a separate flange is not to have less than two fastenings on each side of a seam.

7.6.3 With reference to 7.6.2(b), the overlap is to be at least 6.4mm and is to extend the full length of the seam.

7.6.4 With reference to 7.6.2 (c), (d), and (e), rivets, welds, bolts, and screws having machine-screw threads are able to be used for fastenings.

7.6.5 For the test, the electrical enclosure is to rest on a smooth, solid, horizontal surface. A vertical force is to be applied to any point on the rear walls of each electrical enclosure. The value of force and the limit of deflection are not specified, and the force on each wall of both the test and reference electrical enclosures is to result in a measurable deflection of the test electrical enclosure. The force is to be applied through a rod having a 12.7 mm by 12.7 mm flat steel face.

7.7 Deflection Test

7.7.1 An electrical raceway cover formed of polymeric material or a drawn, embossed, flanged, or similarly strengthened electrical enclosure cover made of metal having thickness less than the applicable value specified in Table 1 shall not deflect inward more than 6.4mm or to a degree that damages enclosed wiring or terminations when a vertical force of 445 N is applied at any point on the cover. For the test, the electrical enclosure is to rest on its back on a smooth, solid, horizontal surface with the cover secured as intended. The force is to be applied through a rod having a 12.7 by 12.7 mm flat steel face. Separate samples are able to be used for additional tests.

7.8 Mold-Stress Test

7.8.1 Molded polymeric enclosure parts shall be conditioned as specified in Clause 7.8.2. Following the conditioning, there shall be no:

a) softening of the enclosure material as determined by handling immediately after the conditioning; and

b) distortion of parts that:

1) reduces spacings between live parts of opposite polarity below minimum specified levels in clause 4.16, spacings;
2) interferes with the intended operation of the product; or
3) makes live parts accessible when investigated by the probe illustrated in Figure 1.

7.8.2 Three complete samples of the enclosure shall be conditioned for 7 hours in an air-circulating oven at 70°C or at the intended operating temperature plus 10°C, whichever is higher. The maximum intended operating temperature is to be based on an ambient temperature of 25°C.

7.9 Flexing Test

7.9.1 A flexible unit-to-unit mechanical connector that permits the connected units to be moved without disassembly of the product shall be tested as specified in 7.9.2 and 7.9.3. The connector shall not be damaged to an extent that it presents a risk of injury to persons or that may interfere with intended use of the product. T he connector shall continue to support the heaviest table at the end of the test. See Figure 2.

7.9.2 Each of three samples of the connector shall be subjected to 50 cycles of flexing. The flexible connector is to be secured to two units, at least one of which is the heaviest unit provided by the manufacturer. One unit is to be clamped in its normal upright position. The heaviest unit is to be pivoted along the axis of the hinge while standing on a smooth, hard surface with glides or feet, if provided, in place. Starting with the units making an angle of 180 degrees, the heaviest unit is to be moved through an angle X equal to 135 degrees unless the travel is mechanically limited to a lesser angle. The heaviest unit is then to be moved through an angle Y equal to 270 degrees in the opposite direction, unless the travel is mechanically limited to a lesser angle and then returned through an angle Z to the starting position. This is considered to be one complete cycle.

7.9.3 Following the test specified in 7.9.2, a connector formed of molded rubber or polymeric material is to be subjected to the appropriate conditioning as specified in 7.9.2 or 7.9.1. The connector is then to be subjected to 50 additional cycles of flexing using the procedure specified in 7.9.2.

7.10 Retention Tests On Electrical Mating Connectors

7.10.1 General

7.10.1.1 For connectors consisting of two or more sections assembled to form flexible joints, the pull specified in 7.10.2.2 shall be applied such that no flexible joint is stressed.

7.10.1.2 Following the separation and secureness tests, there shall be no stress (i.e. there is no movement of the cord or wiring more than 1.6 mm) to internal connections, damage to the contacts or connector bodies.

7.10.2 Separation Test

7.10.2.1 Mating connectors shall be tested for the minimum separation force as specified in 7.10.2.2 and 7.10.2.3 using a pull of 14N. The connectors shall not separate.

Mating connectors provided with a mechanical latching mechanism or equivalent means to prevent unintended disconnection and displacement are not required to be tested.

7.10.2.2 Each of three previously untested pairs of the mating connectors shall be subjected to ten conditioning cycles of insertion and withdrawal, after which the connectors are to be fully reinserted. The specified pull is then to be applied for 1 minute in a direction normal to the plane of the face of the connecting devices and tending to separate the connectors.

7.10.2.3 Following the test specified in 7.10.2.2, each of the three pairs of connectors shall be connected to a source of supply and made to carry 125 percent of rated current for 7 hours. The connectors are then to undergo 50 additional cycles of insertion and withdrawal and the specified pull is to be repeated.

