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AMENDMENT 1

Information technology equipment – Safety – Part 1: General requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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
108/350/FDIS	108/357/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 maintenance result 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- withdrawn,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.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

CONTENTS

Add the titles of the new annexes as follows:

Add the titles of the new figures as follows:

1.2 Definitions

Add after "RATING, PROTECTIVE CURRENT.....1.2.13.17" *in the list of* "Definitions in alphabetical order of nouns" *the following new entry:*

SHREDDER (DOCUMENT/MEDIA, HOUSEHOLD AND HOME/OFFICE) 1.2.13.18

Add, after the existing definition 1.2.13.17*, the following new definition:*

1.2.13.18
(HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA) SHREDDER
equipment with a plug configuration associated with PLUGGABLE EQUIPMENT TYPE A, or battery operated equipment, designed to shred paper or other forms of media as instructed by the manufacturer

NOTE 1 Examples of other forms of media include but are not limited to digital video disks, compact disks, flash memory, magnetic strip cards, or magnetic disks, or the like.

NOTE 2 HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS are typically identified as either strip-cut type or cross-cut type. A strip-cut HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDER shreds the paper into long strips using a motor-based shredding mechanism. A cross-cut DOCUMENT/MEDIA SHREDDER shreds paper two or more ways into tiny particles, typically using a more powerful motor and more complex shredding mechanism.

NOTE 3 A document/media shredder is considered to be non-household or non-home/office type if the document/media shredder is provided with a plug configuration associated with PLUGGABLE EQUIPMENT TYPE B, or is PERMANENTLY CONNECTED EQUIPMENT.

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

Replace the existing rule 3 *of this table by the following:*

3 For a single capacitor bridging FUNCTIONAL INSULATION, BASIC INSULATION or SUPPLEMENTARY INSULATION, the peak test voltage of the capacitor shall be at least equal to 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, and the r.m.s. test voltage 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.

Replace the existing rule 4 of this table by the following:

4 For a single capacitor bridging DOUBLE INSULATION or REINFORCED INSULATION, the peak test voltage of the capacitor 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; and the r.m.s. test voltage 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.

Replace the existing rule 7 *of this table 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 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 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 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 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 the existing Table 1D by the following new table:

AC MAINS SUPPLY voltage up to and including V r.m.s.	Overvoltage Category	MAINS TRANSIENT VOLTAGE kV	Bridged insulation	Capacitor type	Number of capacitors	
					Using Table 5B	Using Table 5C
150	II	1,5	B or S	Y2	1	1
	II	1,5	D or R	Y2	2	2
	II	1,5	D or R	Y1	1	1
	II	1,5	F	X2	1	1
	III	2,5	F	X2	1	1
	III	2,5	B or S	Y2	-	2
	III	2,5	D or R	Y1	-	1
	IV	4,0	F	X1	-	1
	IV	4,0	B or S	Y1	-	1
	IV	4,0	B or S	Y2	-	2
	IV	4,0	D or R	Y1	-	2
250	II	2,5	F	X2	1	1
	III	4,0	F	X1	1	1
300	II	2,5	B or S	Y2	1	2
	II	2,5	D or R	Y1	1	1
	II	2,5	D or R	Y2	2	3
	III	4,0	B or S	Y1	-	1
	III	4,0	B or S	Y2	-	2
	III	4,0	D or R	Y1	-	2
	III	4,0	D or R	Y2	-	4
	IV	6,0	F	X1	-	2
	IV	6,0	B or S	Y1	-	2
	IV	6,0	D or R	Y1	-	3
500	II	4,0	F	X1	1	1
	II	4,0	B or S	Y1	1	1
	II	4,0	D or R	Y1	1	2
	III	6,0	F	X1	-	2
	III	6,0	B or S	Y1	-	2
	III	6,0	D or R	Y1	-	3
	IV	8,0	F	X1	-	2
	IV	8,0	B or S	Y1	-	2
	IV	8,0	D or R	Y1	-	3

The values in the table apply to FUNCTIONAL INSULATION (F), BASIC INSULATION (B), SUPPLEMENTARY INSULATION (S), DOUBLE INSULATION (D) and REINFORCED INSULATION (R).

NOTE Table 5B is used for Overvoltage Categories I and II only.

1.5.7.1 Resistors bridging functional insulation, basic insulation or supplementary insulation

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

NOTE In Finland, Norway and Sweden resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with 1.5.7.1. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.

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

Replace the fifth paragraph of this subclause by the following new paragraph:

If an accessible conductive part or circuit is separated from another part by DOUBLE INSULATION or REINFORCED INSULATION that is bridged by a resistor or group of resistors, the accessible part or circuit shall comply with the requirements for a LIMITED CURRENT CIRCUIT in 2.4 between the accessible conductive part or circuit and earth. If a group of resistors is used, the current measurement in 2.4.2 is made with each resistor short-circuited in turn, unless the group passes the resistor test below. When measuring the LIMITED CURRENT CIRCUIT, the ammeter is placed between the load side of the bridging components and any USER accessible part, including earth.

1.5.9.4 Bridging of basic insulation by a VDR

After the existing note of this subclause, add the following new paragraph:

It is permitted to use a gas discharge tube (GDT) in series with a VDR that bridges BASIC INSULATION in accordance with the conditions in this subclause if the GDT complies with the requirements for FUNCTIONAL INSULATION.

1.7 Markings and instructions

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

NOTE Additional requirements for markings and instructions are contained in the following subclauses:

2.1.1.2	Battery compartments	4.3.3	Adjustable controls
2.1.1.8	Energy hazards	4.3.5	Plugs and sockets
2.3.2.3	Protection by earthing	4.3.13.4	UV radiation
2.6.1	Unearthed parts	4.3.13.5	Lasers
2.6.2	FUNCTIONAL EARTHING	4.4.2	Hazardous moving parts
2.6.3.4 c)	Bonding conductors	4.4.5.2	Fan protection for USERS
2.6.5.1	Bonding conductors	4.4.5.3	Fan protection for service persons
2.7.1	External protective devices	4.5.4 Table 4C	Marking of hot parts
2.7.6	Neutral fusing	4.5.4	Touch temperatures
2.10.3.2	Overvoltage Categories	4.6.2	Equipment on non-combustible floors
3.2.1.2	DC MAINS SUPPLY	4.6.3	Removable doors and covers
3.3.7	Grouping of wiring terminals	5.1.7.1	TOUCH CURRENT exceeding 3,5 mA
3.4.3	Disconnect devices	5.1.8.2	Summation of TOUCH CURRENTS
3.4.6	Two-pole disconnect devices	6.1.1 and 6.1.2.2	Earthing for a TELECOMMUNICATION NETWORK
3.4.7	Four-pole disconnect devices	7.2 and 7.4.1	Earthing for a CABLE DISTRIBUTION SYSTEM
3.4.9	Plugs as disconnect devices	G.2.1	Equipment in Overvoltage Categories III and IV
3.4.10	Interconnected equipment	DD.2	Maximum shelf load
3.4.11	Multiple power sources	EE.2	Shredder warning
4.1	Equipment stability	EE.4	Shredder power disconnection
4.2.5	Impact test		

1.7.1 Power rating

Replace the existing title and text of this subclause by the following new title and text (including the new subclauses 1.7.1.1 and 1.7.1.2):

1.7.1 Power rating and identification markings

1.7.1.1 Power rating markings

Equipment shall be provided with a power rating marking, the purpose of which is to specify a supply of correct voltage and frequency, and of adequate current-carrying capacity.

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, but the overall equipment or system electrical rating need not be marked.

For equipment intended to be installed by an OPERATOR, the power rating marking, if required, shall be readily visible in any OPERATOR ACCESS AREA. If a manual voltage selector is not OPERATOR-accessible, the power rating marking shall indicate the RATED VOLTAGE for which the equipment is set during manufacture; a temporary marker is permitted for this purpose. The power rating marking is permitted on any outer surface of the equipment, except the bottom of equipment having a mass exceeding 18 kg.

