IEC 60950-1

Edition 2.0 2013-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

Information technology equipment – Safety –
Part 1: General requirements

Matériels de traitement de l'information – Sécurité –
Partie 1: Exigences générales

IEC 60950-1:2005/A2:2013

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Information technology equipment – Safety – Part 1: General requirements

Matériels de traitement de l'information – Sécurité – Partie 1: Exigences générales

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FOREWORD

This amendment has been prepared by IEC technical committee 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

The text of this amendment is based on the following documents:

FDIS	Report on voting
108/507/FDIS	108/510/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

0.1 General principles of safety

Replace, in the existing second paragraph, the words "technologies and materials" *by* "technologies, components and materials".

Add, between the existing second and third paragraphs, the following new note:

NOTE The need for additional detailed requirements to cope with a new situation should be brought promptly to the attention of the appropriate committee.

1.1.1 Equipment covered by this standard

Replace the existing third paragraph by the following new paragraph:

This part of IEC 60950 is also applicable to:

– components and subassemblies intended for incorporation in this equipment. Such components and subassemblies need not comply with every requirement of the standard, provided that the complete equipment, incorporating such components and subassemblies, does comply;

– external power supply units intended to supply other equipment within the scope of this part of IEC 60950;

– accessories intended to be used with equipment within the scope of this part of IEC 60950.

Replace, in the existing NOTE 1, the words "components and subassemblies" *by* "components, subassemblies and accessories".

1.1.3 Exclusions

*Replace in the existing first dash "*and transformers;" *by "*and distribution transformers;"

1.2.1.1
RATED VOLTAGE

Replace the existing definition by the following new definition:

supply voltage from which the equipment is to be operated as declared by the manufacturer

1.5.1 General

Replace the existing text and notes of this subclause by the following new text:

Where safety is involved, components shall comply with the requirements of this standard or, where specified in a requirements clause, with the safety aspects of the relevant IEC component standards.

NOTE An IEC component standard is considered relevant only if the component in question clearly falls within its scope.

Components and subassemblies that comply with IEC 62368-1 are acceptable as part of an 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.

1.5.2 Evaluation and testing of components

Replace the existing text and note of this subclause by the following new text:

Where use of an IEC component standard is permitted above, evaluation and testing of components shall be conducted as follows:

– a component shall be checked for correct application and use in accordance with its rating;

– a component that has been demonstrated to comply with a standard harmonized with the relevant IEC component standard shall be subjected to the applicable tests of this standard, as part of the equipment, with the exception of those tests that are part of the relevant IEC component standard;

– a component that has not been demonstrated to comply with a relevant standard as above shall be subjected to the applicable tests of this standard, as part of the equipment, and to the applicable tests of the component standard, under the conditions occurring in the equipment;

NOTE The applicable test for compliance with a component standard is, in general, conducted separately.

– where components are used in circuits not in accordance with their specified ratings, the components shall be tested under the conditions occurring in the equipment. The number of samples required for test is, in general, the same as required by an equivalent standard.

Compliance is checked by inspection and by the relevant data or tests.

1.5.6 Capacitors bridging insulation

Replace the existing second dash of this subclause by the following new dash:

– Humidity: (93 ± 3) % relative humidity;

Table 1C – Capacitor ratings according to IEC 60384-14

Replace, in the existing Table 1C modified by Amendment 1, the first six rows by the following:

Capacitor subclass according to IEC 60384-14	RATED VOLTAGE of the capacitor V r.m.s.	TYPE TEST impulse voltage of the capacitor kV peak	TYPE TEST r.m.s. voltage of the capacitor kV r.m.s.
Y1	Up to and including 500	8	4
Y2	Over 150 up to and including 300	5	1,5
Y4	Up to and including 150	2,5	0,9
X1	Up to and including 760	4 [a]	-
X2	Up to and including 760	2,5 [a]	-

Replace the existing Rule 2 of Table 1C modified by Amendment 1 by the following:

2 For a single capacitor bridging FUNCTIONAL INSULATION, BASIC INSULATION, SUPPLEMENTARY INSULATION or REINFORCED INSULATION, the voltage rating of the single capacitor shall be at least equal to the RMS WORKING VOLTAGE across the insulation being bridged, determined according to 2.10.2.2.