7.10.3 Secureness Test

7.10.3.1 Mating connectors shall be tested as specified in 7.10.3.2 using a pull of 33 N per contact or 133 N , whichever is less, and with any latching mechanism, if provided, used as intended. The connectors shall separate.

Mating connectors consisting of material that does not rely upon compression of polymeric parts or rigid sections of raceway not requiring strain-relief shall have a separation force equal to the maximum required force (as determined from six mated pairs) plus 22 N applied to the mated connectors 101.6mm (4 in) from the mating point.

7.10.3.2 Each of three previously untested pairs of the mating connectors shall be subjected to ten conditioning cycles of insertion and withdrawal, after which the connectors are to be fully reinserted. The specified pull is then to be applied for 1 minute in a direction normal to the plane of the face of the connecting devices and tending to separate the connectors.

7.10.3.3 Following the test specified in 7.10.3.2, each of the three pairs of connectors shall be connected to a source of supply and made to carry 125 percent of rated current for 7 hours. The connectors are then to undergo 50 additional cycles of insertion and withdrawal and the specified pull is to be repeated.

7.11 Tests on Non-Metallic Mechanical Connectors

7.11.1 A nonmetallic unit-to-unit mechanical connector shall be conditioned as specified in 7.11.2 or 7.11.3. The connector shall not crack, shrink, melt, swell, warp, or otherwise be damaged to an extent that interferes with the intended use.

7.11.2 Three complete samples of the enclosure shall be conditioned for 7 hours in an air-circulating oven at:

a) 70°C; or
b) the normal operating temperature plus 10°C, whichever is higher.

Note: The maximum normal operating temperature is to be based on an ambient temperature of 25°C .

7.11.3 A connector of rubber-like material, such as neoprene, shall be placed in an air oven for 70 hours at 100 ±3°C.

7.12 Strain-Relief Tests

7.12.1 General

7.12.1.1 Where mentioned in this section, the term cable may be replaced by cord, flexible metal conduit, or the like, as applicable.

7.12.2 Power supply cord

7.12.2.1 A fitting intended to secure the power supply cord to an electrical connector or table system raceway shall be subjected to the tests specified in Clauses 7.12.2.2 — 7.12.2.4. The fitting shall not allow the completed assembly to separate. The supporting metal or polymeric material used at a point where the circuit supply is to be connected shall not crack, distort to an extent that would interfere with the intended operations of the product, or allow stress to be placed on wire terminations.

7.12.2.2 Three samples of each raceway-fitting interface of the completed power supply cord assembly shall be used.

7.12.2.3 A decorative panel and the like or other mechanical device that is not reliably secured in place may be removed for the purpose of conducting the tests.

7.12.2.4 Each of the samples shall be secured to the support (electrical connector or table system raceway) as intended in the completed cable assembly. The support device is to be clamped in position and oriented so that the opening of the support device is downward and parallel to the horizontal. Power supply cords employing a connector to mate with a raceway component within the panel, and not having a separate clamp, shall be tested by inserting the connector in the mating component and then clamping the component in position. Wire connections within the electrical connector or raceway shall be disconnected if they would tend to support the applied force. A 35-pound weight is to be attached to the cable at a distance of 152mm from the face of the opening of the support device, and is to be gradually applied to the power supply cord in a direction perpendicular to the face of the power supply cord fitting. The weight is to be applied for 1 minute.

7.12.3 Unit-To-Unit and Pass-Through-Unit Electrical Connections

7.12.3.1 The strain-relief means between a connector and the supporting flexible cable or raceway shall be tested as specified in 7.12.3.3. The strain-relief means shall not be displaced or damaged or cause damage to the cable or raceway.

7.12.3.2 Each of three samples of the connector and associated cable or raceway assembly shall be tested.

7.12.3.3 Wire terminations within the assembly shall be disconnected if they would tend to support the applied force. A 156 N force is to be applied in the direction that would tend to cause direct pullout of the connector from the raceway. The force shall be gradually applied and maintained at the specified value for 1 minute.

7.13 Spill Test

7.13.1 To comply with the requirement in Clause 4.14.5 (receptacle with face position other than vertical), immediately following the testing described in Clauses 7.13.2 and 7.13.3, the insulation and spacings of a raceway and convenience receptacle assembly shall perform acceptably when subjected to the Dielectric Voltage-Withstand Test of clause 7.3.

7.13.2 Any convenience receptacle covers shall to be opened to their most disadvantageous position. Covers that tend to close themselves shall be allowed to fall to their natural resting position. If more than one receptacle is enclosed by such a self-closing cover, a single power-supply cord shall be mated with one of the outlets and the cord is to exit in the wiring channel from behind the cover as intended.

