



National Differences For

UL 62368-1

Audio/video, information and communication technology equipment - Part 1: Safety requirements

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This new edition of ANSI/UL 62368-1 is being issued to update requirements to those published in IEC 62368-1, second edition. Technical changes to the IEC Standard have been incorporated into the new edition of the UL Standard. National Differences from the First Edition of UL 62368-1 were reviewed and updated in the new edition.

UL 62368-1 is an adoption of IEC 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements (Second Edition, issued February 2014). Please note that the national difference document incorporates all of the U.S. national differences for UL 62368-1.

This document provides a single listing of the National Differences included in the UL adoption of the corresponding IEC standard.

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Preface

This document provides a single listing of the technical National Differences included in the UL adoption of the corresponding IEC standard.

In its IEC-based standards, UL uses the notations indicated below to identify national difference type, and these types are additionally noted in this document. The standard may not use all types of these deviations.

D1 - These are deviations which are based on basic safety principles and requirements, elimination of which would compromise safety for U.S. consumers and users of products.

D2 - These are deviations based on safety practices. These are deviations for IEC requirements that may be acceptable, but adopting the IEC requirements would require considerable retesting or redesign on the manufacturer's part.

DC - These are deviations based on the component standards and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE - These are deviations based on editorial comments or corrections.

DR - These are deviations based on the national regulatory requirements.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

National Differences

1DV.1 DC Modify Clause 1 by adding the following text after the third paragraph:

Battery backup systems that are not an integral part of stationary equipment, such as provided in separate cabinets, are subject to the appropriate standard for battery backup systems, such as UL 1973, Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications.

NOTE See Figures 1.1 and 1.2 of UL 1973 for more information on independent electric energy storage systems (EESS) covered by UL 1973, which can consist of both low voltage (class ES or ES2) and high voltage (class ES3) subsystems, battery management, thermal management, and related features and safeguards. When interconnected with AV, IT, and CT Equipment, and typically used in conjunction with an uninterruptible power supply (UPS), such EESS typically serve as a short-term substitution of the mains supply during power outages and similar disturbances.

1DV.2 DE Modify Clause 1 by replacing the seventh paragraph with the following:

Additional requirements for information and communication technology equipment intended for outdoor installation are given in CSA/UL 60950-22. Additional requirements for audio/video equipment intended for outdoor installation are given in the relevant requirements in CAN/CSA C22.2 No. 60065 or UL 60065.

1DV.3 DR Modify Clause 1 by adding the following text:

1DV.3.1 This standard also is applicable to equipment designed to be installed in accordance with the Canadian Electrical Code, Part I, CSA C22.1-12; Canadian Electrical Code, (CEC) Part II, General Requirements, CAN/CSA C22.2 No. 0-10; the National Electrical Code, NFPA 70-2014; and the National Electrical Safety Code, IEEE C2-2012.

1DV.3.2 The standard is also applicable to equipment, when identified by a marking or instruction [see Annex DVK (Annex DVA, Clause 1 entry)], designed to be installed in accordance with Article 645 of the National Electrical Code, NFPA 70-2014 and the Standard for the Protection of Information Technology Equipment, NFPA 75-2013.

1DV.3.3 See Annex DVA for requirements and references to regulatory requirements that apply to this equipment, as applicable.

1DV.4 D2 Modify Clause 1 by adding the following text:

1DV.4.1 This standard includes additional requirements for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities. See Annex DVB.

1DV.4.2 This standard includes additional requirements for equipment intended for mounting under kitchen cabinets. See Annex DVC.

1DV.4.3 This standard does not apply to equipment having Remote Feeding Telecommunication (RFT) circuits. Equipment having RFT circuits is covered by CSA/UL 60950-21.

1DV.4.4 Additional requirements may apply to large data storage equipment. Refer to CSA/UL 60950-23.

1DV.4.5 This standard does not cover Modular Data Centers (MDCs), only the information and communication technology equipment contained within.

NOTE: In the U.S., Modular Data Centers are covered by UL 2755, Modular Data Centers.

1DV.5 *DC Modify Clause 1 by adding the following text:*

1DV.5.1 Power Distribution Equipment and Sub-Assemblies

1DV.5.1.1 This standard also is applicable to power distribution subassemblies connected to a mains used to distribute power entirely within a system of equipment also covered by this standard, such as power distribution units (PDUs) in the form of cord-connected power strips and shelves with multiple power outlets (receptacles) and intended to be installed in system racks, cabinets, home entertainment centers, etc.

1DV.5.1.2 For equipment covered by this standard that incorporates components and sub-assemblies that perform a power distribution and control function covered by other standards, such as panelboards, load transfer equipment, or uninterruptible power systems utilized in power conditioners and computer power centers, this standard only may be used for investigation of safety for those aspects not covered by the other standards.

1DV.5.1.3 This standard also does not apply to stand-alone equipment used for distribution of mains power that is covered by individual power distribution equipment standards.

1DV.5.1.4 Based on the specific function, the following requirements are applicable to the stand-alone distribution equipment, or apply additionally to power distribution sub-assemblies and components of equipment covered by this standard, as described in 1DV.5.1.2 and 1DV.5.1.3:

- For Industrial Control Equipment, see CSA C22.2 No. 14 and UL 508.
- For Panelboards, see CSA C22.2 No. 29 and UL 67.
- For Switchboards, see CSA C22.2 No 244 and UL 891.
- For Transfer Switch Equipment, see CSA C22.2 No 178.1 and UL 1008.
- For Uninterruptible Power Systems, see CSA C22.2 No. 107.3 and UL 1778.
- For Power Distribution Centers for Communications Equipment, see UL 1801.

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- For other forms of power distribution units for general applications, such as,
 - Relocatable Power Taps, see CSA C22.2 No. 21, Cord Sets and Power Supply Cords, and UL 1363, Relocatable Power Taps.
 - Cord connected Surge Protective Devices, see CSA Technical Information Letter No. A-24, Interim Certification Requirements for AC Line Connected Wiring Devices with Varistors, and UL 1449, Surge Protective Devices.
 - Furniture Power Distribution Units, see CSA C22.2 No. 21, Cord Sets and Power Supply Cords, and UL 962A, Furniture Power Distribution Units.

NOTE 1 It is assumed that power distribution equipment covered by the scope of this Standard is interconnected to the "Outlet" of a "Branch Circuit" as defined in Section 0 of the CEC, Part I, and Article 100 of the NEC. In the case of cord-connected equipment, the Outlet is the Receptacle associated with the building wiring. In the case of permanently connected equipment, the Outlet is the interface between the Branch Circuit conductors associated with the building wiring and the input terminals, pressure connectors, or leads associated with the power distribution equipment covered in whole or part by this standard.

NOTE 2 The following are common definitions of the hardware with related functions that require additional investigation to the appropriate Canadian and U.S. standards.

Industrial Control Panel – An assembly of two or more components consisting of one of the following:

- (1) Power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers;
- (2) Control circuit components only, such as pushbuttons, pilot lights, selector switches, timers, switches, control relays; or
- (3) A combination of power and control circuit components.

These components, with associated wiring and terminals, are mounted on or contained within an enclosure or mounted on a subpanel. The industrial control panel does not include the controlled equipment.

Panelboard – A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front.

Switchboard – A large single panel, frame, or assembly of panels on which are mounted, on the face, back, or both, switches, overcurrent and other protective devices, buses, and usually instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets.

Transfer Switch – An automatic or nonautomatic device for transferring one or more load conductor connections from one power source to another.

Uninterruptible Power Supply – A power supply used to provide alternating current power to a load for some period of time in the event of a power failure.

2DV.1 DE Modify Clause 2 by adding the following NOTE:

NOTE See also 4.1.1DV.1.