For STATIONARY EQUIPMENT, the power rating marking shall be visible after the equipment has been installed as in normal use.

For equipment intended to be installed by a SERVICE PERSON, and if the power rating marking is in a SERVICE ACCESS AREA, the location of the permanent marking shall be indicated in the installation instructions or on a readily visible marker on the equipment. It is permitted to use a temporary marker for this purpose.

The power rating marking shall include the following:

– RATED VOLTAGE(S) or RATED VOLTAGE RANGE(S), in volts;

  - the voltage range shall have a hyphen (-) between the minimum and maximum RATED VOLTAGES and when multiple RATED VOLTAGES or RATED VOLTAGE RANGES are given, they shall be separated by a solidus (/);

  NOTE 1 Some examples of RATED VOLTAGE markings are:

  – RATED VOLTAGE RANGE: 220-240 V. This means that the equipment is designed to be connected to an AC MAINS SUPPLY having any voltage between 220 V and 240 V.

  – multiple RATED VOLTAGE: 120/230/240 V. This means that the equipment is designed to be connected to an AC MAINS SUPPLY having a voltage of 120 V or 230 V or 240 V, usually after internal adjustment.

  - if equipment is to be connected to both line conductors and to the neutral conductor of a single-phase, three-wire power distribution system, the power rating marking shall give the line-to-neutral voltage and the line-to-line voltage, separated by a solidus (/), with the added notation "Three wires plus protective earth", "3W + PE" or equivalent;

  NOTE 2 Some examples of the above system rating markings are:

  120/240 V; 3 wire + PE;

  120/240 V; 3W + ⏚ (60417-IEC-5019);

  100/200 V; 2W + N + PE;

  100-120/200-240 V; 2W + N + PE.

– symbol for nature of supply, for d.c. only;

– RATED FREQUENCY or RATED FREQUENCY RANGE, in hertz, unless the equipment is designed for d.c. only;

– RATED CURRENT, in milliamperes or amperes;

  - for equipment with multiple RATED VOLTAGES, the corresponding RATED CURRENTS shall be marked such that the different current ratings are separated by a solidus (/) and the relation between RATED VOLTAGE and associated RATED CURRENT appears distinctly;
  - equipment with a RATED VOLTAGE RANGE shall be marked with either the maximum RATED CURRENT or with the current range;
  - the power rating marking for RATED CURRENT of a group of units having a single supply connection shall be placed on the unit which is directly connected to a MAINS

SUPPLY. The RATED CURRENT marked on that unit shall be the total maximum current that can be on circuit at the same time and shall include the combined currents to all units in the group that can be supplied simultaneously through the unit and that can be operated simultaneously.

NOTE 3 Some examples of RATED CURRENT markings are:

– for equipment with multiple RATED VOLTAGES:

120/240 V; 2,4/1,2 A;

100-120/200-240 V; 2,4/1,2 A;

– for equipment with a RATED VOLTAGE RANGE:

100-240 V; 2,8 A or the peak value of the test voltage of Table 5C;

100-240 V; 2,8-1,4 A;

100-120 V; 2,8 A;

200-240 V; 1,4 A.

It is recognized that in some regions it is customary to use a point (·) as a decimal marker instead of a comma.

Additional markings are permitted, provided that they do not give rise to misunderstanding.

Where symbols are used, they shall conform to ISO 7000 or IEC 60417 where appropriate symbols exist.

1.7.1.2 Identification markings

Equipment shall be provided by the following identification markings:

– manufacturer's name or trade-mark or identification mark;

– manufacturer's model identification or type reference;

– symbol □, IEC 60417-5172 (DB:2003-02), for the identification of CLASS II EQUIPMENT only, except where this is forbidden by 2.6.2.

Additional identification markings are permitted, provided that they do not give rise to misunderstanding.

These identification markings shall be readily visible in any OPERATOR ACCESS AREA, except that they shall not be located on the bottom of equipment having a mass exceeding 18 kg. For STATIONARY EQUIPMENT, the identification markings shall be visible after the equipment has been installed as in normal use.

1.7.7.1 Protective earthing and bonding terminals

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

A wiring terminal intended for connection of a PROTECTIVE EARTHING CONDUCTOR shall be indicated by the symbol ⏚, IEC 60417-5019 (DB:2002-10). This symbol shall not be used for other earthing terminals, except that the symbol may also be used to identify the separate protective earthing terminal specified in 5.1.7.1.

2.1.1.5 Energy hazards

Replace the existing text of c)2) by the following:

2) the stored energy in a capacitor is at a HAZARDOUS ENERGY LEVEL if the voltage, U, is 2 V or more, and the stored energy, E, calculated from the following equation, is 20 J or more:

$$E = 0{,}5\ CU^2 \times 10^{-6}$$

Where:

E is the energy, in joules (J);

C is the capacitance, in microfarads (μF);

U is the measured voltage on the capacitor, in volts (V).

2.1.1.7 Discharge of capacitors in equipment

Replace the last sentence of the last paragraph of this subclause by the following:

When conducting the voltage decay measurement, the measurement is either made with, or referred to, an instrument having an input impedance consisting of a resistance of 100 MΩ ± 5 MΩ in parallel with an input capacitance of 25 pF or less.

2.1.1.8 Energy hazards - d.c. mains supplies

Replace the last sentence of item a) by the following:

A HAZARDOUS ENERGY LEVEL exists if the voltage, U, is 2 V or more, and the stored energy, E, is 20 J or more.

2.4.1 General requirements

Add the following new Note 2 at the end of this subclause, and renumber the existing note as Note 1:

NOTE 2 A LIMITED CURRENT CIRCUIT may be derived from either a PRIMARY CIRCUIT or a SECONDARY CIRCUIT.

2.5 Limited power sources

Replace the existing item b) by the following:

b) a linear or non-linear impedance limits the output in compliance with Table 2B. If a positive temperature coefficient device is used, it shall:
   - pass the tests specified in IEC 60730-1, Clauses 15, 17, J.15 and J.17; or
   - meet the requirements in IEC 60730-1 for a device for Type 2.AL action;

Replace the existing item c) by the following:

c) a regulating network, or an integrated circuit (IC) current limiter, limits the output in compliance with Table 2B, both with and without a simulated single fault (see 1.4.14) in the regulating network or the IC current limiter (open circuit or short circuit). A single fault between the input and output is not conducted if the IC current limiter meets a suitable test program as given in Annex CC;

2.6.2 Functional earthing

*Delete the words "*or inaccessible*" in the first sentence of the existing first paragraph of this subclause.*

2.6.5.6 Corrosion resistance

Replace the words "protective earthing" *by* "protective earthing and protective bonding" *in the first sentence of the existing first paragraph of this subclause.*

2.8.4 Fail-safe operation

Add, after the second item of the list, the following new paragraph and note:

For protection against extreme hazard, either a redundant system of two SAFETY INTERLOCK systems shall be used or the fixed separation distances in a single SAFETY INTERLOCK system circuit (for example, those associated with printed boards) shall meet the requirements for REINFORCED INSULATION.

NOTE A SAFETY INTERLOCK system is considered to consist of the components/elements that are directly capable of disconnecting the hazardous part (for example, relay contacts or a switch) including components (for example, a relay coil) and other parts forming part of the initiation circuit (for example, those mounted on printed boards).

Replace the first compliance statement of this subclause by the following:

Compliance is checked by inspection of the SAFETY INTERLOCK system, circuit diagrams and available data and, if necessary, by simulation of single faults (see 1.4.14) (for example, failure of a semi-conductor device or an electromechanical component). Moving mechanical parts in mechanical and electromechanical systems are not subjected to simulated single faults if they comply with 2.8.5 and 2.8.7. Fixed separation distances in SAFETY INTERLOCK system circuits (for example, those associated with printed boards) that protect against other than extreme hazards are not subjected to simulated single faults if the separation distances comply with 2.8.7.1.