7.13.3 A 76mm diameter container, 102mm high, is to be filled with 0.24 L of saline solution, consisting of 8 grams of table salt per liter of distilled water, and placed on a supporting surface of the Powered Table System immediately adjacent to the convenience receptacle cover. The container is then to be tipped over. An effort is to be made to direct the spill toward the most disadvantageous area of the assembly. The test potential described in 7.3.3 is to be applied 1 minute after the container is tipped over.

7.14 Corrosion-Resistance Coating on Steel Surface Raceway

7.14.1 Zinc Coating: Zinc coatings shall be such that a specimen of the finished raceway will not show a fixed deposit of copper after two 1 min immersions in a standard copper sulphate solution which is prepared in accordance with ASTM Standard A239. The specimen shall be 150 mm long. Copper deposits within 6 mm of cut edges shall be disregarded.

7.14.2 Nonmetallic Coating: A nonmetallic coating shall cover the surface evenly. It shall be tough and adhere to the surface well. The coating shall meet the requirements of ASTM Standards D3363 (with a 2 H hardness rating) and D3359 (with no square lifting adhesion rating). Coating on precoated sheet shall meet the requirements of ASTM Standard D4145 (flexibility rating) in addition to the two tests above.

Table 1
Thicknesses of Sheet-Metal Electrical Enclosure

Material	Minimum thickness, mm (inch)					
	Knockouts and other points of connection for a wiring system		Sheet-metal electrical enclosure		Recessed sheet-metal electrical enclosure	
Uncoated sheet steel	0.91	(0.036)	0.64	(0.025)	0.58	(0.023)
Sheet aluminum	1.27	(0.050)	0.89	(0.035)	0.74	(0.029)

Table 2
Thickness of Cast Metal Parts

Material	Minimum thickness	
	mm	(inch)
Malleable iron	2.4	(3/32)
Iron other than malleable iron	3.2	(1/8)
Die-cast nonferrous:		
Part is ribbed or otherwise reinforced	1.6	(1/16)
Part is not ribbed or otherwise reinforced	2.4	(3/32)
Cast nonferrous other than die-cast	2.4	(3/32)

Table 3
Maximum Temperatures

Materials and components	°C
1. Varnished-cloth insulation	85
2. Fiber, wood, and other similar electrical insulation	90
3. Phenolic composition employed as electrical insulation or as a part whose malfunction would result in a risk of fire or electric shock[a]	150
4. Insulated wires and cables[a]	60
5. On the surface of a capacitor casing:[b]	
Electrolytic	65
Other types	90
6. Receptacle contacts	55
NOTE – See Clause 7.4.7.	
[a] The limitations on phenolic composition and on wire insulation do not apply to compounds that have been investigated and determined to be acceptable for higher temperatures.	
[b] A capacitor operating at a temperature higher than indicated may be evaluated on the basis of its marked temperature rating, or when not marked with a temperature rating, can be investigated to determine its compliance at the higher temperature.	