2DV.2 DE Modify Clause 2 by adding the following references:

ANSI/ASA S3.25-1989, American National Standard for Occluded Ear Simulator

ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E162, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

ASTM F2951, Consumer Safety Specification for Baby Monitors

CSA C22.1, Canadian Electrical Code, Part I

CAN/CSA C22.2 No. 0, Canadian Electrical Code, Part II, General Requirements

CSA C22.2 No. 0.12, Wiring Space and Wire Bending Space in Enclosures for Equipment Rated 750 V or Less

CSA C22.2 No. 14, Industrial Control Equipment

CSA C22.2 No. 21, Cord Sets and Power Supply Cords

CSA C22.2 No. 29, Panelboards and enclosed panelboards

CSA C22.2 No. 31, Switchgear Assemblies

CSA C22.2 No. 42, General use receptacles, attachment plugs, and similar wiring devices

CAN/CSA C22.2 No. 94, Special Purpose Enclosures

CAN/CSA C22.2 No. 94.2, Enclosures for Electrical Equipment, Environmental Considerations

CSA C22.2 No. 107.3, Uninterruptible Power Systems

CSA C22.2 No. 178.1, Requirements for Transfer Switches

CSA C22.2 No. 205, Signal Equipment

CAN/CSA C22.2 No. 226, Protectors in Telecommunication Networks

CSA C22.2 No. 233, Cords and cord sets for communication systems

CSA C22.2 No. 244, Switchboards

CAN/CSA C22.2 No. 60065, Audio, Video and Similar Electronic Apparatus – Safety Requirements

CAN/CSA C22.2 No. 60601-1, Medical Electrical Equipment – Part 1-1: General Requirements for Safety

CAN/CSA C22.2 No. 60950-1, Information Technology Equipment – Safety – Part 1: General Requirements

CAN/CSA C22.2 No. 60950-21, Information Technology Equipment – Safety – Part 21: Remote Power Feeding

CAN/CSA C22.2 No. 60950-22, Information Technology Equipment – Safety – Part 22: Equipment to be Installed Outdoors

CAN/CSA C22.2 No. 60950-23, Information Technology Equipment – Safety – Part 23: Large Data Storage Equipment

CSA CAN-3-C235, Preferred Voltage Levels for AC Systems, 0 to 50 000 V

CAN/CSA-E60825-1, Safety of laser products – Part 1: Equipment classification, requirements and user's guide

CSA Technical Information Letter No. A-24, Interim Certification Requirements for AC Line Connected Wiring Devices with Varistors

C.R.C, c. 1370, Canadian Radiation Emitting Devices Regulations (REDR)

Canada – Hazardous Products Act – Hazardous Products (Toys) Regulations; Canada – Consumer Packaging and Labeling Act

IEC 60318, Electroacoustics – Simulators of human head and ear – Part 1: Ear simulator for the measurement of supra-aural and circumaural earphones

IEC 60651, Sound Level Meters

IEC 61672-1, Electroacoustics – Sound level meters – Part 1: Specifications

IEEE C2, National Electrical Safety Code

IEEE 269, Standard Methods for Measuring Transmission Performance of Analog and Digital Telephone Sets, Handsets, and Headsets

IEEE 487, Recommended Practice for the Protection of Wire-Line Communication Facilities Serving Electric Power Locations

IEEE 1613, Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations

ISO 261, ISO general purpose metric screw threads – General plan

ISO 262, ISO general purpose metric screw threads – Selected sizes for screws, bolts and nuts

NEMA C84.1, American National Standard for Electric Power Systems and Equipment-Voltage Ratings (60 Hz)

NFPA 70, National Electrical Code

NFPA 72, National Fire Alarm and Signaling Code

NFPA 75, Standard for the Protection of Information Technology Equipment

NFPA 99, Health Care Facilities Code

UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations

UL 50E Enclosures for Electrical Equipment, Environmental Considerations

UL 67 Panelboards

UL 497 Protectors for Paired Conductor Communications Circuits

UL 497A Secondary Protectors for Communications Circuits

UL 498 Attachment Plugs and Receptacles

UL 508 Industrial Control Equipment

UL 723 Tests for Surface Burning Characteristics of Building Materials

UL 746A Polymeric Materials – Short Term Property Evaluations

UL 891 Switchboards

UL 962A Furniture Power Distribution Units

UL 1008 Transfer Switch Equipment

UL 1059 Terminal Blocks

UL 1069 Hospital Signaling and Nurse-Call Equipment

UL 1363 Relocatable Power Taps

UL 1449 Surge Protective Devices

UL 1778 Uninterruptible Power Systems

UL 1801 Outline for Power Distribution Centers for Communications Equipment

UL 1863 Communications-Circuit Accessories

UL 2043 Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

UL 60065 Audio, Video, and Similar Electronic Apparatus – Safety Requirements

UL 60950-1 Information Technology Equipment Safety – Part 1: General Requirements

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UL 60950-21 Information Technology Equipment – Safety – Part 21: Remote Power Feeding

UL 60950-22 Information Technology Equipment – Safety – Part 22: Equipment to be Installed Outdoors

UL 60950-23 Information Technology Equipment – Safety – Part 23: Large Data storage Equipment

U.S. Code of Federal Regulations (CFR), Title 21, Chapter I, Subchapter J, Part 1020, Section 1020.10

U.S. Code of Federal Regulations (CFR), Title 21, Chapter I, Subchapter J, Part 1040

U.S. Code of Federal Regulations (CFR), Title 16, Chapter II, Subchapter C, Part 1505

3.2DV DE Modify 3.2 by replacing the entry for the abbreviation PIS with the following, to correct a typographical error:

PIS potential ignition source

3.3DV DE Modify 3.3 by adding the term "telecommunication network" to the above list.

telecommunication network **3.3.1.3DV.1**

3.3.1.2DV D2 Modify 3.3.1.2 by adding the following Notes:

Note 1 to entry: For additional information on low voltage d.c. mains (with 48 V and 60 V 'station battery' interface per IEC/TR 62102, or more commonly known as 'centralized d.c. power systems'), refer to Annex DVD.

Note 2 to entry: The requirements in this standard are considered adequate for equipment connected to high voltage d.c. mains up to 600 V d.c. Specific requirements for the d.c. mains interface connector are future work.

3.3.1.3DV D1 Add new definition of telecommunication network as 3.3.1.3DV.1:

3.3.1.3DV.1 TELECOMMUNICATION NETWORK – metallically terminated transmission medium intended for communication between equipment that may be located in separate buildings, excluding:

- the mains system for supply, transmission and distribution of electrical power, if used as a telecommunication transmission medium;
- cable distribution systems;
- ES1 circuits connecting units of audio/video, information, and communication technology equipment.

3.3.3.5DV DE Modify 3.3.3.5 by adding the following NOTE:

NOTE 1-15, 2-15, 2-20, 5-15 and 5-20 plugs and outlets as specified in IEC/TR 60083 are considered to be non-industrial within the meaning of this standard.

4.1.1DV.1 D2 Modify 4.1.1 by adding the following text:

In the U.S. and Canada, components and subassemblies that comply with the standards referenced in Annex DVE are required in addition to or as a replacement for the requirements in this standard. Components complying with these standards are considered acceptable as part of equipment covered by this standard without further evaluation other than to give consideration to the appropriate use of the component or subassembly in the end product.

4.1.1DV.2 DC Modify 4.1.1 by adding the following text:

In the U.S. and Canada, components and subassemblies that comply with the standards referenced in Annex DVG are acceptable as an alternative to requirements as part of equipment covered by this standard without further evaluation other than to give consideration to the appropriate use of the component or subassembly in the end product.

4.1.2DV DC Modify 4.1.2 by adding the following text:

In the U.S. and Canada, some UL/CSA component standards may be used as alternatives to referenced IEC standards for the purposes of North America certifications or surveillance programs. Components and subassemblies that comply with the standards referenced in Annex DVF are acceptable as part of equipment covered by this standard without further evaluation other than to give consideration to the appropriate use of the component or subassembly in the end product.

4.1.16DV DE Add Clause 4.1.16DV.1:**4.1.16DV.1 Mains connections**

4.1.16DV.1.1 DE See Clause G.7 for Mains Supply Cords for Pluggable (Cord Connected) Equipment.

4.1.16DV.1.2 DR See Clause G.7ADV for Mains Supply Cords for Pluggable (Cord Connected) Equipment (Canadian and U.S. regulatory-based requirements).

4.1.16DV.1.3 D2 See Annex DVH for requirements for Permanently Connected Equipment.

4.1.16DV.1.4 DR See Annex DVH for requirements for Permanently Connected Equipment (Canadian and U.S. regulatory-based requirements).

4.1.17DV D2 Add Clause 4.1.17DV.1:**4.1.17DV.1 External interconnecting cable and wiring**

4.1.17DV.1.1 General

External interconnecting cable and wiring are investigated to the requirements of 6.5 and either 4.1.17DV.1.2 or 4.1.17DV.1.3, as appropriate.

External interconnecting cable and wiring 3,05 m or less may be investigated as part of the equipment (system) to the requirements of this standard. See 4.1.17DV.1.2.