Replace the existing Rule 3 of Table 1C modified by Amendment 1 by the following:

3 For a single capacitor bridging FUNCTIONAL INSULATION, BASIC INSULATION or SUPPLEMENTARY INSULATION,

– the TYPE TEST impulse test voltage of the single capacitor shall be not less than the peak value of the test voltage (not the r.m.s. voltage) of Table 5B for BASIC INSULATION, or the peak value of the test voltage of Table 5C for BASIC INSULATION, as applicable;

– the TYPE TEST r.m.s. voltages of the single capacitor shall be not less than the required r.m.s. test voltage of Table 5B for BASIC INSULATION, or the equivalent r.m.s. test voltage (not the peak voltage) of Table 5C for BASIC INSULATION, as applicable.

Replace the existing Rule 4 of Table 1C modified by Amendment 1 by the following:

4 For a single capacitor bridging DOUBLE INSULATION or REINFORCED INSULATION,

– the TYPE TEST impulse voltage of the single capacitor shall be not less than the peak value of the test voltage (not the r.m.s. voltage) of Table 5B for REINFORCED INSULATION, or the peak value of the test voltage of Table 5C for REINFORCED INSULATION, as applicable;

– the TYPE TEST r.m.s. voltage of the single capacitors shall be not less than the required r.m.s. test voltage of Table 5B for REINFORCED INSULATION, or the equivalent r.m.s. test voltage (not the peak voltage) of Table 5C for REINFORCED INSULATION, as applicable;

Replace the existing Rule 7 of Table 1C modified by Amendment 1 by the following:

7 If two or more capacitors are used in series, all of the following apply:

– under single fault conditions, the voltage on each of the remaining individual capacitors shall not exceed the voltage rating of the relevant individual capacitor;

– for BASIC INSULATION or SUPPLEMENTARY INSULATION, the sum of the TYPE TEST peak impulse test voltages of all capacitors shall be not less than the peak value of the test voltage (not the r.m.s. voltage) of Table 5B, or the peak value of the test voltage of Table 5C, as applicable;

– for BASIC INSULATION or SUPPLEMENTARY INSULATION, the sum of the TYPE TEST r.m.s. test voltages of all capacitors shall be not less than the required r.m.s. test voltage of Table 5B, or the equivalent r.m.s. test voltage (not the peak voltage) of Table 5C, as applicable;

– for REINFORCED INSULATION, the sum of the TYPE TEST peak impulse test voltages of all capacitors shall be not less than the peak value of the test voltage (not the r.m.s. voltage) of Table 5B, or the peak value of the test voltage of Table 5C, as applicable;

– for REINFORCED INSULATION, the sum of the TYPE TEST r.m.s. test voltages of all capacitors shall be not less than the required r.m.s. test voltage of Table 5B, or the equivalent r.m.s. test voltage (not the peak voltage) of Table 5C, as applicable;

– they shall comply with the other rules above.

Table 1D – Informative examples of application of capacitors

*Replace, in the existing Table 1D modified by Amendment 1, the value "*1*" by "-" in the following rows as shown:*

150	III	2,5	F	X2	-	1
250	III	4,0	F	X1	-	1

1.5.7.2 Resistors bridging double insulation or reinforced insulation between the a.c. mains supply and other circuits

Replace, in the existing second dash, the value "93 % ± 3 %" by "(93 ± 3) %".

1.5.9.2 Protection of VDRs

Replace the last existing sentence of this subclause by the following new sentence:

Compliance is checked by inspection and, if necessary to determine that the circuit is a LIMITED CURRENT CIRCUIT*, by measurement and test.*

1.5.9.4 Bridging of basic insulation by a VDR

Replace the first existing paragraph of this subclause by the following new paragraph:

It is permitted to bridge BASIC INSULATION by a VDR complying with the requirements of Annex Q, with or without a GDT in series, provided that one side of the circuit is earthed in accordance with 2.6.1 a).

Replace the last existing paragraph of this subclause, added by Amendment 1, and the compliance statement by the following new text:

For all other equipment, it is permitted to bridge BASIC INSULATION by a VDR in series with a GDT provided that:

– the VDR complies with the requirements of Annex Q; and
– the GDT complies with:
  - the electric strength test for BASIC INSULATION; and
  - the external CLEARANCE and CREEPAGE DISTANCE requirements for BASIC INSULATION.