Figure 1
Articulate Probe

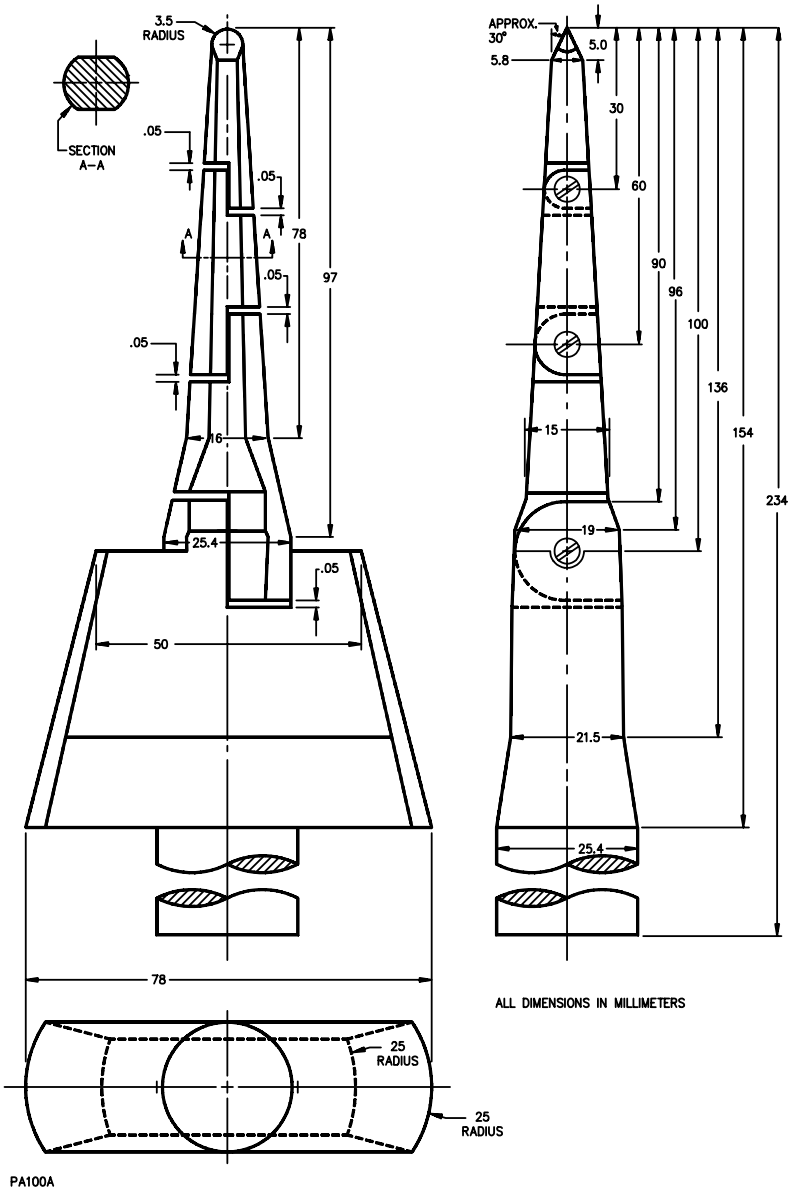
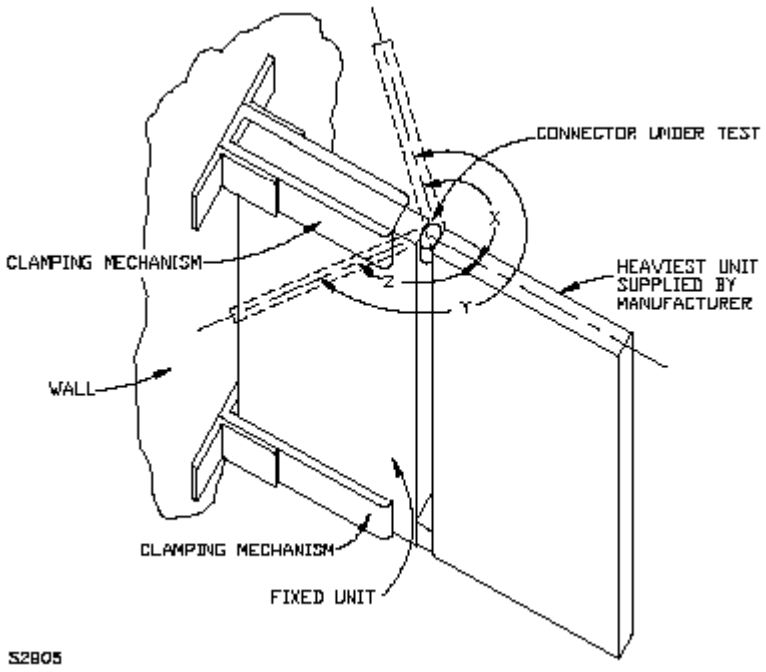


Figure 2
Flex Test



Annex A (informative)
Manufacturing and Production Tests

1 Grounding-Continuity Test

1.1 Each cord-connected furnishing shall be tested, to determine that grounding continuity exists between the grounding pin of the attachment plug and the electrical enclosure or other non-current carrying metal parts. When the electrical enclosure is complete, the electrical enclosure is not required to be attached to a furnishing.

1.1. Any appropriate indicating device (an ohmmeter, battery- and buzzer-combination, or similar equipment) can be used to determine compliance with Clause 1.1.

2 Polarity

2.1 Each furnishing shall be checked to verify that there is electrical continuity between the grounded supply-circuit conductor of the attachment plug and the part of the product that is intended to be connected to the grounded supply-circuit conductor of the attachment plug. The continuity shall be determined either visually or through the use of an electrical test. Equivalently, continuity can be verified between the ungrounded supply-circuit conductor of the attachment plug and the part of the product that is intended to be connected to the ungrounded conductor.

3 Dielectric Voltage-Withstand Test

3.1 Each electrical component shall withstand, without breakdown, for a period of 1 min, the application of an ac voltage of suitable power frequency, between live parts and non-current-carrying metal parts. The test voltage shall be 1000 V plus twice the rated voltage.

3.2 Compliance with the requirements of Clause 3.1 shall be determined by means of a suitable testing transformer the output of which can be regulated. Starting at zero the applied voltage shall be increased gradually and at a uniform rate until the required test value is reached or until breakdown occurs.

3.3 The test is to be conducted with the furnishing fully assembled. It is not intended that the product be unwired, modified, or disassembled for the test.

A furnishing employing solid-state components (such as load connected, across-the-line components or transient voltage surge suppressors) that are able to sustain damage from the dielectric potential can be tested before the components are electrically connected.