External interconnect cable and wiring longer than 3,05 m are regulated by the Canadian Electrical Code, Part I, CSA C22.1, and the National Electrical Code, NFPA 70, and are subject to associated requirements. See 4.1.17DV.1.3.

External interconnect cable longer than 3,05 m designed to carry audio and/or video signals only, and that is not specified by the manufacturer to be routed inside the building structure (e.g., walls, ceilings, etc.), is subject to the applicable requirements of 4.1.17DV.1.2. For purposes of 4.1.17DV.1.2, it is assumed such cables are connected to PS1 circuits.

Alternatively, detachable external interconnecting cable and wiring (with terminations) may be excluded from the equipment evaluation if specified by the manufacturer.

4.1.17DV.1.2 Equipment (system) interconnecting cable and wiring

The following requirements apply to detachable and nondetachable external interconnecting cable and wiring investigated as part of the equipment (system):

- The length of the external interconnecting cable or wiring shall not exceed 3,05 m.
- For external interconnecting cable and wiring connected to PS2 and PS3 circuits, see 6.5 for fire (flammability) considerations.
- There are no fire (flammability) considerations for external interconnecting cable and wiring specified by the manufacturer for connection to circuits that are PS1.
- External interconnecting cable and wiring intended to be connected to an ES3 or PS3 circuit require a jacket for mechanical protection in accordance with Table G.7ADV.2, or equivalent.
- Detachable external interconnecting cable and wiring (with terminations) intended to be connected to a PS2, PS3, ES2, or ES3 circuit and furnished as part of the equipment shall be either marked, or similarly identified in the installation instructions, with the name, trademark, or trade name of the organization that is responsible for the equipment and with the organization's identifying number or equivalent designation for the cable. See Annex DVK.
- The marking may be applied on the cable and wiring at any location.
- This marking is not required to comply with the test for permanence of markings, F.3.9

NOTE This marking is required to allow authorities having jurisdiction to identify external interconnecting cables and wiring that are evaluated as a part of the equipment (system).

Optical fiber interconnecting cables 3,05 m or less are not subject to the above requirements.

4.1.17DV.1.3 External interconnecting cable and wiring considered part of the building installation

External interconnecting cables and wiring longer than 3,05 m are regulated by the Canadian Electrical Code, Part I, CSA C22.1, and the National Electrical Code, NFPA 70. See Annex DVA (Annex Q entry).

4.6.2DV D2 Modify 4.6.2 by adding the following text:

- wire-wrap terminals used for the connection of ES1 and ES2 that are:
 - provided on equipment that forms part of the telecommunication network, up to and including the demarcation point, and are located in service access areas only. (This equipment is generally considered Central Office Equipment, although it may be deployed elsewhere in similarly controlled environments.); and
 - provided with a guard or cover that prevents unintentional contact during normal operation.

are tested with a steady force of $2,5 \text{ N} \pm 0,25 \text{ N}$.

4.8.3DV D2 Modify 4.8.3 by adding the following as a new paragraph following the second dashed paragraph:

If screws or similar fasteners are used to secure the door/cover providing access to the battery compartment, the fasteners shall be captive to ensure that they remain with the door/cover. This does not apply to side panel doors on larger devices which are necessary for the functioning of the equipment and which are not likely to be discarded or left off the equipment.

4.8.4.5DV D2 Modify 4.8.4.5 by deleting the first dashed paragraph.

4.8.5DV.1 D2 Modify 4.8.5 by replacing the value of 30 N in the first paragraph with 45 N.

4.8.5DV.2 D2 Modify 4.8.5 by replacing the first and second dashed paragraphs with the following:

- the battery compartment door/cover shall not open; and
- the battery shall not become accessible.

Figure 20DV D2 Delete Figure 20.

This Figure does not apply.

5.4.1.8.1DV DE *Modify 5.4.1.8.1 e) by replacing the last sentence with the following to correct a typographical error:*

For DOUBLE INSULATION between transformer windings, the short-circuit is assumed to take place at the point by which the highest WORKING VOLTAGE is produced across the other insulation;

5.4.4.1DV D1 *Modify 5.4.4.1 by replacing the last paragraph with the following:*

For printed boards, see Clause G.13. For antenna terminals, see 5.4.5. For solid insulation on internal and external wiring, see Clause G.6. Additionally, for internal wiring accessible to an ordinary person, see 5.4.6.

5.6.3DV.1 DR *Replace the first paragraph of 5.6.3 with the following:*

Protective earthing conductors shall comply with the minimum conductor sizes in Table G.5, except as required by

- Table G.7ADV.1 for cord connected equipment; or
- Annex DVH for permanently connected equipment.

5.6.3DV.2 DR *Add two new Notes following the existing Note 2:*

NOTE 1 For cord connected equipment, reference is made to G.7.2 and Table G.7ADV.1 for the size of current-carrying conductors and its associated protective earthing conductor.

NOTE 2 For permanently connected equipment provided with terminal(s) for connection to mains supply, reference is made to the requirements in DVH.3.4 for the size of the protective earthing conductor.

5.6.3DV.3 DR *In the fifth paragraph, add “or Table G.7ADV.1” after the reference to Table G.5.*

5.6.4.1DV DR *Modify 5.6.4.1 by replacing the first dashed paragraph with the following:*

- the minimum conductor sizes in Table G.5 or Table G.7ADV.1 as applicable; or

5.6.4.4DV DR *Modify 5.6.4.4 by adding “or Table G.7ADV.1” after the reference to Table G.5.*

Table 32DV DR *Modify Table 32 as follows:*

In the first column heading, add “or Table G.7ADV.1” after the reference to Table G.5.

5.6.6.1DV DR *Modify 5.6.6.1 by replacing the second paragraph with the following:*

Protective bonding conductors that meet the minimum conductor sizes in Table G.5 or Table G.7ADV.1 as applicable, throughout their length, and whose terminals all meet the minimum sizes in Table 32 are considered to comply without test.

5.7.6.2DV DE *Modify the title of this clause to read as follows:*

Prospective touch voltage and touch current to external circuits

5.7.7DV.1 D2 Modify 5.7.7 as follows:

In the first paragraph, and in the first dashed paragraph of a) 1), add the word “stationary” before “pluggable equipment type A”.

5.7.7DV.2 D2 Modify 5.7.7 as follows:

In the third paragraph, add the following text at the beginning of the paragraph: “Except as noted in a) 1),”

5.7.7DV.3 D2 Modify 5.7.7 by replacing a) 2) with the following text:

- 2) Such equipment shall comply with 5.7.5. The value of $S(I_1)$ shall be added to the measured protective conductor current to determine compliance with the 5 % input current limit per phase specified in 5.7.5.

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5.7.7.1DV D2 Add Clause 5.7.7.1DV.1, including Figures 5.7.7.1DV.1 and 5.7.7.1DV.2:**5.7.7.1DV.1 Limitation of touch current due to ringing signals**

NOTE 1 This requirement is intended to measure the total touch current of the equipment, including touch current due to ringing signals, and determine that the total touch current of the equipment continues to comply with the relevant limits for ES2 specified in Table 4. This requirement supplements 5.7.7, which considers cumulative touch currents associated with all telecommunication ports in the equipment, but not ringing signals exclusively.