Compliance is checked by inspection and, if necessary, by measurement and test.

1.7 Markings and instructions

*Delete the existing reference to "*2.1.1.8 Energy hazards*".*

1.7.1.1 Power rating markings

Replace the existing second paragraph, added by Amendment 1, by the following two new paragraphs:

If the equipment is not provided with a means for direct connection to a MAINS SUPPLY, it need not be marked with any electrical rating, such as its RATED VOLTAGE, RATED CURRENT or RATED FREQUENCY.

If the equipment, or a system, has multiple MAINS SUPPLY connections, each individual MAINS SUPPLY electrical rating must be marked, unless they are the same, but the overall equipment

or system electrical rating need not be marked. If the multiple MAINS SUPPLY are identical, it is permitted to mark them, for example, as "MAINS SUPPLY electrical rating x N" where N is the number of identical MAINS SUPPLY connections.

1.7.1.2 Identification markings

Add, after the existing subclause added by Amendment 1, the following new subclause:

1.7.1.3 Use of graphical symbols

Graphical symbols placed on the equipment, whether required by this standard or not, shall be in accordance with IEC 60417 or ISO 3864-2 or ISO 7000, if available. In the absence of suitable symbols, the manufacturer may design specific graphical symbols.

Symbols placed on the equipment shall be explained in the user manual.

2.2.3 Voltages under fault conditions

Replace, in the existing first paragraph of this subclause, the existing words "Figure 2E" *by* "Figure 2E.1 and Figure 2E.2" *(two instances).*

*Replace in the existing first paragraph of this subclause the value "*120 V d.c*" by "*120 V_{peak}*".*

*Replace the existing third paragraph starting with "*Only one pulse ...*" by the following new text:*

A limit of 120 V_{peak} applies if the pulse goes above V_1 only once during time t_1, for example see Figure 2E.1.

A limit of 71 V_{peak} applies if the pulse goes above V_1 more than once during time t_1, for example see Figure 2E.2.

Figure 2E – Voltages in SELV circuits under single fault conditions

Replace the existing Figure 2E by the following new Figures 2E.1 and 2E.2:

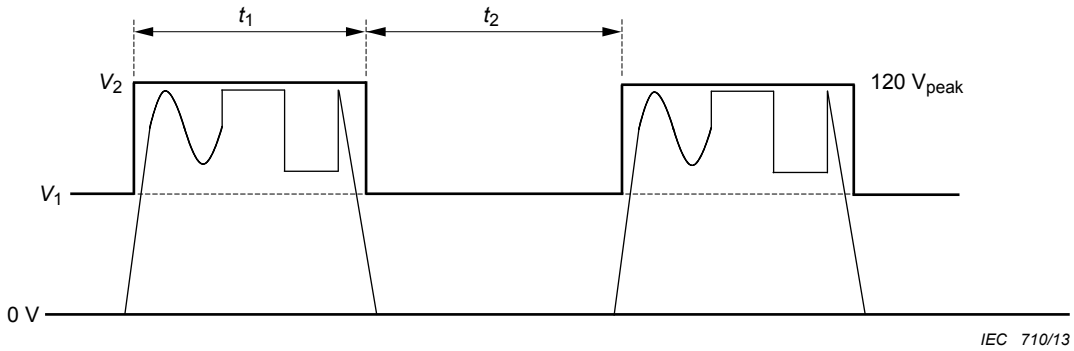


Figure 2E.1 – Voltages in SELV circuits under single fault conditions for a single pulse above *V*1