2.8.7 Switches and relays

Replace the existing title of this subclause by the following new title:

2.8.7 Switches, relays and their related circuits

2.8.7.1 Contact gaps

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

2.8.7.1 Separation distances for contact gaps and their related circuits

If the separation distances for contact gaps and their related circuits are located in the PRIMARY CIRCUIT, the separation distances shall not be less than that for a disconnect device (see 3.4.2). If the separation distance is located in a circuit other than a PRIMARY CIRCUIT, the separation distance shall be not less than the relevant minimum CLEARANCE value for BASIC INSULATION in a SECONDARY CIRCUIT specified in 2.10.3 (or Annex G).

Compliance is checked by inspection of the available data and, if necessary, by measurement.

2.8.7.2 Overload test

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

The contact of a switch or relay in the SAFETY INTERLOCK system is subjected to an overload test consisting of 50 cycles of operation at the rate of 6 to 10 cycles per minute, making and breaking 150 % of the current imposed in the application, except that where a switch or relay contact switches a motor load, the test is conducted with the rotor of the motor in a locked condition. After the test, the SAFETY INTERLOCK system, including the switch or relay, shall still be functional.

2.8.7.3 Endurance test

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

The contact of a switch or a relay in the SAFETY INTERLOCK system is subjected to an endurance test, making and breaking 100 % of the current imposed in the application at a rate of 6 to 10 cycles of operation per minute. A higher rate of cycling is permitted if requested by the manufacturer. For reed switches used in SAFETY INTERLOCK systems located in ELV CIRCUITS, SELV CIRCUITS and TNV-1 CIRCUITS, the test is 100 000 operating cycles. For other switches and relays in SAFETY INTERLOCK systems, the test is 10 000 operating cycles. After the test, the SAFETY INTERLOCK system, including a switch or relay, shall still be functional.

2.8.7.4 Electric strength test

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

Except for reed switches in ELV CIRCUITS, SELV CIRCUITS and TNV-1 CIRCUITS, an electric strength test as specified in 5.2.2, is applied between the contacts of the relays and switches after the tests of 2.8.7.2 and 2.8.7.3. If the contact is in a PRIMARY CIRCUIT, the test voltage is as specified for REINFORCED INSULATION. If the contact is in a circuit other than a PRIMARY CIRCUIT, the test voltage is as specified for BASIC INSULATION in a PRIMARY CIRCUIT.

2.9.2 Humidity conditioning

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

Where required by 2.9.1, 2.10.8.3, 2.10.10 or 2.10.11, humidity conditioning is conducted for 48 h in a cabinet or room containing air with a relative humidity of (93 ± 3) %. The temperature of the air, at all places where samples can be located, is maintained within 2 K of any convenient value t between 20 °C and 30 °C such that condensation does not occur. During this conditioning the component or subassembly is not energized.

Table 2K – Minimum clearances for insulation in primary circuits and between primary and secondary circuits

Replace the existing Table 2K by the following new table:

CLEARANCES in mm

PEAK WORKING VOLTAGE up to and including V	MAINS TRANSIENT VOLTAGE														
	1 500 V [c]						2 500 V [c]						4 000 V [c]		
	Pollution degree														
	1 and 2 [b]			3			1 and 2 [b]			3			1, 2 [b] and 3		
	F	B/S	R	F	B/S	R	F	B/S	R	F	B/S	R	F	B/S	R
71 [a]	0,4	1,0 (0,5)	2,0 (1,0)	0,8	1,3 (0,8)	2,6 (1,6)	1,0	2,0 (1,5)	4,0 (3,0)	1,3	2,0 (1,5)	4,0 (3,0)	2,0	3,2 (3,0)	6,4 (6,0)
210 [a]	0,5	1,0 (0,5)	2,0 (1,0)	0,8	1,3 (0,8)	2,6 (1,6)	1,4	2,0 (1,5)	4,0 (3,0)	1,5	2,0 (1,5)	4,0 (3,0)	2,0	3,2 (3,0)	6,4 (6,0)
420 [a]	F 1,5 B/S 2,0 (1,5) R 4,0 (3,0)												2,5	3,2 (3,0)	6,4 (6,0)
840	F 3,0 B/S 3,2 (3,0) R 6,4 (6,0)														
1 400	F/B/S 4,2 R 6,4														
2 800	F/B/S/R 8,4														
7 000	F/B/S/R 17,5														
9 800	F/B/S/R 25														
14 000	F/B/S/R 37														
28 000	F/B/S/R 80														
42 000	F/B/S/R 130														

The values in the table are applicable to FUNCTIONAL INSULATION (F) if required by 5.3.4 a) (see 2.10.1.3), BASIC INSULATION (B), SUPPLEMENTARY INSULATION (S) and REINFORCED INSULATION (R).

The values in parentheses apply to BASIC INSULATION, SUPPLEMENTARY INSULATION or REINFORCED INSULATION only if manufacturing is subjected to a quality control programme that provides at least the same level of assurance as the example given in Clause R.2. DOUBLE INSULATION and REINFORCED INSULATION shall be subjected to ROUTINE TESTS for electric strength.

If the PEAK WORKING VOLTAGE exceeds the peak value of the AC MAINS SUPPLY voltage, linear interpolation is permitted between the nearest two points, the calculated minimum CLEARANCE being rounded up to the next higher 0,1 mm increment.

[a] If the PEAK WORKING VOLTAGE exceeds the peak value of the AC MAINS SUPPLY voltage, use the peak value of the AC MAINS SUPPLY voltage in this column and use Table 2L in accordance with 2.10.3.3 b) regarding additional CLEARANCES

[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.

Table 2L – Additional clearances in primary circuits

Add the following new paragraph to the existing conditions of Table 2L (after "For voltage values…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.

Table 2M – Minimum clearances in secondary circuits

*In the 7 000 V row of Table 2M, replace the existing value "*7,5" *by "*17,5*".*

Table 2N – Minimum creepage distances

Replace the existing Table 2N by the following new table:

CREEPAGE DISTANCES in mm

RMS WORKING VOLTAGE up to and including V	Pollution degree						
	1[a]	2			3		
	Material Group						
	I, II, IIIa, IIIb	I	II	IIIa, IIIb	I	II	IIIa, IIIb (see Note)
10	0,08	0,4	0,4	0,4	1,0	1,0	1,0
12,5	0,09	0,42	0,42	0,42	1,05	1,05	1,05
16	0,1	0,45	0,45	0,45	1,1	1,1	1,1
20	0,11	0,48	0,48	0,48	1,2	1,2	1,2
25	0,125	0,5	0,5	0,5	1,25	1,25	1,25
32	0,14	0,53	0,53	0,53	1,3	1,3	1,3
40	0,16	0,56	0,8	1,1	1,4	1,6	1,8
50	0,18	0,6	0,85	1,2	1,5	1,7	1,9
63	0,2	0,63	0,9	1,25	1,6	1,8	2,0
80	0,22	0,67	0,9	1,3	1,7	1,9	2,1
100	0,25	0,71	1,0	1,4	1,8	2,0	2,2
125	0,28	0,75	1,05	1,5	1,9	2,1	2,4
160	0,32	0,8	1,1	1,6	2,0	2,2	2,5
200	0,42	1,0	1,4	2,0	2,5	2,8	3,2
250	0,56	1,25	1,8	2,5	3,2	3,6	4,0
320	0,75	1,6	2,2	3,2	4,0	4,5	5,0
400	1,0	2,0	2,8	4,0	5,0	5,6	6,3
500	1,3	2,5	3,6	5,0	6,3	7,1	8,0
630	1,8	3,2	4,5	6,3	8,0	9,0	10
800	2,4	4,0	5,6	8,0	10	11	12,5
1 000	3,2	5,0	7,1	10	12,5	14	16
1 250	4,2	6,3	9,0	12,5	16	18	20
1 600	5,6	8,0	11	16	20	22	25
2 000	7,5	10	14	20	25	28	32
2 500	10	12,5	18	25	32	36	40
3 200	12,5	16	22	32	40	45	50
4 000	16	20	28	40	50	56	63
5 000	20	25	36	50	63	71	80
6 300	25	32	45	63	80	90	100
8 000	32	40	56	80	100	110	125
10 000	40	50	71	100	125	140	160
12 500	50	63	90	125			
16 000	63	80	110	160			
20 000	80	100	140	200			
25 000	100	125	180	250			
32 000	125	160	220	320			
40 000	160	200	280	400			
50 000	200	250	360	500			
63 000	250	320	450	600			

The values in the table apply to FUNCTIONAL INSULATION if required by 5.3.4 (a) (see 2.10.1.3), BASIC INSULATION and SUPPLEMENTARY INSULATION. For REINFORCED INSULATION the values are twice those in the table.