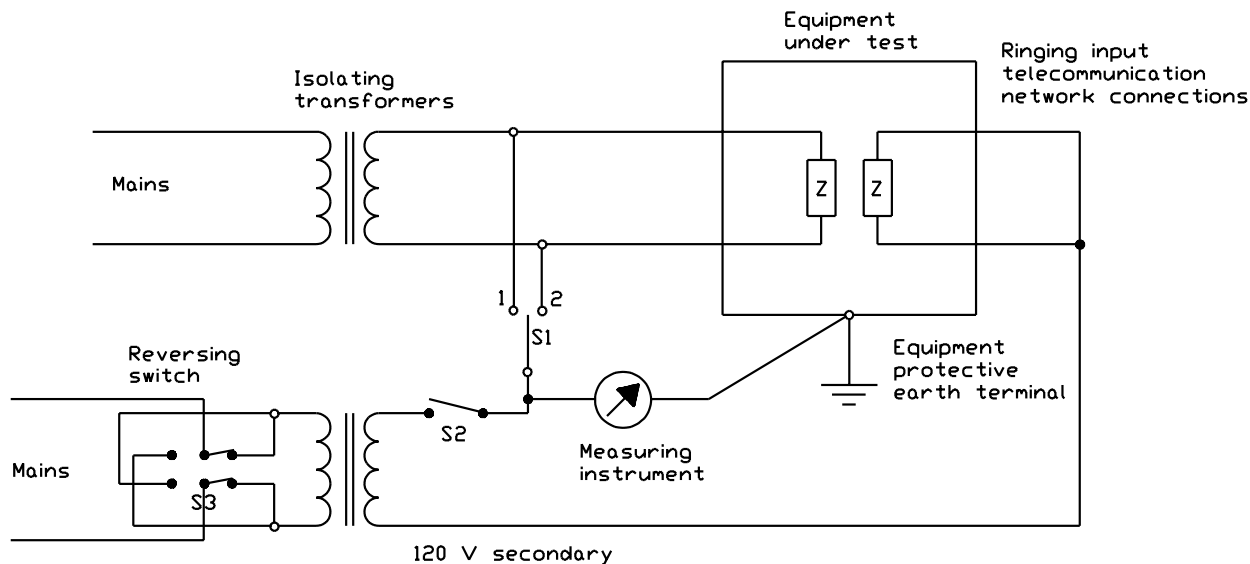
Equipment containing input telecommunication network leads over which ringing voltages are applied to the equipment shall be tested using the circuit of Figure 5.7.7.1DV.1 for mains-connected equipment or Figure 5.7.7.1DV.2 for other equipment. For any position of the selector switches, the total touch current including consideration of 5.7.7 shall not exceed the relevant limits for ES2 specified in Table 4, unless the equipment complies with 5.7.7 a) with the protective conductor current due to ringing signal taken into account.

An EUT that receives ringing voltages on up to three telecommunication network connection ports shall have simulated ringing applied to each network connection.

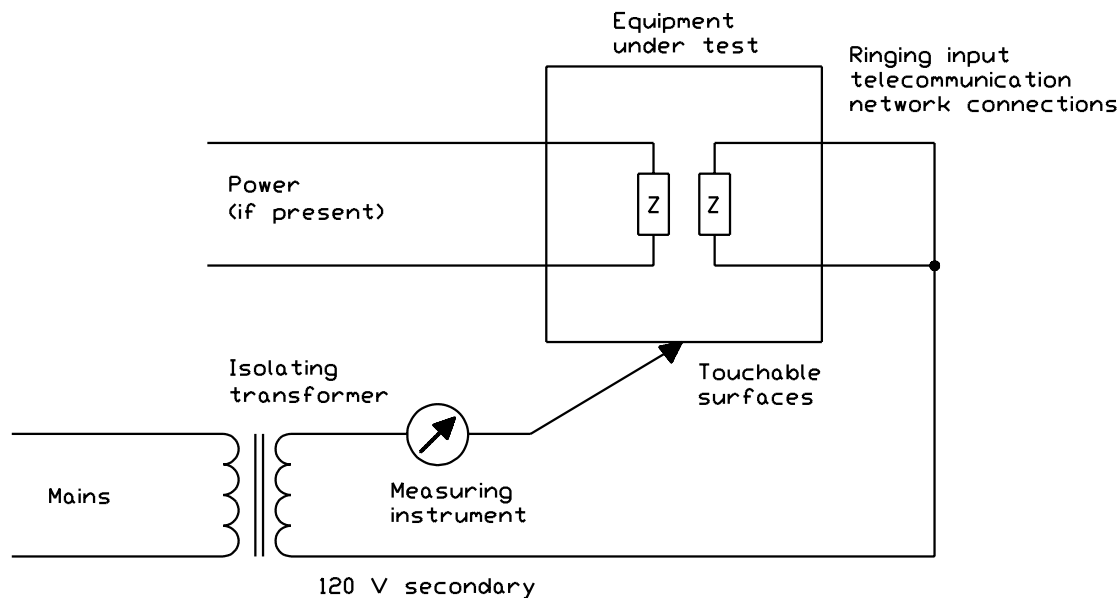
For four or more ports receiving ringing, simulated ringing shall be applied to three ports and an additional 3 % (rounding down) of the remaining ports.

Compliance is checked by the following tests, which are conducted using the measuring network described in IEC 60990, Figure 4. Simulated ringing at 120 V, 50 to 60 Hz, shall be applied to ringing input telecommunication network leads, either one lead at a time or connected together. Other telecommunication network leads shall be left disconnected. Equipment shall be evaluated in each operating state, including ground start. The general test methods of 5.7 shall apply, checking touch current for all positions of switches S1, S2, and S3 in Figure 5.7.7.1DV.1. In case the total touch current exceeds the ES2 limits, the protective conductor current is measured using the test set up of Figure 5.7.7.1DV.1 or Figure 5.7.7.1DV.2 with the measuring instrument replaced with an ammeter having negligible impedance.

NOTE 2 Conducting the test with the leads connected together generally is a more efficient, though sometimes more onerous, test method. Compliance using either test method is acceptable.



SM967



SM969

Figure 5.7.7.1DV.2 – Test circuit for earth leakage current on other than mains-connected equipment

6.5.1DV.1 DC *Modify 6.5.1 by adding the following text to the end of the second, third, and fourth paragraphs:*

or the insulation of the conductor or cable assembly shall be rated VW-1 or FT-1.

6.5.1DV.2 D2 *Modify 6.5.1 by adding the following text and NOTES after the third paragraph:*

PS3 wiring outside a fire enclosure shall comply with single fault testing in Clause B.4. Alternatively, the following constructions are considered to comply:

- conductors provided with overcurrent protection in accordance with Article 240 of the National Electrical Code, NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, Section 14;
- internal conductors supplied by a power source that is limited to the output voltage and current values specified in Table Q.1 or is limited to the output voltage values and provided with an overcurrent protective device with a rated current value as specified in Table Q.2;
- interconnecting cables supplied by a limited power source (see Clause Q.1); and
- a 20-A protective device used with any size wire in the primary.

NOTE 1 Devices for overload protection of components may also provide protection of associated wiring.

NOTE 2 Internal circuits connected to a mains supply may require individual protection depending on reduced wire size and length of conductors.

6.7DV D1 *Add Clause 6.7DV.1:*

6.7DV.1 Safeguards against electrically-caused fire due to overvoltage from power line crosses

6.7DV.1.1 Equipment with external circuits intended for connection to a telecommunication network that uses outside cable subject to overvoltage from power line failures shall comply with Annex DVI.

10.6.1DV D2 *Modify 10.6.1 by adding the following text:*

For telecommunication-network connected equipment, see Annex DVJ.

F.1DV DR *Modify F.1 by adding the following text:*

F.1DV.1 See Annex DVK for U.S. and Canadian markings and instructions.

F.3.3.9DV DR Add F.3.3.9DV.1 :**F.3.3.9DV.1 Equipment with output terminals**

Output terminals provided for supply of other equipment except mains supply shall be marked with the nominal output voltage and frequency and, in addition, the maximum output current or power, unless the terminals are marked with the type references of the equipment which are permitted to be connected. When intended to be installed or interconnected in the field by a skilled person, the Class of wiring shall be marked adjacent to the terminals.

Compliance is checked by inspection.

G.4.3DV D2 Modify G.4.3 as follows:

Delete the second sentence of the EXAMPLE.

G.5.4.9DV DE Modify G.5.4.9 by replacing the title with the following to correct a typographical error:

Test method and compliance criteria for series motors

G.7.2DV DR Modify G.7.2 as follows:

In the first paragraph, replace the reference to Table G.5 with a reference to Table G.7ADV.1.

G.7ADV DR Add Clause G.7ADV, Power supply cords – detachable and nondetachable

NOTE 1 Applicability of these requirements is dependent on the construction of the equipment and the intended installation and use.

NOTE 2 Related to requirements from the National Electrical Code (NEC), NFPA 70 and the Canadian Electrical Code (CEC), Part I, CSA C22.1, and designated as DR National Differences, this clause is not intended to provide a complete list of all the requirements for power supply cords (detachable and non-detachable) that may be applicable to all equipment covered by this standard – only those that most commonly apply to this type of equipment. For complete requirements, the National Electrical Code (NEC), NFPA 70, the Canadian Electrical Code (CEC), Part I, CSA C22.1, or other referenced documents need to be consulted.

G.7ADV.1 General

Flexible cords and plugs are permitted for movable equipment, hand-held equipment, stationary equipment, and transportable equipment, and for fixed equipment where the fastening means and mechanical connections of the equipment are designed to permit removal for maintenance and repair.

NOTE Equipment such as automated teller machines (ATMs) and similar bank equipment, which are typically installed in banks, financial institutions, supermarkets, etc., are examples of such fixed equipment where flexible cords and plugs are permitted.

Table G.7ADV.1 - Power supply cord ampacity Continued

Copper Conductor Size (AWG)	Thermoplastic types	Thermoset types	Types
	TPT, TST	C, E, EO, PD, S, SJ, SJO, SJOW, SJOO, SJOOW, SO, SOW, SOO, SOOW, SP-1, SP-2, SP-3, SRD, SV, SVO, SVOO	HPD, HPN, HSJ, HSJO, HSJOO
NOTE Derived from the NEC and CEC, Part I. Based on ambient temperature of 30 °C. a) The allowable currents under subheading "A" apply to 3-conductor cords and other multi-conductor cords connected to utilization equipment so that only 3 conductors are current-carrying. The allowable currents under subheading "B" apply to 2-conductor cords and other multi-conductor cords connected to utilization equipment so that only 2 conductors are current-carrying. b) Tinsel cord. c) Elevator cables only. d) 7 amperes for elevator cables only; 2 amperes for other types.			

G.7ADV.4 Serviceability

Power supply cords and cord sets shall incorporate flexible cords suitable for the particular application or shall be of a type at least as serviceable for the particular application.

Table G.7ADV.2 lists common applications and associated suitable cord types.

Table G.7ADV.2 – Power supply cord serviceability and cord length

Type of equipment	Minimum cord type	Cord length, m
Movable equipment, including desktop, table-top, musical instruments	NISP-2, NISPE-2, NISPT-2, SP-2, SPE-2, SPT-2, SP-3, SPE-3, SPT-3, SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO, SJ, SJE, SJT	1,5 min ^{a), b)}
Transportable equipment, including hand-held	SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO	1,5 min ^{a), b)}
Stationary equipment, including floor-standing, rack-mounted, fixed (wall ceiling) mounted	S, SE, SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, SO, SOO, ST, STO, STOO, PPE, W	1,5 min ^{a), b)}
	NISP-2, NISPE-2, NISPT-2, SP-2, SPE-2, SPT-2, SP-3, SPE-3, SPT-3, SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO	1,5 min ^{a)} , 2,4 max
Movable, stationary and transportable equipment, including audio and video equipment and musical instruments used in non-household ^{c)} applications	SJ, SJE, SJT	1,5 min, 7,5 max
^{a)} The minimum length of the power supply cord shall be 1,5 m, unless intended for a special installation, such as dedicated equipment intended to be mounted near a receptacle. ^{b)} No maximum length specified, except that for equipment intended to allow installation in NFPA 70, Article 645, ITE Rooms [see Annex DVA (Clause 1 entry) and Annex DVK (Annex DVA entry)], the maximum length is 4,5 m. ^{c)} Non-household applications include commercial and professional equipment installations.		

G.7ADV.5 Length

G.7ADV.5.1 Minimum length

The minimum length of a power supply cord shall be 1,5 m unless it is intended for a special installation, such as dedicated equipment intended to be mounted near a mains socket-outlet.

For equipment provided with an external power supply, the minimum length of the power supply cord shall be 0,5 m, provided that the total length of the conductive path from the receptacle to the equipment is 1,5 m or greater.

NOTE The minimum 1,5 m length includes the power supply cord, the axial length of the power supply, and the output conductors, measured from the face of the attachment plug cap to the output connector face. The minimum 0,5 m length of a detachable power supply cord is measured from the face of the attachment plug cap to the cord connector face. The minimum 0,5 m length of a non-detachable power supply cord is measured from the face of the attachment plug cap to the point on the flexible cord where it enters the power supply enclosure, including any strain relief means outside the enclosure.

G.7ADV.5.2 Maximum length

For equipment intended for installation in ITE Rooms, the length of a power supply cord shall not exceed 4,5 m.

For other intended installations, see Table G.7ADV.2.

H.2DV D2 Modify H.2 by adding the following text after the second dashed paragraph in a):

Continuous ringing signals shall:

- be located only in areas where a skilled person has access during servicing;
- be so located and guarded that unintentional contact with such parts is unlikely during servicing by a skilled person, or be provided with a marking to warn a skilled person of the presence of continuous ringing signals; and
- not become accessible to an ordinary person under single fault conditions.

H.4DV D2 Add Clause H.4DV.1:

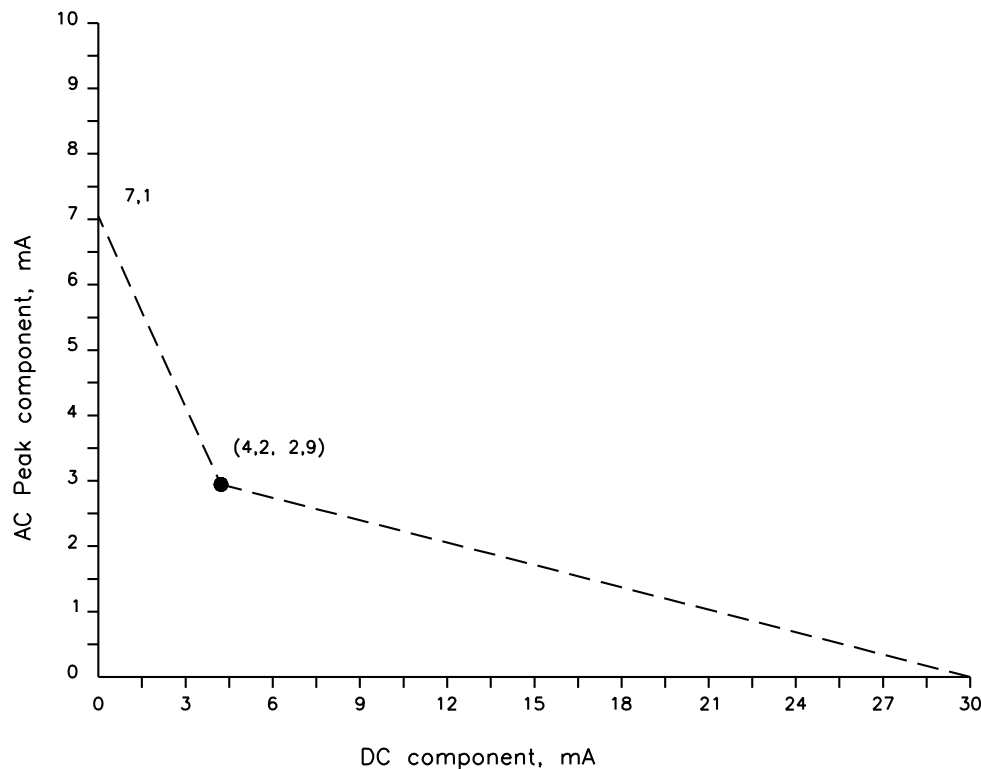
H.4DV.1 Other telecommunication signals

Telecommunication signaling systems (e.g., some message waiting systems) using voltages or current, or both, greater than those specified in 5.2.1.1 and 5.2.1.2 shall be permitted if they comply with the following:

NOTE 1 A part may rely on different requirements for different time intervals.

NOTE 2 These requirements are based on small area contact; parts are not grippable.

- continuous signal: For a signal of duration greater than 5 s, the current through the measuring network described in IEC 60990, Figure 4, shall be not greater than 7.1 mA peak a.c., or 30 mA d.c., or the limit shown in Figure H.4DV.1 for combinations of a.c. and d.c., when measured in accordance with 5.7.
- intermittent signal: For a signal of duration less than 5 s, the current through the measuring network described in IEC 60990, Figure 4, shall be not greater than the limit specified in Figure H.4DV.2. The signal shall be followed by a quiet interval of at least 1 s before the next intermittent signal. During the quiet interval, either the voltage is less than 56,6 V d.c., or the current measured is less than 0,5 mA.



SM971A

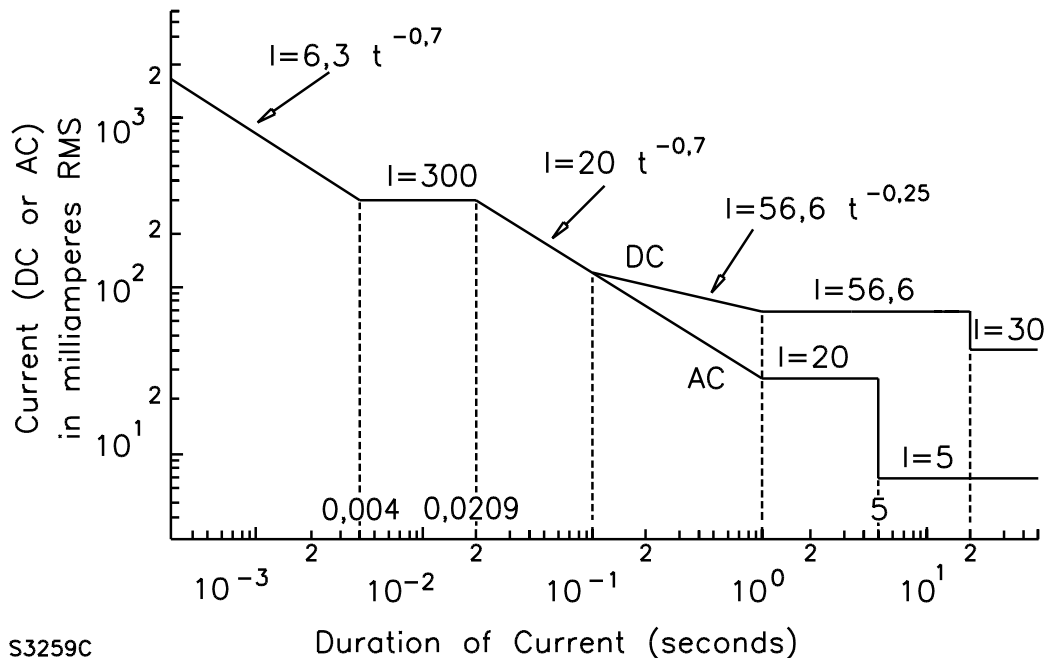


Figure H.4DV.2 - Maximum current as a function of duration

M.1DV DC *Modify Clause M.1 by adding the following text:*

Where a battery standard does not contain requirements for electrical insulation used as a safeguard, appropriate insulation requirements from Clause 5 are applicable based on the working voltage.

M.2.1DV DC *Modify Clause M.2.1 by adding the following text:*

Battery packs with sealed secondary cells and batteries (other than button) containing alkaline or other non-acid electrolyte and used in stationary equipment shall comply with either IEC 62133, UL 2054, or UL 1973.

Additionally, such battery packs that rely on solid-state circuits and software controls as safeguards shall comply with either the requirements in UL 1973 for System Safety Analysis (5.7) and Protective Circuit and Controls (5.8), or similar requirements in an appropriate standard for electronic safety-related controls that are suitable for investigation of such protection of secondary cells and batteries.

P.4.1DV DE *Modify P.4.1 by adding the following text to correct an editing error in the IEC Standard:*

For metalized coatings, clearances and creepage distances for pollution degree 3 shall be maintained instead of the tests of P.4.2DV.1.

P.4.2DV DE Add the following text as P.4.2DV.1 to correct an editing error in the IEC Standard:

P.4.2DV.1 Tests

A sample of the equipment or a subassembly of the equipment containing parts having metalized coating and the parts joined by adhesive is evaluated with the sample placed with the part secured by adhesive on the underside.

Condition the sample in an oven at a temperature T_C for the specified duration (eight weeks, three weeks or one week) as follows:

$$T_C = T_R + (T_A + 10 - T_S)$$

In case the value for $T_A + 10 - T_S$ is negative, the value will be replaced by zero.

where

T_C is the conditioning temperature;

T_R is the rated conditioning temperature value of $(82 \pm 2)^\circ\text{C}$ for eight weeks; $(90 \pm 2)^\circ\text{C}$ for three weeks; or $(100 \pm 2)^\circ\text{C}$ (for one week) as applicable;

T_A is the temperature of the coating or the part under NORMAL OPERATING CONDITIONS (see B.2.6.1);

$$T_S = 82.$$

NOTE 1 For example for eight week conditioning, if the actual temperature is 70°C , then the $T_A + 10 - T_S = 70 + 10 - 82 = -2$, then this -2 is ignored. The minimum conditioning temperature remains 82°C . Also, for three week conditioning, if the actual temperature is 70°C , then the $T_A + 10 - T_S = 70 + 10 - 82 = -2$, then this -2 is ignored. The minimum conditioning temperature remains 90°C . Also, for one week conditioning, if the actual temperature is 70°C , then the $T_A + 10 - T_S = 70 + 10 - 82 = -2$, then this -2 is ignored. The minimum conditioning temperature remains 100°C .

NOTE 2 For example for eight week conditioning, if the actual temperature is 75°C , then the $T_A + 10 - T_S = 75 + 10 - 82 = +3$, the minimum conditioning temperature becomes $82 + 3 = 85^\circ\text{C}$. Also, for three week conditioning, if the actual temperature is 75°C , then the $T_A + 10 - T_S = 75 + 10 - 82 = +3$, then the minimum conditioning temperature remains $90 + 3 = 93^\circ\text{C}$. Also, for one week conditioning, if the actual temperature is 75°C , then the $T_A + 10 - T_S = 75 + 10 - 82 = +3$, then the minimum conditioning temperature remains $100 + 3 = 103^\circ\text{C}$.

NOTE 3 The table below gives the summary of the results in NOTE 1 and NOTE 2:

T_A	T_R	T_S	$T_A + 10 - T_S$	$T_C = T_R + (T_A + 10 - T_S)$
70	82 (8 weeks)	82	$70 + 10 - 82 = -2$	$82 + 0 = 82$
70	90 (3 weeks)	82	$70 + 10 - 82 = -2$	$90 + 0 = 90$
70	100 (1 week)	82	$70 + 10 - 82 = -2$	$100 + 0 = 100$
75	82 (8 weeks)	82	$75 + 10 - 82 = +3$	$82 + 3 = 85$
75	90 (3 weeks)	82	$75 + 10 - 82 = +3$	$90 + 3 = 93$
75	100 (1 week)	82	$75 + 10 - 82 = +3$	$100 + 3 = 103$

Upon completion of the temperature conditioning, subject the sample to the following:

- remove the sample from oven and leave it at any convenient temperature between 20 °C and 30 °C for a minimum of 1 h;*
- place the sample in a freezer at $-40\text{ °C} \pm 2\text{ °C}$ for a minimum of 4 h;*
- remove and allow the sample to come to any convenient temperature between 20 °C and 30 °C for a minimum of 8 h;*
- place the sample in a cabinet at 91 % to 95 % relative humidity for 72 h at any convenient temperature between 20 °C and 30 °C;*
- remove the sample and leave it at any convenient temperature between 20 °C and 30 °C for a minimum of 1 h;*
- place the sample in an oven at the temperature used for the temperature conditioning (T_C) for a minimum of 4 h;*
- remove the sample and allow it to reach any convenient temperature between 20 °C and 30 °C for a minimum of 8 h.*

The sample is then immediately subjected to the tests of Annex T according to 4.4.4.

With the concurrence of the manufacturer, the above time durations may be extended.

After the above tests:

- a metalized coating or a part secured by adhesive shall not fall off or partly dislodge;*
- a metalized coating shall be subjected to the abrasion resistance test of G.13.6.2. After the abrasion resistance test, the coating shall have not loosened and no particles shall become loose from the coating;*
- ENCLOSURE parts serving as SAFEGUARDS shall comply with all the applicable requirements for ENCLOSURES.*

P.5DV DE Delete Clause P.5.

Clause P.5 has been relocated to P.4.1 and P.4.2.

Table T.1DV DE Modify Table T.1 by replacing the first entry in the first column with the following to correct a typographical error:

Unless otherwise specified below, any glass used as a SAFEGUARD against class 3 energy sources

U.1DV D1 Modify U.1 by adding the following text:

The outer enclosure housing a CRT shall have no opening that exceeds 130 mm² unless the minor dimension of the opening is 10 mm or less.

Table W.3DV DE Modify Table W.3 by replacing the entry for 1.2.8.14 in the first column with the following to correct a typographical error:

1.2.8.14 TNV-3 CIRCUIT TNV CIRCUIT – whose normal operating voltages exceed the limits for an SELV circuit under normal operating conditions and – on which overvoltages from telecommunication networks and cable distribution systems are possible

Annex DVA D2 Add Annex DVA:

This annex provides examples of and references for regulatory requirements that apply to equipment. Although normative, applicability of an individual requirement is dependent on the particular construction of the equipment and its intended installation and use.

This annex is not intended to provide a complete list of all of the applicable requirements, only to serve as a reference for requirements that most commonly apply to this type of equipment.

For complete requirements, the referenced code, standard, or regulation shall be consulted.

Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the edition of that code or standard referenced in Clause 2, Normative References.

“CEC” refers to the Canadian Electrical Code, Part I, CSA C22.1. “NEC” refers to the U.S. National Electrical Code, NFPA 70.

Annex DVA

Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
1	<u>Scope</u> <u>Equipment installed on utility facilities and functions up to the service point.</u> Special installation methods are required for equipment associated with supply and communication lines employed by a public or private electric supply, communications, railway, or similar utility in the exercise of its function as a utility. These include street and area lights (supplied by underground or overhead conductors) under the exclusive control of utilities (including their authorized contractors) or other qualified persons (such as those associated with an industrial complex). Note The NEC and CEC cover utilization wiring and equipment installation requirements beyond the service point, i.e., within homes, buildings, etc.	IEEE C2	
	<u>Equipment installed in communication facilities associated with high voltage electric power stations</u> Special installation methods are required for equipment connected to wire-line communication facilities serving high voltage electric power stations operating at greater than 1 kV. These requirements do not cover the equipment used in the design of such installations. Special system design requirements, such as those covered by ANSI/IEEE 487, Recommended Practice for the Protection of Wire-Line Communication Facilities Serving Electric Power Locations, and ANSI/IEEE 1613, Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations, shall be followed to reduce the risks associated with wire-line communication facilities serving such power stations.	NEC: 90.2(B)(5); IEEE 487; IEEE 1613	CEC: Sections 0, 36, and 60
	<u>Equipment intended for installation in Information Technology Equipment Rooms</u> Equipment intended for installation Information Technology Equipment Rooms, commonly also known as Computer Rooms and Data Centers, shall be marked to indicate suitability for use in such locations. This marking is required since Article 645, Information Technology Equipment, of the National Electrical Code, and NFPA 75, Standard for Protection of Information Technology Equipment, contain special requirements for equipment installed in such locations. NOTE The CEC also has requirements for Data Processing Systems in various Sections of the Code, which are referenced in this Annex, as applicable.	NEC: 645; NFPA 75	
	<u>Equipment intended for outdoor installation</u> See Clause 1 and the reference to IEC 60950-22.	NEC: 110.11, 110.28, Table 110.28	CEC: 22-102, 2-400, 2-402, Table 65

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Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	Equipment intended for outdoor installation shall be evaluated in accordance with the Standard for Enclosures for Electrical Equipment, Non- Environmental Considerations, UL 50, Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, Special Purpose Enclosures, CAN/CSA C22.2 No. 94, or Enclosures for Electrical Equipment, Environmental Considerations, CSA C22.2 No. 94.2, and shall be marked with a suitable outdoor use enclosure designation compatible with the National Electrical Code, NFPA 70, or the Canadian Electrical Code, Part I, CSA C22.1. The term "rainproof" may be used instead of an Enclosure-type number for equipment enclosures meeting the environmental requirements for Enclosure Types 3R and 3RX. The term "raintight" may be used instead of an Enclosure-type number for equipment enclosures meeting the environmental requirements for Enclosures Types 3, 3S, 3SX, 3X, 4, 4X, 6 and 6P.		
	<u>Equipment for use in spaces used for environmental air (plenums)</u> Equipment intended for use in spaces used for environmental air, such as the space over a hung ceiling used for environmental air-handling purposes, is required to be provided with a metal enclosure or with a non-metallic enclosure having adequate fire-resistance and low smoke-producing characteristics. Determination of low-smoke-producing characteristics is made in accordance with the Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces, UL 2043. Equipment intended for installations in these locations shall be marked to indicate suitability.	NEC: 300.22(C)	CEC: 12-010
	Equipment shall not be installed in air ducts specifically fabricated for environmental air.	NEC: 300.22(B)	CEC: 12-010
	<u>Automated information storage equipment</u> For equipment identified for ITE (computer) room applications [see Annex DVA (Clause 1 entry), Equipment intended for installation in Information Technology Equipment Rooms], automated information storage equipment intended to contain more than 0,76 m³ of combustible media shall have provision for either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge. Note – Automated information storage equipment is enclosed storage and retrieval equipment that moves recorded media between storage and electronic computer equipment.	NFPA 75: 8.1.4	
	<u>Commercial audio systems incorporating emergency signaling functionality</u> Commercial audio systems that incorporate emergency signaling functionality, including mass notification and muting/override, shall comply with applicable parts of NFPA 72, National Fire Alarm and Signaling Code, depending upon the specific features.	NFPA 72	CEC: 46-210

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Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	<u>Consumer products designed or intended primarily for children 12 years of age or younger</u> Consumer products designed or intended primarily for children 12 years of age or younger are subject to additional requirements in accordance with Canadian and U.S. Regulations.	U.S. Code of Federal Regulations (CFR), Title 16, Chapter II, Subchapter C, Part 1505	Canada – Hazardous Products Act – Hazardous Products (Toys) Regulations; Canada – Consumer Packaging and Labeling Act
	<u>Baby Monitors</u>		
	Baby monitors shall comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.	U.S. CPSC	
2	<u>Normative references</u>		
3	<u>Terms, definitions and abbreviation</u>		
4	<u>General requirements</u>		
5	<u>Electrically-caused injury</u>		
5.6	<u>Protective conductor</u> <u>Provisions for protective earthing</u> The terms “protective earth,” “protective earthing” and “earthing” are not commonly used in Canada or the U.S. For connections to the grounding system, the following terms should be applied as defined in the Canadian Electrical Code (CEC), Part I, CSA C22.1, and/or the National Electrical Code (NEC), NFPA 70. These terms appear in parentheses, where appropriate: Bonding Conductor (CEC) Grounding Conductor (CEC, NEC) Grounded (CEC, NEC) Grounding Conductor, Equipment (NEC) Grounding (CEC) Grounding System (CEC)	NEC: Article 100	CEC: Section 0
	<u>Size of protective bonding conductors</u> For pluggable equipment type A, the current rating of the circuit supplied by the mains shall be taken as 20 A since pluggable equipment type A configurations used Canada and the U.S. are protected by maximum 20 A branch circuit overcurrent protection.	NEC: 210.20, 210.23	CEC: 26-710(b), 26- 720(f)
	<u>Output receptacle circuit earthing (grounding)</u> Equipment having output receptacles for alternating current power connections that are generated from an internally derived source (i.e., provided with transformer isolation internal to the equipment, which provides isolation of the output circuit from the mains supply) shall have the earthed (grounded) circuit conductor bonded to the protective earthing (grounding) terminal via a “system bonding jumper” considering the maximum fault current of the circuit. For cord-connected equipment, the size of the bonding jumper shall not be less than the current-carrying conductors of the derived output circuit. For permanently connected equipment, the bonding jumper shall not be less than 8 AWG per NEC Table 250.66 and CEC Table 41.	NEC: 250.30, 250.66, Table 250.66, 645.15 NEC: 250.66, Table 250.66	CEC: 10-614, 10-906, Table 41 CEC: 10-614, Table 41
	<u>Screws for protective bonding</u>	NEC: 250.8	

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Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	Sheet metal (spaced thread) screws shall not be used to connect protective earthing (grounding) and bonding conductors or connection devices to enclosures.		
	<u>Earthing (grounding) of equipment connected to d.c. mains</u> Equipment intended to be connected to a nominal 48 V d.c. (or higher) power supply source, or systems rated less than 48 V d.c. that have one point directly earthed (grounded), shall have provision for the earthing (grounding) of all exposed dead metal parts that might become energized from the power supply source or from circuits involving a risk of electric shock. See Annex DVH.	NEC: 480.4, 250	CEC: 10-102, 10-104, 10-202, 10-404, 10-810
6	<u>Electrically-caused fire</u> See Annex DVA (Clause 1 entry), Equipment for use in spaces used for environmental air (plenums), Equipment intended for use in spaces used for environmental air (plenums).		
6.3	<u>Safeguards against fire under normal operating conditions and abnormal operating conditions</u>		
	<u>Air Filters</u>	NFPA 75: 7.2.1	
	For equipment identified for ITE (computer) room applications [see Annex DVA (Clause 1 entry)], air filters for use in the cooling systems of individual units shall comply with UL 900, Air Filter Units. The air filters shall be arranged in such a way that they can be removed, inspected, cleaned or replaced when necessary.		
	<u>Liquids for lubrication, cooling or hydraulic purposes</u>	NFPA 75: 7.2.2	
	For equipment identified for ITE (computer) room applications [see Annex DVA (Clause 1 entry)], if the design of the unit is such that oil or equivalent liquid is required for lubrication, cooling, or hydraulic purposes, it shall have a closed-cup flash point of 149°C (300°F) or higher, and the container shall be of a sealed construction, incorporating automatic pressure relief devices.		
	<u>Maximum quantity of flammable liquid stored in equipment</u>	NFPA 30	
	The maximum quantity of flammable liquid stored in equipment shall comply with Table DVA.1.		
6.4.8	<u>Fire enclosures and fire barriers</u> <u>Flammability requirements for large surfaces</u> For equipment identified for ITE (computer) room applications [see Annex DVA (Clause 1 entry), Equipment intended for installation in Information Technology Equipment Rooms], an external surface of combustible material having an exposed area of greater than 0,9 m ² (10 sq ft) or a single dimension greater than 1,80 m (6 ft) shall have a flame spread rating of 50 or less when tested in accordance with either: – the Standard for Tests for Surface Burning Characteristics of Building Materials, UL 723, or ASTM E 84; or – the radiant panel furnace method in ASTM E162. The flame spread rating as determined by this method is the average value based on tests of six samples representative of the wall thickness used, with no single sample rating greater than 75. The limits mentioned refer to the exposed surface area of a single unbroken section. If two sides of a single piece are exposed, only the larger side shall be considered in computing the area.	NFPA 75: 7.1.4	

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Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	A material with a flame spread rating higher than 50 may be used as the exterior finish or covering on any portion of the enclosure, guard or cabinet if the flame spread rating of the combination of the base material and finish or covering complies with the flame spread requirements. For equipment not identified for ITE (computer) room applications, an external surface of combustible material that is not a fire enclosure but that has an exposed area of greater than 0,9 m² (10 sq ft) or a single dimension greater than 1,80 m (6 ft), shall be made of V-1 class material.		
6.5.4	<u>Requirements for interconnection to building wiring</u> See Annex Q.		
6.6	<u>Safeguards against fire due to the connection of secondary equipment</u> See Annex Q		
7	<u>Injury caused by hazardous substances</u>		
8	<u>Mechanically-caused injury</u>		
9	<u>Thermal burn injury</u>		
10	<u>Radiation</u>		
10.3.1	<u>Protection against laser radiation</u> <u>Requirements for equipment incorporating lasers</u> Requirements for lasers are contained in the applicable national codes and regulations. Compliance of laser products with the U.S. Code of Federal Regulations (CFR), Title 21, Part 1040, and the Canadian Radiation Emitting Devices Regulations, REDR c. 1370, shall be determined by: a) determining the Class of laser (as defined in the CFR) from the manufacturer's required documentation, such as the Center for Devices and Radiological Health (CDRH) report, markings and labels, or similar documentation; b) verifying that the manufacturer's markings and labels having the information specified in the CFR are affixed on the laser product (as defined in the CFR); c) determining that the corresponding construction features, such as protective housing, interlocks, and similar features, are provided in accordance with the CFR; and d) determining that the resulting construction complies with the construction requirements of this standard.	U.S. Code of Federal Regulations (CFR), Title 21, Chapter I, Subchapter J, Part 1040	Canada – Radiation Emitting Devices Regulations, REDR c. 1370; or CAN/CSA-E60825-1, Safety of laser products – Part 1: Equipment classification, requirements and user's guide
10.5.1	<u>Protection against x-radiation</u>		

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Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	<u>Ionizing radiation</u> In addition to measurement of ionizing radiation during normal operation in accordance with 10.5.3, measurements are made with the equipment operating under the following abnormal operating conditions, as applicable: – a maximum supply voltage of 130 V if the equipment has a nominal voltage rating between 110 V and 120 V; or – a maximum supply voltage of 110 % of the equipment nominal if the nominal is not between 110 V and 120 V; and – under conditions identical to those resulting from component or circuit malfunction that maximize x-radiation while maintaining the equipment operative for normal use.	U.S. Code of Federal Regulations (CFR), Title 21, Chapter I, Subchapter J, Part 1020, Section 1020.10	Canadian Radiation Emitting Devices Regulations, REDR c. 1370
Annexes			
F	<u>Equipment markings, instructions, and instructional safeguards</u>		
F.3.3.3	<u>Rated voltage</u> <u>Rated voltage marking</u> Based on nominal rating conventions, the following marking schemes shall be used: The voltage rating for equipment with more than one phase supply conductor and an earthed neutral supply conductor shall indicate the phase-to-earth rated voltage and the phase-to-phase rated voltage, separated by a solidus (/), and shall give an indication of the number of phases of the supply. In order to differentiate this marking from multiple voltage ratings, the number of supply wires, including the neutral, shall also be provided. For example: 120/240 V, 3-wire means the voltage is supplied by two phase wires and one neutral wire with 120 V between each phase conductor and the neutral and 240 V between the phase conductors. 120/240 V, 3-wire + PE means the voltage is supplied by two phase wires and one neutral wire with 120 V between each phase conductor and the neutral and 240 V between the phase conductors, with additional provision for protective earth. 120/208 V, 3-phase 4-wire means the voltage is supplied by a three-phase power system and one neutral wire with 120 V between each phase conductor and the neutral and 208 V between phases. For cord-connected equipment, the rated voltage specified shall not exceed the rating of the attachment plug.	NEC: Article 100, 110.4, 110.21, 220.5, 645.16 NEMA C84.1	CEC: 2-100 CSA CAN3- C235

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Annex DVA Continued

Clause No.	Topic/summary	U.S. Regulation	Canadian Regulation
	<u>Overcurrent protection for appliances</u> This clause contains requirements for sizing branch circuits for appliances (equipment). If special overcurrent devices separate from the equipment are required, data for selection of these devices shall be marked on the equipment. <u>Overcurrent protection for Class 2 limiting</u> Where overcurrent protection is required for Class 2 and Class 3 limiting in accordance with the National Electrical Code, NFPA 70, the overcurrent device shall not be interchangeable with devices of higher ratings. A marking is not sufficient regardless of the location of the device. Where a limited power source per Annex Q is used to provide current limiting to external wiring in accordance with the National Electrical Code, NFPA 70, a fuse, if used, shall not be accessible to Ordinary Persons unless it is not interchangeable.	NEC: 422.11 NEC: 422.11, 422-60 NEC: 725.121, Chapter 9 Tables 11(A) and 11(B)	CEC: 14-104, Table 13 CEC: 16-206
G.3.5	<u>Protective devices not mentioned in Clauses G.2 – G.5</u> See Clauses G.1, G.5, G.7		
G.4.2	<u>Mains connectors</u> See Clause G.7 and G.4.3. class II equipment provided with 15- or 20-A standard supply outlets, Edison-base lampholders or a single pole disconnect device shall be provided with a polarized-type attachment plug. <u>Isolated Ground Receptacles</u> When incorporated into the equipment, Isolated Ground Receptacles shall be of a type identified for the purpose (orange triangle marked on the face of the receptacle) and shall be installed in accordance with the Grounding and Bonding requirements in Section 250.146(D), Isolated Receptacles, of NFPA 70, NEC. Metal parts of the equipment shall be separately protectively earthed in accordance with 5.6, including use of appropriate identification symbols as required.	NEC: 422.40 NEC: 250.146(D)	CEC: 14-016 CEC: 10- 112, 10-906(8)
G.4.3	<u>Connectors other than mains connectors</u> See Annex Q. GFCI protection Receptacles, rated 125-V, single phase, 15- or 20-A accessible to either ordinary, instructed, or skilled persons shall be provided with GFCI Protection for Personnel if the equipment containing the receptacles is installed outdoors. <u>Wiring terminals for the connection of external conductors</u> Field wiring terminals provided for interconnection of units by conductors not supplied by a limited power source, or a Class 2 circuit defined in the National Electrical Code, NFPA 70, or the Canadian Electrical Code, Part I, CSA C22.1, also shall comply with the applicable requirements in Annex DVH.3.	NEC: 210.8(B) NEC: 300.1, 725	CEC: 24-116, 26-700, 26-710(n) CEC: Section 16

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