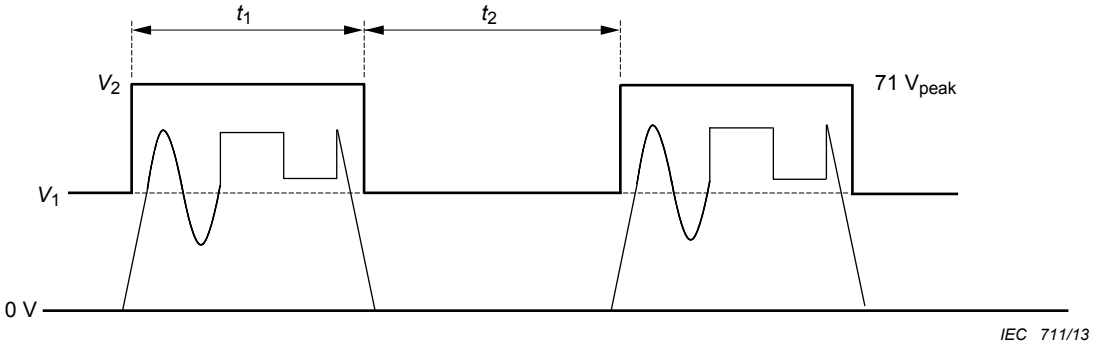


Figure 2E.2 – Voltages in SELV circuits under single fault conditions for multiple pulses above *V*1

Table 2B – Limits for power sources without an overcurrent protective device

Replace the existing footnote d of this table by the following new footnote:

[d] Measurement of I_{sc} and *S* are made 5 s after application of the load if protection is by an electronic circuit and 60 s for a positive temperature coefficient device or in other cases.

2.6.2 Functional earthing

Delete the existing last dashed item of this subclause, including the bulleted items of this dash.

Add, before the existing last sentence of this subclause, the following new text:

For equipment having a power supply cord where a conductor with green-and-yellow insulation is used only to provide a FUNCTIONAL EARTHING connection:

– the equipment shall not be marked with the symbol  , IEC 60417-5172 (2003-02); and
– the equipment may be marked with:
  - the symbol  , IEC 60417-5018 (2011-07); or
  - the symbol  , IEC 60417-6092 (2011-10).

These symbols shall not be used for CLASS I EQUIPMENT.

There are no requirements other than those in 3.1.9 regarding the termination of this FUNCTIONAL EARTHING conductor at the equipment end.

Table 2D – Minimum size of protective bonding conductors

*Replace the value "*16*" in the first column, first row by "*20*".*

2.7.1 Basic requirements

*Replace in the existing note the word "*CENELEC*" by "*CENELEC and in China*".*

2.9.2 Humidity conditioning

Replace in the existing first paragraph, modified in Amendment 1, the value "2 K" by "± 2 °C".

Replace the existing second paragraph by the following two new paragraphs:

For equipment designated for use in tropical conditions, the time duration shall be 120 h at a temperature of (40 ± 2) °C and a relative humidity of (93 ± 3) %.

With the concurrence of the manufacturer, it is permitted to increase the time durations.

Table 2H – Examples of application of insulation

Replace the existing row for BASIC, TNV-2 CIRCUIT of this table by the following new row:

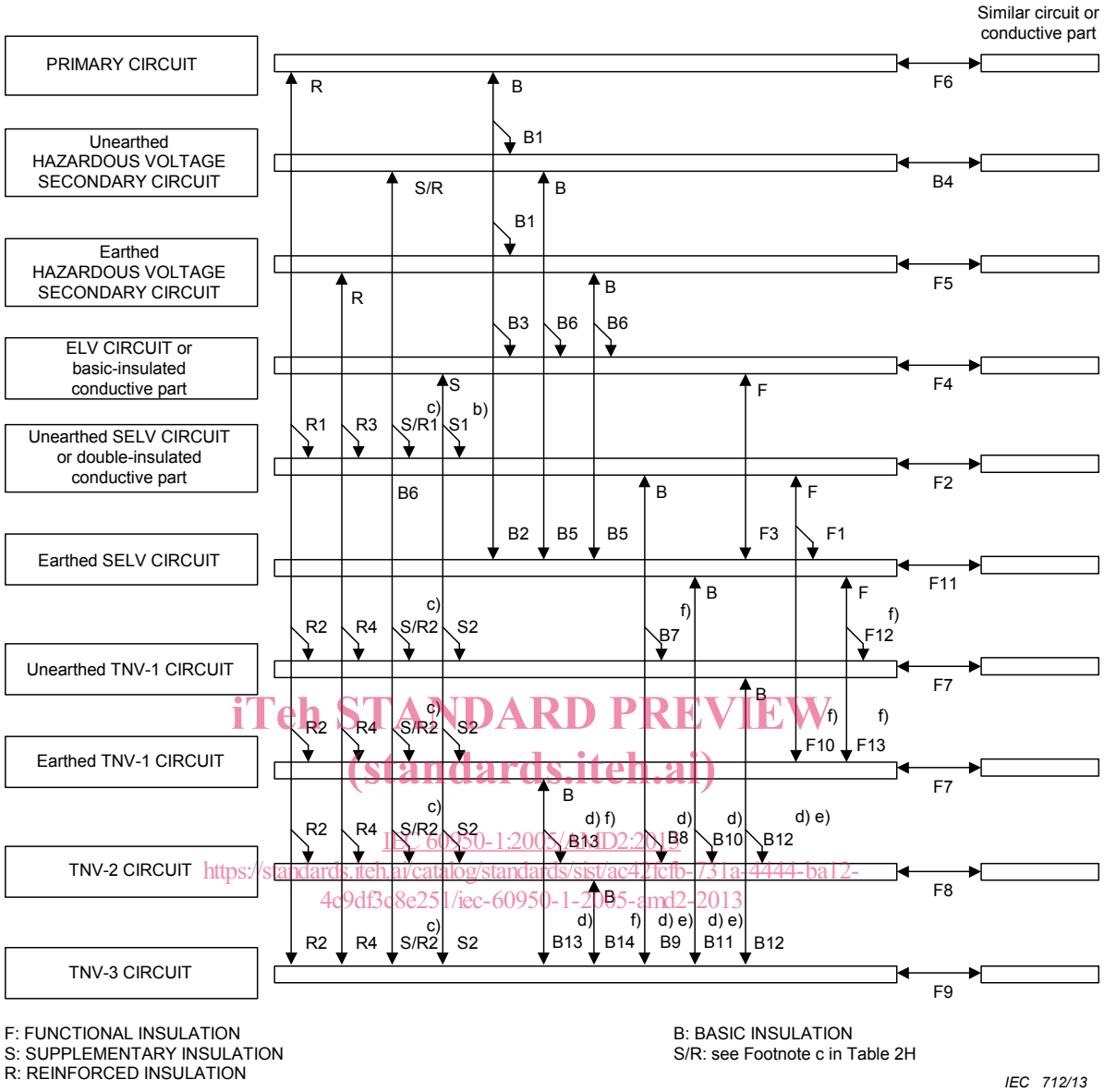
	TNV-2 CIRCUIT	– unearthed TNV-1 CIRCUIT – earthed TNV-1 CIRCUIT – TNV-3 CIRCUIT	B12 [d e] B13 [d f] B14 [f]

Replace the existing row for SUPPLEMENTARY, TNV CIRCUIT of this table by the following new row:

	TNV CIRCUIT	– basic-insulated conductive part – ELV CIRCUIT	S2 S2

Figure 2H – Examples of application of insulation

Replace the existing figure, including the note, by the following new note and figure:



NOTE The references b), c), d), e) and f) refer to the corresponding footnotes in Table 2H.

2.10.3.1 General

Add, after the existing Note 1, the following new note and renumber the subsequent notes accordingly:

NOTE 2 China has special requirements in choosing multiplication factors at altitudes above 2 000 m.

Table 2L – Additional clearances in primary circuits

Replace the existing table, modified by Amendment 1, by the following new table:

CLEARANCES in mm

MAINS TRANSIENT VOLTAGE						
1 500 V [c]				2 500 V [c]		
Pollution Degrees 1 and 2 [b]	Pollution Degree 3	FUNCTIONAL [a] BASIC or SUPPLEMENTARY INSULATION	REINFORCED INSULATION	Pollution degrees 1, 2 and 3 [b]	FUNCTIONAL [a] BASIC or SUPPLEMENTARY INSULATION	REINFORCED INSULATION
PEAK WORKING VOLTAGE up to and including V				PEAK WORKING VOLTAGE up to and including V		
210 (210)	210 (210)	0,0	0,0	420 (420)	0,0	0,0
298 (288)	294 (293)	0,1	0,2	493 (497)	0,1	0,2
386 (366)	379 (376)	0,2	0,4	567 (575)	0,2	0,4
474 (444)	463 (459)	0,3	0,6	640 (652)	0,3	0,6
562 (522)	547 (541)	0,4	0,8	713 (729)	0,4	0,8
650 (600)	632 (624)	0,5	1,0	787 (807)	0,5	1,0
738 (678)	715 (707)	0,6	1,2	860 (884)	0,6	1,2
826 (756)	800 (790)	0,7	1,4	933 (961)	0,7	1,4
914 (839)	885 (873)	0,8	1,6	1 006 (1 039)	0,8	1,6
1 002 (912)	970 (956)	0,9	1,8	1 080 (1 116)	0,9	1,8
1 090 (990)	1 055 (1 039)	1,0	2,0	1 153 (1 193)	1,0	2,0
1 178 (1 068)	1 140(1 122)	1,1	2,2	1 226 (1 271)	1,1	2,2
1 266 (1 146)	1 225(1 205)	1,2	2,4	1 300 (1 348)	1,2	2,4
1 354 (1 224)	1 310(1 288)	1,3	2,6	1 374 (1 425)	1,3	2,6