Linear interpolation may be used between the nearest two points, the calculated minimum CREEPAGE DISTANCE being rounded up to the next higher specified increment, or the value in the next row below, whichever is lower. For values:

- not exceeding 0,5 mm, the specified increment is 0,01 mm; and
- for those exceeding 0,5 mm, the specified increment is 0,1 mm.

For REINFORCED INSULATION, the calculated value for BASIC INSULATION shall be doubled first before applying the rounding off.

NOTE Material Group IIIb is not recommended for applications in Pollution Degree 3 with an RMS WORKING VOLTAGE above 630 V.

[a] It is permitted to use the values for Pollution Degree 1 if one sample passes the tests of 2.10.10.

2.10.5.5 Cemented joints

Replace the sixth paragraph of this subclause by the following new paragraph:

For b) and c) above, the tests of 2.10.10 and 2.10.11 are not applied to a printed board made using pre-preg if the temperature of the printed board measured during the test of 4.5.2 does not exceed 90 °C at any point on the printed board material.

Table 2Q – Minimum separation distances for coated printed boards

Replace the existing Table 2Q by the following new table:

PEAK WORKING VOLTAGE up to and including V peak	BASIC INSULATION or SUPPLEMENTARY INSULATION mm	REINFORCED INSULATION mm
71 [a]	0,025	0,05
89 [a]	0,04	0,08
113 [a]	0,063	0,125
141 [a]	0,1	0,2
177 [a]	0,16	0,32
227 [a]	0,25	0,5
283 [a]	0,4	0,8
354 [a]	0,56	1,12
455 [a]	0,75	1,5
570	1,0	2,0
710	1,3	2,6
895	1,8	3,6
1 135	2,4	3,8
1 450	2,8	4,0
1 770	3,4	4,2
2 260	4,1	4,6
2 830	5,0	5,0
3 540	6,3	6,3
4 520	8,2	8,2
5 660	10,0	10,0
7 070	13,0	13,0
8 910	16,0	16,0
11 310	20,0	20,0
14 140	26,0	26,0
17 700	33,0	33,0
22 600	43,0	43,0
28 300	55,0	55,0
35 400	70,0	70,0
45 200	86,0	86,0
Linear interpolation may be used between the nearest two points, the calculated minimum separation distance being rounded up to the next higher specified increment, or the value in the next row below, whichever is lower. For values: - not exceeding 0,5 mm, the specified increment is 0,01 mm; and - for those exceeding 0,5 mm, the specified increment is 0,1 mm.		
[a] The test of 2.10.8 is not required.		

4.2.1 General

Add the following new sentence at the end of the first paragraph of this subclause:

For additional requirements for rack-mounted equipment, see Annex DD.

Replace the third paragraph of this subclause by the following new paragraph:

A MECHANICAL ENCLOSURE shall be sufficiently complete to contain or deflect parts, which because of failure or for other reasons, might become loose, separated or thrown from a moving part (see 4.2.11 for the relevant requirements).

Delete the note.

Replace the fourth paragraph of this subclause by the following new paragraph:

Compliance is checked by inspection of the construction and available data and, where necessary, by the relevant tests of 4.2.2 to 4.2.7 and 4.2.11 as specified.

4.2.5 Impact test

Replace the fifth paragraph of this subclause by the following new paragraph:

The impact test is not applied to the following:

– *the face of a cathode ray tube (see 4.2.8);*

– *the platen glass of equipment (for example, on a copying machine);*

– *the surface of the ENCLOSURE of STATIONARY EQUIPMENT, including EQUIPMENT FOR BUILDING-IN, that is inaccessible and protected after installation;*

– *a flat panel display*

- *having a surface area of glass not exceeding 0,1 m^2 or with a major dimension not exceeding 450 mm; or*
- *made of laminated glass; or*

NOTE Laminated glass includes constructions such as plastic film affixed to a single side of the glass.

- *that has been evaluated and complies with 19.5 of IEC 60065.*

4.2.6 Drop test

In the fourth paragraph of this subclause, replace "19 mm to 20 mm" of the existing text by "18 mm ± 2 mm".

4.2.7 Stress relief test

Replace the second paragraph of this subclause by the following new paragraph:

Compliance is checked by the mould stress relief test of IEC 60695-10-3, or by the test procedure described below, or by the inspection of the construction and the available data where appropriate.

Replace the third paragraph of this subclause by the following new paragraph:

One sample consisting of the complete equipment, or of the complete ENCLOSURE together with any supporting framework, is placed in a circulating air oven at a temperature 10 K higher than the maximum temperature observed on the ENCLOSURE during the test of 4.5.2, but not less than 70 °C, for a period of 7 h, then permitted to cool to room temperature.

After the existing Subclause 4.2.10, add the following new subclause:

4.2.11 Rotating solid media

Equipment shall be so constructed that solid media rotating at a speed higher than 8 000 r/min that may be damaged and shatter during normal operating conditions is contained.

Compliance is checked by inspection and, if necessary, by the following tests in accordance with Figure 4G or Figure 4H, as appropriate.

The size of gap 'X' between the media door or tray assembly and the ENCLOSURE is measured while a static force of F ± 10 % is applied to the inside of the cover at the most unfavourable location using test pin, (see Figure 2B). The formula for calculating the static force to be applied is:

$$F = S \times (mv^2) / R_o$$

where

F *is the force in Newtons to be applied;*

S *= 0,250 when no deflector is used (considered worst case fractional size of fragment mass);*

S *= 0,125 when a deflector is used (considered worst case fractional size of fragment mass);*

m *is the media mass in kilograms;*

v *is the velocity of the outside diameter of the media in metres per second;*

R_o *is the outer radius of the media in metres.*

NOTE 1 The entire mass of the media is as specified by the manufacturer.

NOTE 2 Typical CD and DVD media will be within the following ranges:

– For a CD (according to IEC 60908):
  - thickness: 1,20 mm $^{+0,3}_{-0,1}$ mm;
  - mass: 14 g to 33 g;

– For a DVD (according to ECMA-267):
  - thickness: 1,20 mm $^{+0,3}_{-0,06}$ mm;
  - mass: 13 g to 20 g.

Where a media deflector is not used, the cover on the door shall not break, separate from the drive or flex such as to create an opening greater than 'X' mm measured between any part of the media door and the nearest outer ENCLOSURE surface through which media fragments could be expelled. A cylindrical probe or feeler gauge shall be used to measure the opening (see Figure 4G). 'X' is the smallest thickness in millimetres of the media specified by the manufacturer.

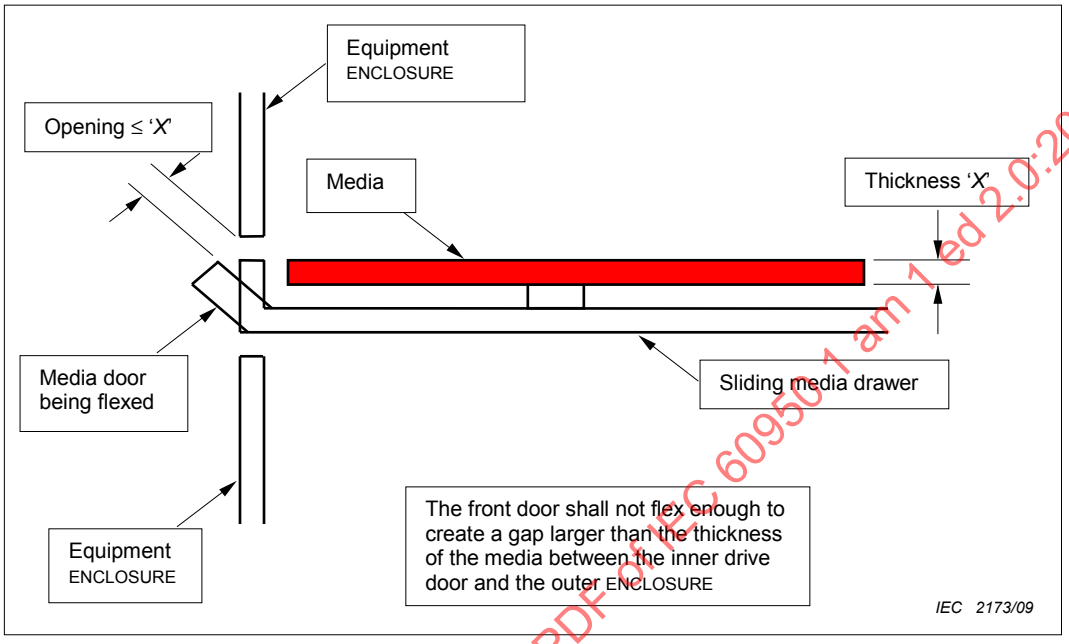


Figure 4G– Example for determining opening 'X' without a deflector

Where a media deflector is used, the cover on the door/deflector combination shall not break, separate from the drive or flex such as to create an opening through which media fragments could be expelled (see Figure 4H).

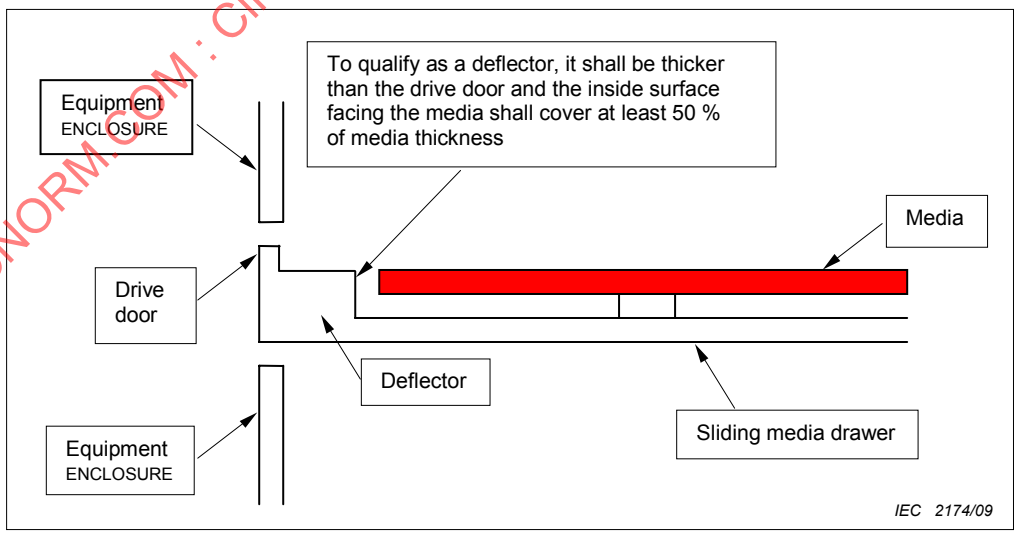


Figure 4H – Example for determining opening 'X' with a deflector

4.3.13.3 Effect of ultraviolet (UV) radiation on materials

Add the following new text to the existing note of this subclause:

A lamp that has UV in the spectrum from 180 nm to 400 nm as its predominant radiation emission (as specified by the lamp manufacturer), and emits higher than 0,001 W/m^2 irradiance, is considered to produce "significant" radiation.

4.3.13.4 Human exposure to ultraviolet (UV) radiation

Add the following new text to the existing Note 1 of this subclause:

A lamp that has UV in the spectrum from 180 nm to 400 nm as its predominant radiation emission (as specified by the lamp manufacturer), and emits higher than 0,001 W/m^2 irradiance, is considered to produce "significant" radiation.

Add the following new paragraph and Note 2 after the existing Note 1:

Equipment that produces a combination of visible light and UV light that is only emitted through a glass focusing lens having a 90 % UV attenuation up to 400 nm is exempt if there are no other openings through which visible radiation is emitted.

NOTE 2 Glass with a thickness of 2 mm usually complies with this requirement.

Renumber the existing Note 2 and 3 as 3 and 4 respectively.

4.3.13.5 Lasers (including LEDs)

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

4.3.13.5 Lasers (including laser diodes) and LEDs

4.3.13.5.1 Lasers (including laser diodes)

Except as permitted below, equipment shall be classified and labelled according to IEC 60825-1, IEC 60825-2 and IEC 60825-12, as applicable.

Equipment that is inherently a Class I laser product, which means the equipment contains no laser or laser diode of a higher class number, is not required to have a laser warning label or other laser statement.

The data for a laser or a laser diode shall confirm that these components comply with the Accessible Emission Limit for Class I when measured according to IEC 60825-1, for the above exception to apply. The data may be obtained from the component manufacturer (see 1.4.15) and can relate to the component alone or to the component in its intended application in the equipment. The lasers or laser diodes shall produce radiation only in the wavelength range of 180 nm to 1 mm.

Compliance is checked by inspection, by evaluation of the data provided by the manufacturer and, if necessary, by testing according to IEC 60825-1.

4.3.13.5.2 Light emitting diodes (LEDs)

Equipment containing LEDs that produce optical radiation in excess of the limits specified in IEC 62471 in the wavelength range 200 nm to 3 000 nm, as specified by the lamp manufacturer, shall be provided with means (such as an interlock, barriers, guards or the equivalent) to reduce the likelihood of optical radiation exceeding the limits specified in IEC 62471 from appearing in USER accessible areas. Low power applications of LEDs need not comply with IEC 62471.

NOTE 1 Some examples of low power applications of LEDs that will normally comply are those used as:

– indicating lights;

– infra-red devices such as are used in home entertainment devices;

– infra-red devices for data transmission, such as are used between computers and computer peripherals;

– optocouplers; and

– other similar low power devices.

Compliance is checked by evaluation of available data sheets, by inspection and, if necessary, by measurement.

NOTE 2 For guidance on measuring techniques, see IEC 62471.

4.4.1 General

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

Except for moving fan blades, hazardous moving parts of the equipment (which means moving parts that have the potential to cause injury) shall be so arranged, enclosed or guarded as to reduce the risk of injury to persons. Moving fan blades are evaluated in accordance with 4.4.5.

4.4.2 Protection in operator access areas

Add the following new sentence at the end of the first paragraph of this subclause:

HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS shall also comply with Annex EE.

After the existing Subclause 4.4.4, add the following new subclause:

4.4.5 Protection against moving fan blades

4.4.5.1 General

Equipment shall be so constructed that the likelihood of injury from moving fan blades has been minimized.

The likelihood of injury from moving fan blades is determined by calculating the *K* factor for each fan blade, where the *K* factor is equal to:

$$K = 6 \times 10^{-7} (m\, r^2\, N^2)$$

Where:

m is the mass (kg) of the moving part of the fan assembly (blade, shaft and rotor);

r is the radius (mm) of the fan blade from the centre line of the motor (shaft) to the tip of the outer area likely to be contacted;

N is the rotational speed (r/min) of the fan blade.

The classification of moving fan blades relative to their ability to cause injury is as follows:

a) a moving fan blade is not considered likely to cause pain or injury if

$$\frac{r/\text{min}}{15\,000} + \frac{K\ \text{factor}}{2\,400} \leq 1$$

b) a moving fan blade is considered likely to cause pain, but is not considered likely to cause injury if

$$\frac{r/\text{min}}{22\,000} + \frac{K\ \text{factor}}{3\,600} \leq 1$$

c) a moving fan blade that does not comply with a) or b) above is considered likely to cause injury.

4.4.5.2 Protection for users

A moving fan blade classified as 4.4.5.1 a) may be located in an OPERATOR ACCESS AREA. Under a single fault condition, a moving fan blade classified as 4.4.5.1 a) may reach the limits permitted for a moving fan blade classified as 4.4.5.1 b).

A moving fan blade classified as 4.4.5.1 b) shall not be located in an OPERATOR ACCESS AREA during normal operation. Under a single fault condition, a moving fan blade classified as 4.4.5.1 b) shall remain within the limits of 4.4.5.1 b). If such a moving fan blade is accessible only during USER servicing, then a warning in accordance with the following shall be provided.

Either the symbol  , or a similar symbol, combined with the triangle shaped warning sign from ISO 3864-2, or the following statement or equivalent text shall be used:

WARNING Hazardous moving parts Keep away from moving fan blades

A moving fan blade classified as 4.4.5.1 c) that is arranged, located, enclosed or guarded so that the possibility of contact with the moving parts of the fan is unlikely by a USER during USER servicing, shall be provided with a warning as specified above.

During USER servicing conditions, where the equipment protection against access to a moving fan blade classified as 4.4.5.1 b) or 4.4.5.1 c) must be defeated or bypassed to perform the servicing, an instruction shall be provided to disconnect the power source prior to defeating or bypassing the equipment protection means, and to restore the equipment protection means before restoring power.

4.4.5.3 Protection for service persons

No equipment protection from moving fan blades is required for the protection for SERVICE PERSONS.

During servicing in areas where inadvertent contact with a moving fan blade classified as 4.4.5.1 c) is possible by a SERVICE PERSON, a marking in accordance with 4.4.5.2 shall be

provided to identify the location of the moving fan blade along with any necessary instructions required for the SERVICE PERSON to avoid contacting the moving fan blade.

6.1.2.1 Requirements

*In the existing Note 2, replace "*EN 60950-1:200x*" by "*EN 60950-1:2006*".*

6.2.1 Separation requirements

Replace the existing item a) of this subclause by the following new item:

a) Unearthed conductive parts and non-conductive parts of the equipment expected to be held or otherwise maintained in continuous contact with the body during normal use (for example, a telephone handset or head set or the palm rest surface of a laptop or notebook computer).

6.2.2.1 Impulse test

Replace the existing Note 2 of this subclause by the following new note:

NOTE 2 In Australia, a value of U_c = 7,0 kV is used in 6.2.1 a) for hand-held telephones and for headsets.

Annex B – Motor tests under abnormal conditions

B.1 General requirements

Replace the last paragraph of this clause by the following new paragraph:

DC motors in SECONDARY CIRCUITS shall pass the tests of B.6, B.7 and B.10 except that motors, which by their intrinsic operation normally operate under locked-rotor conditions, such as stepper motors, are not tested, In addition, d.c. motors in SECONDARY CIRCUITS that are used for air-handling only and where the air propelling component is directly coupled to the motor shaft are not required to pass the test of B.6.

Annex D – Measuring instruments for touch current tests

Figure D.1 – Measuring instrument

In the existing key of this figure, replace ">1 MΩ*" by "*≥ 1 MΩ*".*

Annex F – Measurement of clearances and creepage distances

Figure F.12 – Measurements through openings in enclosures

*In the existing text at the bottom of the figure, replace "*in ternal*" by "*internal*".*

Annex G – Alternative method for determining minimum clearances

G.1.2 Summary of the procedure for determining minimum clearances

*Replace the existing items (*3*) to (*6*) of this subclause by the following new items:*

(3) Use the rules in G.4.1 and the above voltage values to determine the REQUIRED WITHSTAND VOLTAGE for mains transients and internal repetitive peaks. In the absence of transients coming from a TELECOMMUNICATION NETWORK, go to step 7.

(4) If the equipment is to be connected to a TELECOMMUNICATION NETWORK, determine the TELECOMMUNICATION NETWORK TRANSIENT VOLTAGE (Clause G.3).

(5) Use the TELECOMMUNICATION NETWORK TRANSIENT VOLTAGE and the rules in G.4.2 to determine the REQUIRED WITHSTAND VOLTAGE for TELECOMMUNICATION NETWORK TRANSIENTS. In the absence of mains and internal repetitive peaks, go to step 7.

(6) Use the rule in G.4.3 to determine the total REQUIRED WITHSTAND VOLTAGE.

G.6 Determination of minimum clearances

Replace the second paragraph of this clause by the following new paragraph:

For equipment to be operated at more than 2 000 m above sea level, the minimum CLEARANCES shall be multiplied by the factor given in Table A.2 of IEC 60664-1. Linear interpolation is permitted between the nearest two points in Table A.2 of IEC 60664-1. The calculated minimum CLEARANCE using this multiplication factor shall be rounded up to the next higher 0,1 mm increment.

Annex J – Table of electrochemical potentials

Table J.1 – Electrochemical potentials (V)

Replace the existing Table J.1 and note by the following new table and note:

Magnesium, magnesium alloys	Zinc, zinc alloys	80 tin/20 zinc on steel, zinc on iron or steel	Aluminium	Cadmium on steel	Aluminium/magnesium alloy	Mild steel	Duralumin	Lead	Chromium on steel, soft solder	Cr on Ni on steel, tin on steel, 12 % Cr stainless steel	High chromium stainless steel	Copper, copper alloys	Silver solder, austenitic stainless steel	Nickel on steel	Silver	Rhodium on silver on copper, silver/gold alloy	Carbon	Gold, platinum	
0	0,5	0,55	0,7	0,8	0,85	0,9	1,0	1,05	1,1	1,15	1,25	1,35	1,4	1,45	1,6	1,65	1,7	1,75	Magnesium, magnesium alloys
	0	0,05	0,2	0,3	0,35	0,4	0,5	0,55	0,6	0,65	0,75	0,85	0,9	0,95	1,1	1,15	1,2	1,25	Zinc, zinc alloys
		0	0,15	0,25	0,3	0,35	0,45	0,5	0,55	0,6	0,7	0,8	0,85	0,9	1,05	1,1	1,15	1,2	80 tin/20 zinc on steel, zinc on iron or steel
			0	0,1	0,15	0,2	0,3	0,35	0,4	0,45	0,55	0,65	0,7	0,75	0,9	0,95	1,0	1,05	Aluminium
				0	0,05	0,1	0,2	0,25	0,3	0,35	0,45	0,55	0,6	0,65	0,8	0,85	0,9	0,95	Cadmium on steel
					0	0,05	0,15	0,2	0,25	0,3	0,4	0,5	0,55	0,6	0,75	0,8	0,85	0,9	Aluminium/magnesium alloy
						0	0,1	0,15	0,2	0,25	0,35	0,45	0,5	0,55	0,7	0,75	0,8	0,85	Mild steel
							0	0,05	0,1	0,15	0,25	0,35	0,4	0,45	0,6	0,65	0,7	0,75	Duralumin
								0	0,05	0,1	0,2	0,3	0,35	0,4	0,55	0,6	0,66	0,7	Lead
									0	0,05	0,15	0,25	0,3	0,35	0,5	0,55	0,6	0,65	Chromium on steel, soft solder
										0	0,1	0,2	0,25	0,3	0,45	0,5	0,55	0,6	Cr on Ni on steel, tin on steel, 12 % Cr stainless steel
											0	0,1	0,15	0,2	0,35	0,4	0,45	0,5	High chromium stainless steel
												0	0,05	0,1	0,25	0,3	0,35	0,4	Copper, copper alloys
													0	0,05	0,2	0,25	0,3	0,35	Silver solder, austenitic stainless steel
														0	0,15	0,2	0,25	0,3	Nickel on steel
															0	0,05	0,1	0,15	Silver
																0	0,05	0,1	Rhodium on silver on copper, silver/gold alloy
																	0	0,05	Carbon
																		0	Gold, platinum

Cr = Chromium
Ni = Nickel

NOTE Corrosion due to electrochemical action between dissimilar metals which are in contact is minimized if the combined electrochemical potential is below about 0,6 V. In the above table the combined electrochemical potentials are listed for a number of pairs of metals in common use. Combinations above the dividing line should be avoided.

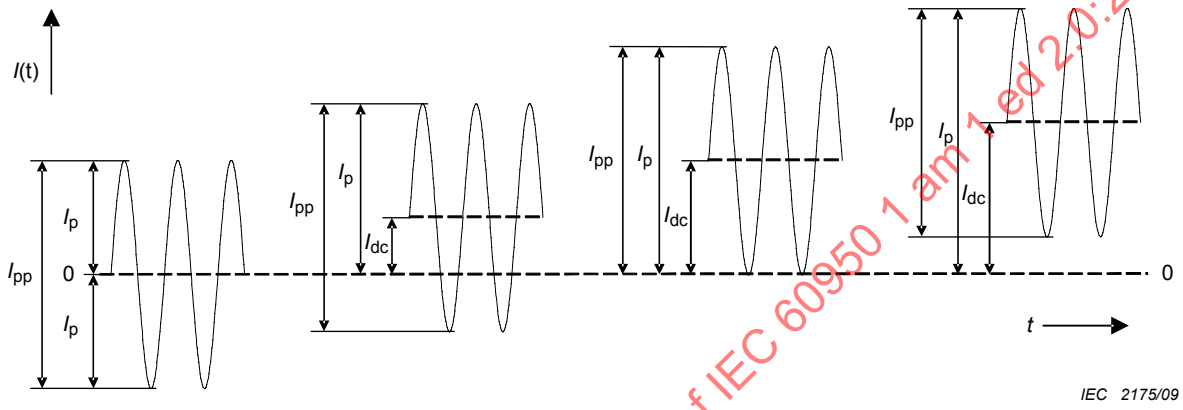
Annex M – Criteria for telephone ringing signals

M.2 Method A

In this clause, replace "I_{TSI}" by "I_{TS1}" (first paragraph of this clause, a), b) and c)).

Figure M.3 – Peak and peak-to-peak currents

Replace the existing Figure M.3 by the following new figure:



Annex P – Normative references

Add the following new references to the existing list:

IEC 60695-10-3, *Fire hazard testing – Part 10-3: Abnormal heat – Mould stress relief distortion test*

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

Delete the following reference from the existing list:

IEC 60216-4-1, *Guide for the determination of thermal endurance properties of electrical insulating materials – Part 4: Ageing ovens – Section 1: Single-chamber ovens*

Annex U – Insulated winding wires for use without interleaved insulation

Replace the second paragraph of this annex by the following new paragraph:

This annex covers round solid winding wires having diameters between 0,05 mm and 5,0 mm and stranded winding wires with equivalent cross-sectional areas.

Annex Y – Ultraviolet light conditioning test

Y.1 Test apparatus

Replace the existing two dashed items of this clause by the following new dashed items:

– *a twin enclosed carbon-arc, (see Y.3), with continuous exposure for a minimum of 720 h. The test apparatus shall operate with a black-panel temperature of 63 °C ± 3 °C in a relative humidity of 50 % ± 5 %; or*

– *a xenon-arc, (see Y.4) with continuous exposure for a minimum of 1 000 h. The test apparatus shall operate with a 6 500 W, water-cooled xenon-arc lamp, a spectral irradiance of 0,35 W/m^2 at 340 nm, a black-panel temperature of 63 °C ± 3 °C in a relative humidity of 50 % ± 5 %.*

Y.3 Carbon-arc light-exposure apparatus

Add the following new paragraph at the end of this clause:

Materials tested with water spray are also considered acceptable.

Y.4 Xenon-arc light-exposure apparatus

Add the following new paragraph before the existing Note:

Materials tested with water spray are also considered acceptable.

Add, after Annex BB, the following new Annexes CC, DD and EE:

Annex CC
(normative)

Evaluation of integrated circuit (IC) current limiters

CC.1 Integrated circuit (IC) current limiters

IC current limiters (used for current limiting the output of a power source in accordance with the requirements of a limited power source, see 2.5) are not shorted from input to output if they comply with all of the following:

– CLEARANCES and CREEPAGE DISTANCES for REINFORCED INSULATION are provided between the input and output pins for the applicable WORKING VOLTAGE, except for IC current limiters in SELV CIRCUITS;

– the IC current limiters limit the current to the manufacturer's specified value (not to be more than 5 A) under normal operating conditions with any specified drift taken into account;

– the IC current limiters are entirely electronic and have no means for manual operation or reset;

– the IC current limiters shall limit the current in accordance with Table 2B taking into account the manufacturer's specified drift, as applicable, (an open circuit is considered an acceptable result) after each of the conditioning tests given in either of the test programs specified in CC.2 or in CC.3. The IC current limiter need only meet one of the test programs.

NOTE The power source for the tests should be capable of delivering 250 VA minimum unless the IC current limiter is tested in the end product.

CC.2 Test program 1

Test program 1 consists of the following:

– *10 000 cycles of turning enable on and off with a 100 Ω ± 5 Ω resistor and a 425 μF ± 10 μF capacitor in parallel with the output;*

– *10 000 cycles of turning enable on and off with an iron-core inductor having 350 mH ± 10 mH inductance at 1 kHz and 10 Ω ± 2 Ω d.c. resistance connected in the output circuit;*

– *10 000 cycles of turning enable on and off with the input connected to a capacitor rated 425 μF ± 1 μF and shorting the output;*

– *10 000 cycles of turning the input pin on and off with a capacitor rated 425 μF ± 10 μF connected to the input supply while keeping enable active and shorting the output;*

– *10 000 cycles of turning the input pin on and off with an iron-core inductor having 350 mH ± 10 mH inductance at 1 kHz and 10 Ω ± 2 Ω d.c. resistance connected to the input supply and return while keeping enable active and shorting the output;*

– *50 cycles with the enable pin held active with the output open-circuited, each cycle consisting of shorting the output and then opening the output;*

– *50 cycles with the enable pin held active while applying a short to the output, each cycle consisting of turning the power on and off;*

– *50 cycles with the enable pin held active while power is applied, each cycle consisting of shorting the output, removing power, reapplying power, removing the short, followed by removal of power.*

CC.3 Test program 2

Test program 2 consists of the following:

- *50 cycles with the enable pin held active with the output open-circuited; each cycle consisting of shorting the output and then opening the output;*
- *50 cycles with the enable pin held active while applying a short to the output; each cycle consisting of turning the power on and off;*
- *50 cycles with the enable pin held active with the output loaded to maximum power, each cycle consisting of turning the power on and off;*
- *50 cycles with the enable pin held active while power is applied, each cycle consisting of shorting the output, removing power, reapplying power, removing the short, followed by removal of power;*
- *3 cycles of exposing the device (not energized) to 70 °C ± 2 °C for 24 h; followed by at least 1 h at room ambient; followed by at least 3 h at -30 °C ± 2 °C; followed by 3 h at room ambient;*
- *10 cycles of exposing the device (while energized) to 50 °C ± 2 °C for 10 min; followed by 10 min at 0 °C ± 2 °C with a 5 min period of transition from one state to the other;*
- *7 days with the output short-circuited and the device wrapped in a double layer of cheesecloth. A fast blow 5 A fuse kept in series with the output shall not open and a current meter shall not show a current lower of more than 5 A.*

Annex DD
(normative)

Requirements for the mounting means of rack-mounted equipment

DD.1 General

These requirements apply to the mounting means of equipment having a mass exceeding 7 kg installed in a rack that can be extended away from the rack for installation, service and the like. This requirement does not apply to equipment fixed in place and provided with equipment subassemblies or racks having a top installation position less than 1 m in height from the supporting surface.

For the purpose of these requirements, the mechanical mounting means for such equipment will be referred to as slide rails. These requirements are intended to reduce the likelihood of injury by retaining the equipment in a safe position and not allowing the slide rails to buckle, the means of attachment to break, or the equipment to slide past the end of the slide rails.

NOTE 1 Slide rails include bearing slides, friction slides or other equivalent mounting means.

NOTE 2 Slide rail constructions of integrated parts/units of the end product (for example, pullout paper trays in copiers/printers) are not considered to be rack-mounted equipment.

Slide rails shall have end stops that prevent the equipment from unintentionally sliding off the mounting means.

DD.2 Mechanical strength test, variable *N*

The slide rails shall be installed in a rack with the equipment, or equivalent setup, in accordance with the manufacturer's instructions. With the equipment in its extended position, a force in addition to the weight of the equipment is to be applied downwards through the centre of gravity for 1 min by means of a suitable test apparatus providing contact over a circular plane surface of 30 mm in diameter. If applying this force could damage the equipment, a metal plate or other means to distribute the force may be placed under the test apparatus. The total force shall be calculated based on the mass of the equipment plus an additional mass as determined below.

NOTE This additional force is intend to take into account other items or devices that may be stacked on top of the installed rack-mounted equipment while in the extended position during installation of other equipment.

For slide-rail mounted equipment, where the slide rails are mounted horizontally on each side of the equipment, the total force applied to the slide rails shall be equal to the greater of the following two values:

– *150 % of the equipment mass plus 330 N,*

– *150 % of the equipment mass, plus an additional mass, where the additional mass is equal to the equipment mass or 530 N, whichever is less.*

For slide rail mounted equipment where the slide rails are mounted vertically on the top and bottom of the equipment in the rack, the total force applied to the slide rails shall be 150 % of the equipment mass, with a minimum force of 250 N and a maximum force of 530 N.

If the supporting surface is intended to be a shelf, then the distribution of force over a metal plate under the test apparatus does not apply. The manufacturer shall specify the maximum load intended to be placed on the shelf in order to determine the force that needs to be applied to the shelf. A marking shall be provided on the shelf to indicate the maximum weight that can be added to the shelf. The force test shall be conducted at 125 % of the maximum weight stated by the manufacturer. The force is to be applied directly by means of the test apparatus providing contact over a circular plane surface of 30 mm in diameter.

DD.3 Mechanical strength test, 250 N, including end stops

The slide rail mounted equipment is installed in a rack in accordance with the manufacturer's instructions. A 250 N static force is applied to the slide rail mounted equipment, in every direction except upward to include the most unfavourable position of the slide rail mounted equipment, for a period of 1 min. The force is applied to the slide rail mounted equipment in its fully extended (service) position as well as its normally recessed (operating) position by means of a suitable test instrument providing contact over a circular plane surface of 30 mm in diameter. The force is applied with the complete flat surface of the test instrument in contact with the equipment. The test instrument need not be in full contact with uneven surfaces (for example corrugated or curved surfaces).

NOTE Additional requirements for a dynamic force test on the end stops are under consideration.

DD.4 Compliance

Compliance is checked by inspection and available manufacturer's data. If data is not available, then the tests according to DD.2 and DD.3 are conducted.

The equipment and its associated slide rails shall remain secure during the tests. One complete cycle of travel of the equipment on the slide rails shall be performed after completion of each test. If the mounting means is not able to perform one complete cycle without binding, a force of 100 N shall be applied horizontally to the front centre point of the equipment with the intent to completely retract the equipment into the rack. Should the equipment fail to fully retract, the mounting means shall not bend or buckle to any extent that could introduce an injury. End stops shall retain the equipment in a safe position and shall not allow the equipment to slide past the end of the slide rails.

Annex EE
(normative)

Household and home/office document/media shredders

EE.1 General

HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS shall additionally comply with the requirements of this annex.

EE.2 Markings and instructions

For HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS, markings or symbols alerting the USER to the following considerations shall be provided adjacent to the document/media feed opening:

– this equipment is not intended for use by children (the product is not a toy);

– avoid touching the document/media feed opening with the hands;

– avoid clothing touching the document/media feed opening;

– avoid hair touching the document/media feed opening; and

– keep aerosol products away [for equipment incorporating a universal (brush) motor only].

Additionally, the symbol  (ISO 7000-0434) and the symbol  ISO 7000-1641) (or a combination of the two) shall be marked adjacent to the document/media feed opening to alert the USER to the presence of important operating, maintenance and/or servicing instructions in the USER instructions accompanying the product, and the symbols required above shall be explained in the instructions.

The markings shall be permanent and easily discernible on the equipment when ready for use.

EE.3 Inadvertent reactivation

With the HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDER held in any position, including being removed from any waste container, it shall not be possible to defeat any SAFETY INTERLOCK or switch that provides protection against the activation of the shredder mechanism by means of the test finger of Figure 2A.

NOTE In Canada, Japan and the United States, a different test finger is used for determining compliance with EE.3 and EE.5.

Compliance is checked by inspection and, where necessary, by a test with the test finger of Figure 2A.

EE.4 Disconnection of power to hazardous moving parts

An isolating switch complying with 3.4.2 shall be provided to disconnect power to hazardous moving parts. This switch may be a two-position (single-purpose) switch or a multi-position (multi-function) switch (for example, a slide switch). This switch shall be located where it is easily accessible to a USER whose body part or clothing may be caught at the feed opening.

The “ON” and “OFF” positions of a two-position switch shall be marked in accordance with 1.7.8.

For a multi-position switch, the “OFF” position of the switch shall be marked in accordance with 1.7.8, and the other positions shall be marked with appropriate words or symbols. If symbols are used, they shall be explained in the USER instructions.

Compliance is checked by inspection.

EE.5 Protection against hazardous moving parts

For HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS contact with hazardous moving parts shall be prevented. A warning statement shall not be used in lieu of construction features that prevent access to hazardous moving parts.

Compliance is checked by the following.

The test finger in Figure 2A shall be inserted into each opening in the MECHANICAL ENCLOSURE, without appreciable force. The test finger shall not contact hazardous moving parts. This consideration applies to all sides of the MECHANICAL ENCLOSURE when the HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS is mounted as intended in accordance with the manufacturer's instructions for use. In some cases, operation of the equipment may be necessary to determine accessibility (for example, where a guard or cover is only opened after the unit is energized and ready for use) when applying both the test finger and wedge probe.

The wedge probe, illustrated in Figure EE.1 and Figure EE.2, shall be inserted into each feed opening in the MECHANICAL ENCLOSURE. A force not exceeding 45 N for strip-cut type HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS and not exceeding 90 N for cross-cut type HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS shall be applied to the wedge probe in any direction relative to the opening. The mass of the wedge probe is to be factored into the overall applied force. Before application of the wedge probe, any MECHANICAL ENCLOSURES or guards that are removable without the use of a TOOL shall be removed. The wedge probe shall not contact hazardous moving parts, including the shredding rollers/mechanisms.