The additional CLEARANCES in the table apply if required by 2.10.3.3 b).

The values in parentheses shall be used:

– if the values in parentheses in Table 2K are used; and

– for FUNCTIONAL INSULATION if required by 5.3.4 a).

For voltage values above the PEAK WORKING VOLTAGE values given in the table, linear extrapolation is permitted.

For voltage values within the PEAK WORKING voltage values given in the table, linear interpolation is permitted between the nearest two points, the calculated minimum additional CLEARANCE being rounded up to the next higher 0,1 mm increment.

[a] There is no minimum CLEARANCE for FUNCTIONAL INSULATION unless it is required by 5.3.4 a). See 2.10.1.3.

[b] It is not required to pass the tests of 2.10.10 for Pollution Degree 1.

[c] The relationship between MAINS TRANSIENT VOLTAGE and AC MAINS SUPPLY voltage is given in Table 2J.

2.10.10 Test for Pollution Degree 1 environment and for insulating compound

Replace the existing last paragraph of this subclause by the following new text:

For other than printed boards, compliance is checked by inspection of the cross-sectional area, and there shall be no visible voids, gaps or cracks in the insulating material.

In the case of insulation between conductors on the same inner surface of printed boards and the insulation between conductors on different surfaces of multilayer printed boards, compliance is checked by external visual inspection. There shall be no delamination which affects the pollution degree.

2.10.11 Tests for semiconductor devices and for cemented joints

Replace the existing last paragraph of this subclause by the following new text:

Compliance is checked by inspection and measurement.

Except for cemented joints on the same inner surface of a printed board, compliance is checked by inspection of the cross-sectional area, and there shall be no visible voids, gaps or cracks in the insulating material.

In the case of insulation between conductors on the same inner surface of printed boards and the insulation between conductors on different surfaces of multilayer boards, compliance is checked by measurement and external visual inspection. There shall be no delamination.

3.2.5.1 AC power supply cords

Replace the entire existing text of this subclause, except for Table 3B, by the following new text:

A MAINS SUPPLY cord shall be of the sheathed type and comply with the following as appropriate:

– if rubber sheathed, be of synthetic rubber and not lighter than ordinary tough rubber-sheathed flexible cord according to IEC 60245-1 (designation 60245 IEC 53);

– if PVC sheathed:

  • for equipment provided with a NON-DETACHABLE POWER SUPPLY CORD and having a mass not exceeding 3 kg, be not lighter than light PVC sheathed flexible cord according to IEC 60227-1:2007 (designation 60227 IEC 52);

  • for equipment provided with a NON-DETACHABLE POWER SUPPLY CORD and having a mass exceeding 3 kg, be not lighter than ordinary PVC sheathed flexible cord according to IEC 60227-1:2007 (designation 60227 IEC 53);

  NOTE 1 There is no limit on the mass of the equipment if the equipment is intended for use with a DETACHABLE POWER SUPPLY CORD.

  • for equipment provided with a DETACHABLE POWER SUPPLY CORD, be not lighter than light PVC sheathed flexible cord according to IEC 60227-1:2007 (designation 60227 IEC 52);

  • for screened cords of MOVEABLE EQUIPMENT, the flexing test of 3.1 of IEC 60227-2:1997;

  NOTE 2 Although screened cords are not covered in the scope of IEC 60227-2, the relevant flexing tests of IEC 60227-2 are used.

– other types of cords may be used if they have similar or better electro-mechanical and fire safety properties as above.

NOTE 3 Where national or regional standards exist, they can be used to show compliance with the above paragraph.

For equipment required to have protective earthing, a PROTECTIVE EARTHING CONDUCTOR shall be included in the MAINS SUPPLY cord.

A MAINS SUPPLY cord shall have conductors with a cross-sectional area not less than those specified in Table 3B.

Compliance is checked by inspection. For screened cords, damage to the screen is acceptable provided that:

– *during the flexing test the screen does not make contact with any conductor, and*

– *after the flexing test, the sample withstands the appropriate electric strength test between the screen and all other conductors.*

Table 3E – Sizes of terminals for mains supply conductors and protective earthing conductors

Replace the existing table by the following new table:

RATED CURRENT A up to and including	Conductor size mm^2	Minimum nominal thread diameter mm		Area of cross section mm^2	
		Pillar type or stud type	Screw type [b]	Pillar type or stud type	Screw type [b]
10	1	3,0	3,5	7	9,6
16	1,5	3,5	4,0	9,6	12,6
25	2,5	4,0	5,0	12,6	19,6
32	4	4,0	5,0	12,6	19,6
40	6	5,0	5,0	19,6	19,6
63	10 [c]	6,0	6,0	28	28
80	16 [c]	7,9	7,9	49	49

[a] This table is also used for the sizes of terminals for PROTECTIVE BONDING CONDUCTORS if specified in 2.6.4.2.

[b] "Screw type" refers to a terminal that clamps the conductor under the head of a screw, with or without a washer.

[c] As an alternative to the requirements of this table, the protective earthing conductor may be attached to special connectors, or suitable clamping means (for example, an upturned spade or closed loop pressure type; clamping unit type; saddle clamping unit type; mantle clamping unit type; etc.) that is secured by a screw and nut mechanism to the metal chassis of the equipment. The sum of the cross-sectional areas of the screw and the nut shall not be less than three times the cross-sectional area of the conductor size in Table 2D or Table 3B as applicable. The terminals shall comply with IEC 60998-1 and IEC 60999-1 or IEC 60999-2.

3.4.11 Multiple power sources

Add, after the existing first paragraph of this subclause, the following new paragraph:

If the disconnect device is not in the equipment, the marking shall be on the equipment and located close to the MAINS input terminals.

4.1 Stability

Add, at the end of the existing text of the first dashed item, the following new paragraph and new note:

Alternatively, the unit is placed in its intended position of use on a plane, inclined at an angle of 10° to the horizontal, and then rotated slowly through an angle of 360° about its normal vertical axis.

NOTE It could be the plane being turned around or the plane could be stationary and the equipment is rotated.

4.3.8 Batteries

Delete the first existing paragraph of this subclause.

Add, after the existing Note 3, the following new paragraphs:

Portable secondary sealed cells and batteries (other than button) containing alkaline or other non-acid electrolyte shall comply with IEC 62133.

Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment (see 1.4.14). For USER-replaceable batteries, the design shall reduce the likelihood of reverse polarity installation if this would create a hazard.

Replace, in the existing list after Note 6, the existing first dashed item, including the bullets, by the following new dashed item:

– ***Overcharging of a rechargeable battery**. The battery is charged while briefly subjected to the simulation of any SINGLE FAULT CONDITION that is likely to occur in the charging circuit and that results in overcharging of the battery. To minimize testing time, the failure is chosen that causes the worst-case overcharging condition. The battery is then charged for a single period of 7h with the simulated failure in place.*

4.3.13.5.2 Light emitting diodes (LEDs)

Add, after the existing Note 2 added by Amendment 1, the following new note:

NOTE 3 If optical radiation is broadband visible and IR-A radiation and the luminance of the source does not exceed 10^4 cd/m^2, it is expected that the radiation does not exceed the exposure limits given in 4.3 of IEC 62471:2006 (see 4.1 of IEC 62471:2006).

4.4.5.2 Protection for users

*Replace in the existing third paragraph, added by Amendment 1, the words "*similar symbol, combined*" with "*similar symbol combined*", thereby deleting the comma.*

4.7.3.4 Materials for components and other parts inside fire enclosures

Add, at the end of the existing first paragraph, the following new sentence:

Requirements for voltage dependent resistors (VDR's) are in Annex Q.

Table 5C – Test voltages for electric strength tests based on required withstand voltages

Replace the existing table by the following new table: