

Translated English of Chinese Standard: GB8898-2011

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ICS 97.020

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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB 8898–2011

Replace GB 8898–2001

Audio, video and similar electronic apparatus—

Safety requirements

(IEC 60065: 2005, MOD)

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Issued on: December 30, 2011

Implemented on: November 01, 2012

**Issued by: General Administration of Quality Supervision, Inspection
and Quarantine of the People's Republic of China;**

**Standardization Administration Committee of the People's
Republic of China**

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Foreword

All the technical contents in this Standard are mandatory.

This Standard is drafted according to the rules specified in GB/T 1.1-2009.

By using redrafting-method, this Standard modifies and adopts the international standard IEC 60065:2005 Section 7.1 *Safety Requirements for Audio, Video and Similar Electronic Equipment* (English version).

The technical differences between this Standard and IEC 60065:2005 are:

a) Marking of the power rating value

The marking of the rated voltage and frequency in 5.1e) and f) of IEC 60065:2005 does not clearly specify specific values, which is only expressed with example, and the voltage in the example never includes Chinese voltage. According to the power grid and power supply requirements in China, the supply voltage is 220V, 50Hz or three-phase 380V and 50Hz. Therefore, this Standard 5.1e) clearly specifies the rating of power supply: the single rated voltage shall be marked as 220V or three-phase as 380V. The rated voltage range shall include 220V or three-phase 380V. For multiple rated voltage, one of which must be 220V or three-phase 380V; and 220V or three-phase 380V must be set [Translator: as default] when leaving the factory. For multiple rated voltage ranges, 220V or three-phase 380V shall be included; and 220V voltage range or three-phase 380V voltage range shall be set [Translator: as default] when leaving the factory.

Rated frequency or rated frequency range is clearly specified under 5.1f) in this Standard: rated frequency or rated frequency range shall be 50Hz or inclusive 50Hz.

b) Safety instructions

Safety instruction is clearly specified, the description “The language acceptable for the country where the equipment is intended for use in shall be used” in 5.4 is changed to “Standard Chinese shall be used”.

In Chapter 5, safety warnings and warning signs are added for operational conditions

under altitude and tropical climate.

For the equipment which is only applicable to region below altitude 2,000m, “Only applicable to regions below altitude 2,000m for safe operation” or similar warning statement or marking symbols shall be provided at prominent location of the equipment.

For equipment which is only applicable to non-tropical climates: “Only applicable to non-tropical climates for safe operation” or similar warning statement or marking symbols shall be provided at prominent location of the equipment.

If marking symbol is used separately, the explanation of meaning shall be provided in the instructions.

Safety warning statement (for example, warning statements – to be used below the altitude 2,000m; to be used in non-tropical climates) shall be in the language acceptable for the targeted market.

Add Annex R, and provide instructions of new safety warning marking.

Add Annex S, and provide comparison table of the Chinese, Tibetan, Mongolian, Zhuang characters and Uyghur characters for sample of safety-related description in this Standard.

c) Power plug

According to the dedicated power plug standards of our nation, the following sentence is added to Note 1 in 15.1.1: the power plug connecting the equipment and network power supply shall comply with the requirements of GB 1002 or GB 1003.

d) Applicable scope

IEC 60065:2005 applies to equipment used below altitude 2,000m. 1.1.3 stipulates that additional requirements are needed for the equipment intended to be used at plateau above altitude 2,000m. IEC 60065:2005 defines additional requirements for equipment used under tropical climates.

Due to the special nature of the geographic and climatic conditions in China, and after

modifying some provisions in the IEC 60065:2005, this Standard applies to the equipment used below altitude 5,000m (inclusive 5,000m) and the equipment used under tropical climate conditions. For the equipment only intended to be used below altitude 2,000m or under non-tropical climates, the corresponding degraded requirements may be adopted, but warnings shall be provided.

The first paragraph of 1.1.3 in this Standard is changed to: This Standard applies to equipment mainly used in altitude 5,000m and below; mainly in dry areas and temperate zones or tropical climates. The fourth paragraph of 1.1.3 is changed to: for the equipment intended to be used in vehicle, vessel or aircraft or used above altitude 5,000m, additional requirements may be needed.

e) Required values of electric clearance

Required value of electric clearance varies for different altitudes. For the equipment applicable to be used below altitude 5,000m, the required value of electric clearance shall correspond to requirements of altitude 5,000m. That is to multiply the multiplication factor 1.48 by the corresponding altitude 5,000m in GB/T 16935.1 - and that is to multiply the required values in Table 8, Table 9 and Table 10 by 1.48. For equipment scheduled to be used below altitude 2,000m, the required values of electric clearance shall correspond to those of altitude 2,000m. That is to multiply the multiplication factor 1 corresponding to altitude 2,000m in GB/T 16935.1. That is to directly use the required values in Table 8, Table 9 and Table 10.

The following contents are added as second paragraph for 13.3.2: These requirements apply to equipment operation in the case that altitude is not more than 2,000m. For the equipment planned to be used between altitude 2,000m and 5,000m, the minimum electric clearance shall be multiplied by the multiplication factor 1.48 corresponding to altitude 5,000m given in Table A.2 of GB/T 16935.1. For the equipment planned to be used at above altitude 5,000m, the minimum electric clearance shall be multiplied by the multiplication factor given in Table A.2 of GB/T 16935.1.

The following contents are added as second paragraph for 13.3.3: Required values in the

table apply to the equipment intended only to be used at altitude 2,000m and lower areas. For the equipment planned to be used at altitude between 2,000m and 5,000m, the minimum electric clearance should be multiplied by the multiplication factor 1.48 corresponding to altitude 5,000m given in Table A.2 of GB/T 16935.1. For the equipment planned to be used at above altitude 5,000m, the minimum electric clearance shall be multiplied by the multiplication factor given in Table A.2 of GB/T 16935.1.

“(Applies to altitude 2,000m and Lower Areas)” is added for the header of Table 8, Table 9 and Table 10.

The Note 3 of Annex J.6 is modified and moved to the second paragraph as main body: for the equipment scheduled to be used between altitude 2,000m and 5,000m, the minimum electric clearance shall be multiplied by the multiplication factor 1.48 corresponding to altitude 5,000m given in Table A.2 of GB/T 16935.1 based on the Table J.2. For the equipment planned to be used above altitude 5,000m, the minimum electric clearance shall be multiplied by the multiplication factor given in Table A.2 of GB/T 16935.1.

When a component has been verified to comply with the relevant national and industrial standard at component level, this component as an integral part of the equipment shall also withstand relevant tests specified in this Standard. The following contents are added as Note 6 in Chapter 14: If the range of application is below altitude 2,000m according to the component's standard provisions, then the relevant requirements of Chapter 13 shall be met based on the range of application specified in this Standard.

f) Heat-moisture treatment conditions

This Standard applies to the equipment used under tropical climates, the heat-moisture treatment conditions in 10.2 shall be treated as tropical climatic conditions. For the equipment designed only to be used under non-tropical climates, the heat-moisture treatment conditions shall comply with provisions of CTL resolution (resolution list No.: 624/07).

Heat-moisture treatment conditions in 10.2 are amended as follows: Heat-moisture

treatment shall be carried out in heat-moisture box with air relative humidity of $(93\pm3)\%$.

Equipment shall withstand heat-moisture treatment with a temperature of $40\pm2^{\circ}\text{C}$ and relative humidity of $(93\pm3)\%$.

For the equipment scheduled to be used only under non-tropical climatic conditions, the relative air humidity is $(93\pm3)\%$ during the heat-moisture treatment. In all places where the equipment can be placed, the air temperature shall be maintained within $20\pm3^{\circ}\text{C}$, at any convenient temperature $(t\pm2)^{\circ}\text{C}$ range without producing condensation.

For equipment used in high altitude areas, pre-treatment of insulating performance assessment shall be the heat-moisture pre-treatment conditions of withstanding temperature shock; specific requirements are still under consideration. The following contents are added at the end of Note 4 in 10.2: for equipment designed to be used at altitude 2,000m to 5,000m, conditions and requirements for the pre-treatment required for assessment of the insulation material performance are under consideration.

g) Temperature limits

This Standard applies to equipment used under tropical climates; the allowable temperature-rise for components involved in 7.1.1-7.1.5 is 10K lower than the specified values in Table 3. The equipment scheduled for a non-tropical climates only shall be allowed to use the temperature-rise limits specified in Table 3.

The first paragraph of footnote ^a in Table 3 is changed to: This Standard applies to the equipment used under tropical climates, temperature-rise limits in the table shall be lowered by 10K. The limits in the table can be adopted for the equipment designed only to be used under non-tropical climates.

Because heating characteristics of equipment used in the high altitude areas will be different, the heating test conditions for equipment designed to be used at altitude 2,000m to 5,000m are still under consideration. The following contents are added as Note 3 in 7.1: For equipment designed to be used at altitude 2,000m to 5,000m, the temperature measurement conditions and temperature limits requirements are under consideration.

h) Limits of contact current

For the equipment used under tropical climates, the limits of contact current shall be halved in order to ensure that the contact current through human body does not exceed the perception current. The original limits shall be kept for the equipment designed only to be used under non-tropical climates. Note 3 in 9.1.1.1 and Note 2 in 11.1 are modified and used as the contents of main body, "For Equipment Used under Tropical Climates, the values given above shall be halved". And Note 4 in 9.1.1.1 is changed to Note 3.

i) Isolation between antenna and protective grounding

Due to the special nature of power supply conditions in our country, grounding services may not be perfect, and isolation measures are required between coaxial socket of wired network antenna and protective grounding circuit.

5.4.1 instruction is added with: i) for the equipment with a wired network antenna socket without isolation, the instruction must provide the warnings, for example, "The wired network antenna connecting to the equipment must be isolated with the protective grounding, otherwise it may cause danger such as fire etc.!".

The third paragraph and Note are added for Chapter 10: The insulation resistance requirements for basic insulation shall be met between coaxial socket of wired network antenna and protective grounding circuit. If Class II equipment with a wired network antenna coaxial socket can be connected to the ground on the Class I equipment through other terminals, then between this antenna coaxial socket and any other connecting terminals, it shall meet the resistance requirements of basic insulation. If the wired network antenna has been isolated with protective grounding prior to connecting into the equipment, then there is no insulation requirement between the wired network antenna coaxial socket and protective grounding circuit, but it must meet the requirements in 5.4.1i).

"In Class II Equipment" in the first paragraph of 10.1 is deleted.

The first paragraph in 12.5 is modified as follows: For the antenna coaxial socket installed

on the equipment and equipped with parts or components which isolate the hazardous live parts and accessible parts; or the antenna coaxial socket equipped with parts or components which are insulated with the protective grounding circuit or other connecting terminals, their structures shall be able to withstand such mechanical stress which can be expected in intended usage.

j) Test methods of CRT

Chapter 18 of IEC 60065:2005 shows that self-explosion-proof CRT shall use the test method specified in 18.2; as an alternative approach, the manufacturer may choose to use the test method of IEC 61965. And note that the entire contents of IEC 61965 will be used to replace the current test of 18.2 in the forthcoming Amendment 2 of IEC 60065. Since the CRT is the compulsorily certified product in China, it must be provided with a unique certified standard and test method, therefore, in Chapter 18 of this Standard, GB 27701-2011 (IEC 61965:2003, IDT) is referenced as the test method of explosion proof CRT.

Delete the first paragraph of Chapter 18 of IEC 60065:2005.

Contents of the second item of 18.1 are modified to:

- For self-explosion-proof CRT, including the CRT with overall protection screen, use the test specified in GB 27701;
- For CRT of self-non-explosion-proof, use test specified in 18.2.

Delete the contents of 18.2 of IEC 60065:2005, the original serial number 18.3 is changed to the present 18.2.

k) Modification of Note 2 in Table 9

Note 2 in Table 9 is modified to: extrapolation is permitted to use for the operating voltage described in Table according to Amendment 2 of IEC 60065:2005.

l) Normative reference and bibliography

The reference principle for quoting and referring to other standards in the normative

reference and bibliography in 1.2 of IEC 60065:2005 is: for all reference documents dated, all the subsequent modification list (excluding the corrigendum) or revisions do not apply to this Standard, however, parties who enter into agreement in accordance with this Standard are encouraged to use the latest version of relevant documents. For undated reference documents, their latest version shall be applicable to this Standard.

Since the situation that the national standard or industrial standard adopting the international standard in China is relatively diversified. In order to facilitate the operation, on the basis of the requirements in GB/T 1.1 and GB/T 20000.2, it specified the reference documents and bibliography in 1.2 in this Standard. If it is a normative reference to the whole international standard, the reference principle taken is as follows:

- If the referenced international standards have not been equivalent or modified to be adopted as the national standards or industry standards, then reference to the international standard;
- If the referenced international standards have been equivalent or modified to be adopted as national standards or industry standards, then reference to these standards;
- When referring to national standards or industry standards, if there is no reference date, its latest edition shall apply;
- The parentheses, after the national standards or industry standard, indicate the identify number, corresponding international standard code and consistent code of the latest version.

The reference principles for only quoting partial chapters or terms of the international standard are as follows: If there is a national standard or industrial standard corresponding to this version of the international standard, then this national standard or industrial standard shall be referenced; if there is no national standard or industrial standard corresponding to this version of international standard, the international standard shall be referenced.

Meanwhile, normative reference documents, bibliography, normative references of this Standard and comparison table of bibliography are given in Annex Q of IEC 60065:2005, in order to retain international standards relevant information.

m) Add normative Annex

This Standard adds the normative Annex R, and provide instructions of new safety warning signs.

n) Other modifications

Correction or editorial modifications for individual requirement and error of IEC 60065 standard are made in this Standard according to the relevant CTL resolutions and Amendment of IEC 60065 standard. The relevant clauses are 10.2, Figure E.9, Figure E.10 and Annex G.

The above technical differences has been complied in main body and identified with vertical single line at the margin of the referred items.

In order for convenient use, this Standard also made the following editorial amendment:

- a) Change the word “the International Standard” to “this Standard”;
- b) Use decimal point “.” To replace the commas “,” for the usage of decimal point;
- c) Delete the Foreword of IEC 60065:2005;
- d) Add the informative Annex P, Annex Q and Annex S.

This Standard is the amendment of GB 8898-2001 *Safety Requirements of Audio, Video and Similar Electronic Apparatus*. The main technical differences between this Standard and GB 8898-2001 are given in Annex P.

This Standard replaced GB 8898—2001.

This Standard is proposed by Ministry of Industry and Information Technology of People's Republic of China.

This Standard is under the jurisdiction of Forth Institute of Electronics of Ministry of

Industry and Information Technology.

This Standard is mainly drafted by the following organizations: Forth Institute of Electronics of Department of Industry and Information Technology, Fifth Institute of Electronics of Department of Industry and Information Technology, Shanghai Institute of Quality Inspection and Technical Research, Telecommunications Institute of Department of Industry and Information Technology, Shenzhen TCL New Technology Co., Ltd., Beijing Tirt Detection Technology Services Co., Ltd.

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The previous versions of the standard replaced by this Standard are as follows: GB 8898-1988, GB 8898-1997, GB 8898-2001.

INTRODUCTION

Safety Principles

General

This introduction introduces the safety judgment principles on which the requirements of this Standard are based. In order to design and manufacture safe apparatus, understanding these principles is essential.

The requirements of this Standard are targeted to provide protection to human body as well as to the surroundings of the apparatus.

Attention is drawn to the safety judgment principles. These principles, which have been standardized, must be considered and are the minimal requirements, in order to establish satisfactory level of safety.

Further development in techniques and technologies may entail the need for future modification of this Standard.

NOTE: The expression "protection to the surroundings of the apparatus" implies that this protection should also include protection of the natural environment in which the apparatus is intended to be used, taking into account the life cycle of the apparatus, i.e. manufacturing, use, maintenance, disposal and possible end-of-life recycling of parts of the apparatus.

Danger

The application of this Standard is intended to prevent injury or damage due to the following hazards:

- Electric shock;
- Excessive temperature;
- Radiation;
- Explosion;
- Mechanical hazard;
- Firing.

Electric shock

Electric shock is due to current passing through the human body. Current at Milli-ampere grade can cause a reaction in persons in good health and may cause secondary risks due to involuntary reaction. Higher current can have more damaging effects. Voltage below certain limit are generally regarded as not dangerous under specified conditions. In order to provide protection against the possibility of higher voltage existed on parts which may be touched or handled by human, such parts shall be either grounded or adequately

insulated.

For parts which can be touched, two levels of protection shall be normally provided to prevent electric shock caused by a fault. Thus a single fault and any consequential fault will not create a hazard. The provision of additional protective measures, such as supplementary insulation or protective grounding, is not considered a substitute for, or a relief from, properly designed basic insulation.

Cause

Contact with parts normally at hazardous voltage.

Breakdown of insulation between parts normally at hazardous voltage and accessible parts.

Breakdown of insulation between parts normally at hazardous voltage and circuit normally at non-hazardous voltage, thereby putting accessible parts and terminals at hazardous voltage.

Touch current from parts at hazardous voltage through the human body. (Touch current can include current due to RFI filter components connected between mains supply circuit and accessible parts or terminals.)

Prevention

Prevent access to parts at hazardous voltage by fixed or locked covers, interlocks, etc. Discharge capacitors at hazardous voltage.

Either use double or reinforced insulation between parts normally at hazardous voltage and accessible parts so that breakdown is not likely to occur, or connect accessible conductive parts to protective ground so that the voltage which can develop is limited to a safe value. The insulations shall have adequate mechanical and electrical strength.

Segregate hazardous and non-hazardous voltage circuit either by double or reinforced insulation so that breakdown is not likely to occur, or by a protective grounded screen, or connect the circuit normally at non-hazardous voltage to protective ground, so that the voltage which can develop is limited to a safe value.

Limit touch current to a safe value or provide a protective grounding connection to the accessible parts.

Excessive temperatures

Requirements include to prevent injury due to excessive temperatures of accessible parts, to prevent damaging of insulation due to excessive internal temperatures, and to prevent mechanical instability due to excessive temperatures developed inside the apparatus.

Radiation

Requirements include to prevent injury due to excessive energy levels of ionizing and laser radiation, for example by limiting the radiation to non-hazardous values.

Explosion

Requirements include to prevent injury due to explosion of CRT.

Mechanical hazards

Requirements include to ensure that the apparatus and its parts have adequate mechanical strength and stability, to avoid the presence of sharp edges and to provide guarding or interlocking of dangerous moving parts.

Firing

Firing can result from

- Overload;
- Component failure;
- Insulation breakdown;
- Poor connections;
- Arcing.

Requirements include to prevent any firing which originates within the apparatus from spreading beyond the immediate vicinity of the source of the fire or from causing damage to the surroundings of the apparatus.

The following preventive measures are recommended:

- Use suitable components and sub-assemblies;
- Avoid excessive temperatures which might cause ignition under normal or fault conditions;
- Take measures to eliminate potential ignition sources such as inadequate contacts, bad connections, disconnections;
- Limit the quantity of combustible material used;
- Control the position of combustible materials in relation to potential ignition sources;
- Use materials with high resistance to fire in the vicinity of potential ignition sources;
- Use encapsulation or barriers to limit the spread of fire within the apparatus;
- Use suitable fire retardant materials for the enclosure.

Audio, video and similar electronic apparatus—Safety requirements

1 General Principles

1.1 Scope

1.1.1 This Standard applies to electronic apparatus designed to be powered from grid power supply, from power supply equipment, from battery or from remote power system and intended for reception, generation, recording or reproduction of audio, video and relevant signals. It also applies to apparatus designed to be used exclusively in combination with the above-mentioned apparatus.

This Standard primarily applies to the apparatus intended for household and similar general use but which may also be used in places of public locations such as schools, theatres, places of worship and the workplace. PROFESSIONAL APPARATUS intended for use as described above is also covered unless it is specifically within the scope of other standards.

This Standard only applies to safety aspects of the above apparatus; it does not apply to other matters, such as style or performance.

If above apparatus is designed to be connected to TELECOMMUNICATION NETWORK or similar network, for example by means of an integrated modem, this standard also applies.

Some examples of apparatus within the scope of this Standard are:

- Receiving apparatus and amplifiers for sound and/or video;
- Independent LOAD TRANSDUCERS and SOURCE TRANSDUCERS;
- Power supply equipment intended to supply other apparatus covered by the scope of this Standard;
- ELECTRONIC MUSICAL INSTRUMENTS, and the electronic accessories such as

rhythm generators, tone generators, music tuners and the like for use with electronic or non-electronic musical instruments;

- Audio and/or video educational apparatus;
- Video projectors;

NOTE 1: Film projectors, slide projectors, overhead projectors are covered by GB 4706.43 [5] ¹⁾

- Video cameras and video monitors;
- Video games and flipper games;

NOTE 2: Video and flipper games for commercial use are covered by GB 4706.69 [6]

- Juke boxes;
- Electronic gaming and scoring machines;

NOTE 3: Electronic gaming and scoring machines for commercial use are covered by GB 4706.69 [6]

- Teletext equipment;
- Recorder and optical disc players;
- Tape and optical disc recorders;
- Antenna signal converters and amplifiers;
- Antenna positioners;
- Civil-frequency-band apparatus;
- Apparatus for IMAGERY;
- Electronic light effect apparatus;
- Apparatus for use in alarm systems;
- Intercommunication apparatus, using low voltage power grid as the transmission

¹⁾ Figures in square brackets refer to the bibliography.

medium;

- Cable front-end receivers;
- Multimedia apparatus;

NOTE 4: The requirements of GB 4943.1 may also be used to meet the requirements for safety of multi-media apparatus (see also GB/T 22698 [16])

- Professional general use amplifiers, recorder or disc players, tape players, recorders, and public broadcasting systems;
- Professional sound/video systems;
- Electronic flash apparatus for photographic purposes (see Annex L).

1.1.2 This Standard applies to apparatus with a RATED SUPPLY VOLTAGE not exceeding

- 250 V a.c. single phase or d.c. supply;
- 433 V a.c. in the case of apparatus for connection to a supply other than single-phase.

1.1.3 This Standard applies to apparatus for use at altitudes not exceeding altitude 5000, primarily in dry locations and in regions with moderate or tropical climates.

For apparatus with protection against splashing water, additional requirements are given in annex A.

For apparatus to be connected to TELECOMMUNICATION NETWORKS, additional requirements are given in annex B.

For apparatus intended to be used in vehicles, ships or aircraft, or at altitudes exceeding 5000 m above sea level, additional requirements may be necessary.

NOTE: See Table A.2 of GB/T 16935.1.

Requirements, additional to those specified in this Standard, may be necessary for apparatus intended for special conditions of use.

the bottom. It is, however, permissible to have it in an area that is easily ACCESSIBLE BY HAND, for example under a lid, or on the exterior of the bottom of a PORTABLE APPARATUS or an apparatus with a mass not exceeding 7 kg, provided that the location of the marking is given in the instructions for use.

Compliance shall be checked by inspection and by rubbing the marking BY HAND for 15 s with a piece of cloth soaked with water, and, at a different place or on a second sample, for 15 s with a piece of cloth soaked with petroleum spirit. After this the marking shall still be clear and legible; it shall not be easily to be removed and they shall show no curling.

Petroleum spirit, to be used for reference purposes is defined as follows:

The petroleum spirit is an aliphatic solvent hexane having a maximum aromatics content of 0.1 % by volume, a kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry-point of approximately 69 °C and a specific mass of approximately 0.7 kg/l.

Letter symbols for quantities and units shall be in accordance with IEC 60027.

Graphical symbols shall be in accordance with GB/T 5465.2 and GB/T 16273.1, as appropriate.

Compliance shall be checked by inspection.

5.1 Identification and supply ratings

The apparatus shall be marked with the following:



(GB/T 5465.2—5036)

c) Except the output terminals of MAINS supply, other output terminals provided for supply of other apparatus shall be marked with the nominal output voltage. In addition, the maximum output current shall be marked, if temperature-rise higher than those in Table 3 may occur with the most unfavorable load, unless the terminals are marked with the type reference of the apparatus.

Socket-outlets providing MAINS power to other apparatus shall be marked with the power and current which may be drawn.

If there is only one TERMINAL provided for supply of other apparatus, the marking may be put on the apparatus at any place, taking into account the first paragraphs of clause 5.

Compliance shall be checked by inspection.

5.3 Where in a manufacturer's service documentation, for example in circuit diagrams or lists of components, a symbol shall be used to indicate that a specific component shall be replaced only by the component specified in that documentation for safety reasons, the following symbol shall be used:



(No. 129, GB/T 16273.1)

This symbol may also be put adjacent to the relevant component.

This symbol shall not be placed on components.

Compliance shall be checked by inspection.

5.4 Instructions

When information with regard to safety is required according to this Standard, this information shall be given in instructions for installation or use and supplied with the apparatus. This information shall be given in the language acceptable to the country where the apparatus is intended to be used.

DISTANCES specified in clause 13.

NOTE 3: An example of assessment of reinforced insulation is given in Figure 2.

Compliance shall be checked by inspection and/or measurement.

8.7 Void

8.8 BASIC, SUPPLEMENTARY and REINFORCED INSULATION shall each withstand the dielectric strength test as specified in 10.3.

For **DOUBLE INSULATION** either the **BASIC** or the **SUPPLEMENTARY INSULATION** shall have a thickness of at least 0.4 mm.

When it is not subject to any mechanical stress and not likely to be deformed or deteriorated under the temperatures of normal operating conditions and fault conditions, the **REINFORCED INSULATION** shall have a minimum thickness of 0.4 mm.

NOTE: Under mechanical stress conditions, the thickness may have to be increased to comply with the insulation requirements as specified in clause 10 and the mechanical strength requirements as specified in clause 12.

The above requirements are not applicable to insulation in thin sheet materials irrespective of their thickness provided that:

- It is used within the enclosure of the apparatus, and
- **BASIC** or **SUPPLEMENTARY INSULATION** comprises at least two layers of material, each of which will pass the dielectric strength test specified in 10.3 for **BASIC** or **SUPPLEMENTARY INSULATION**, or
- **BASIC** or **SUPPLEMENTARY INSULATION** comprises three layers of material for which all combinations of two layers together pass the dielectric strength test specified in 10.3 for **BASIC** or **SUPPLEMENTARY INSULATION**, or
- **REINFORCED INSULATION** comprises at least two layers of material, each of which will pass the dielectric strength test specified in 10.3 for **REINFORCED INSULATION**, or

- There is a danger of fire to the surroundings of the apparatus;
- Safety is impaired by abnormal heat developed in the apparatus.

Compliance shall be checked by the tests of 11.2.1.

During the tests, any flame inside the apparatus shall be extinguished within a period of 10 s.

During the test, solder may be soften or become fluid as long as the apparatus does not become unsafe within the sense of this Standard.

In addition, solder terminations shall not be used as a protective mechanism with the exception of solder which is intended to melt, for example that of THERMAL LINKS.

11.2.1 Measurement of temperature-rise

The apparatus shall be operated under fault conditions and the temperature-rise shall be measured after a stable state has been attained, but not later than after 4 h operation of the apparatus.

During this period, the apparatus shall meet the requirements of 11.2.2 - 11.2.6.

In the case where an applied fault condition results in the disconnection of the current before stable state has been reached, the temperature-rise are measured immediately after the disconnection.

If the temperature is limited by fuses, the following additional test is carried out if necessary in relation to the characteristic of the fuse.

The fuse-link is short-circuited during the test and the current passing through both the fuse-link and the short-circuit link under the relevant fault condition, is measured:

- If this current remains less than 2.1 times the rated current of the fuse-link, the temperatures are measured after a stable state has been attained;
- If this current reaches immediately to 2.1 times or higher than the rated current of the fuse-link, or reaches this value after a period of time equal to the maximum pre-arcing

NOTE 4: The total clearances obtained by the use of Table 9 lie between the values required for homogeneous and inhomogeneous fields. As a result, these clearances may not assure conformance with the appropriate dielectric strength test in case of fields which are substantially inhomogeneous.

NOTE 5: Use of clearance - Tables 8 and 9:

Select the appropriate column in Table 8 for the nominal a.c. mains voltage and pollution degree. Select the row appropriate to an operating voltage equal to the a.c. mains voltage. Note the minimum clearance requirement.

Go to Table 9. Select the appropriate column for the nominal a.c. mains voltage and pollution degree and choose the row in that column which covers the actual peak operating voltage. Read the additional clearance required from one of the two right-hand columns and add this to the minimum clearance from Table 8 to give the total minimum clearance.

**Table 8 – Minimum CLEARANCES for insulation in circuit CONDUCTIVELY
CONNECTED TO THE MAINS and between such circuit and circuit not
CONDUCTIVELY CONNECTED TO THE MAINS
(Applicable to below altitude 2, 000 m)**

14.3.5 Insulation between HAZARDOUS LIVE parts and ACCESSIBLE parts

14.3.5.1 Windings of CLASS II construction

The insulation between HAZARDOUS LIVE windings and ACCESSIBLE parts or parts intended to be connected to ACCESSIBLE conductive parts, for example an iron core, and the insulation between HAZARDOUS LIVE parts, for example an iron core connected to a HAZARDOUS LIVE winding, and windings intended to be connected to ACCESSIBLE conductive parts, shall consist of DOUBLE or REINFORCED INSULATION according to 8.8, except that for coil formers and partition walls providing REINFORCED INSULATION, a thickness of at least 0.4 mm without additional requirements applies.

Compliance shall be checked by inspection and measurement.

14.3.5.2 Windings of CLASS I construction

The insulation between HAZARDOUS LIVE windings and ACCESSIBLE conductive parts or parts intended to be connected to ACCESSIBLE conductive parts connected to a PROTECTIVE GROUNDING TERMINAL or contact, for example an iron core, and the insulation between HAZARDOUS LIVE parts, for example an iron core separated from a HAZARDOUS LIVE winding by functional insulation only, and winding wires or foils of protective shield-layers intended to be connected to a PROTECTIVE GROUNDING TERMINAL or contact, shall consist of BASIC INSULATION according to 8.8.

The winding wires of windings intended to be connected to a PROTECTIVE GROUNDING TERMINAL or contact shall have sufficient current-carrying capacity to ensure that, if a breakdown of insulation occur, a fuse or disconnection device will open the circuit before the winding is destroyed.

Compliance shall be checked by inspection and measurement.

14.4 High voltage components and assemblies

NOTE: For high voltage cables, reference is made to 20.1.2.

If there is no other requirement in 20.1.3, components operating at voltage exceeding 4 kV

which they are exposed during intended use.

Compliance shall be checked by inspection.

14.9.3 Moving parts liable to cause personal injury shall be so arranged or enclosed as to provide adequate protection against this danger during intended use. Protective enclosures, guards and the like shall have adequate mechanical strength. They shall not be removable BY HAND.

Compliance shall be checked by inspection and by manual test.

14.9.4 In addition, for motors having phase-shifting capacitors, three-phase motors and series motors GB 4943.1, annex B, clauses B.8, B.9 and B.10 applies.

14.10 Batteries

14.10.1 Batteries shall be so mounted that there is no risk of the accumulation of flammable gases and that the leakage of electrolyte cannot impair any insulation.

Compliance shall be checked by inspection.

14.10.2 If it is possible for the USER to replace rechargeable batteries, which can be recharged in the apparatus, by non-rechargeable batteries, special means, such as a separate charging contact on a rechargeable special battery-pack or an electronic protective circuit, shall be provided to avoid any current being supplied into the non-rechargeable batteries.

This requirement does not apply to batteries inside the apparatus, the replacement of which by the USER is not intended, for example batteries for memories.

Compliance shall be checked by inspection.

NOTE: Additional requirements regarding the instructions for use are given in 5.4.1.

14.10.3 Under normal operating conditions and under fault conditions, the following currents shall not exceed the permissible values given by the battery manufacturer.

- For rechargeable batteries, the charging current;

- For lithium batteries, the discharging current and the reverse current.

Compliance shall be checked by measurement.

Lithium batteries shall be removed from the circuit and replaced by a voltage source when measuring discharging current and by a short circuit when measuring reverse current.

14.10.4 Battery mold stress relief

A SPECIAL BATTERY, in which containment of the electrolyte is dependent upon a thermoplastic material, shall not release electrolyte due to stresses caused by the molding process if the electrolyte can contact insulation or enter into the USER serviceable compartment.

Compliance shall be checked by the following test.

The battery is to be placed in an air-circulating oven, maintained at a temperature of 70 °C, for a period of 7 h. Following the oven conditioning, the battery shall be examined for electrolyte that has been released.

14.10.5 Battery drop test

A USER-serviceable SPECIAL BATTERY shall not release electrolyte as a result of being dropped. Compliance shall be checked by the following test.

Three samples are each to be subjected to a single drop through a distance of 1 m to strike a hardwood surface as described in 15.4.3. Following the drop test, each battery is to be examined for electrolyte that has been released.

14.11 Optocouplers

Optocouplers shall comply with the constructional requirements of clause 8.

Internal and external CLEARANCES and CREEPAGE DISTANCES of optocouplers shall comply with 13.1. As an alternative, it is permitted to use 13.6 for testing jointed insulation.

14.12 Surge suppression varistors

Surge suppression varistors used in order to prevent MAINS over-voltage coming into the

apparatus shall comply with GB/T 10194.

Such components shall not be connected between parts connected to the MAINS and ACCESSIBLE conductive parts or parts connected to them, except for earthed parts of PERMANENTLY CONNECTED APPARATUS.

Reference is made to GB/T 10194 where the following requirements apply:

- preferred climatic categories (2.1.1 of GB/T 10194)
- Maximum lower temperature: -10 °C
- Minimum upper temperature: +85 °C
- Minimum duration of climatic tests: 21 days
- Maximum continuous voltage (2.1.2 of GB/T 10194)

The minimum value of the maximum continuous a.c. voltage shall be 1.2 times the RATED SUPPLY VOLTAGE of the apparatus.

- Current pulse rating (GB/T 10194, sub-clause 2.1.2)

Surge suppression varistors shall withstand a combination pulse of 6 kV/3 kA with voltage waveform of 1.2/50 μ s and current waveform of 8/20 μ s.

Compliance shall be checked by applying the group 1 test of GB/T 10194. After the test, the varistor voltage (as defined in GB/T 10194) shall not be changed by more than 10 % when measured with the manufacturer's specified current.

- Firing hazard (GB/T 10194, Table I, group 6)

The coating of surge suppression varistors shall have a flammability category V-0 or better according to GB/T 11020.

Compliance shall be checked according to GB/T 11020 or according to clause G. 1.1 of annex G.

- Thermal stress

TERMINAL or contact of the apparatus.

NOTE 3: For class I apparatus, provision for both kinds of socket-outlets and interconnection couplers is allowed on the same apparatus.

NOTE 4: Socket-outlets allowing only the connection of class II apparatus can be designed, for instance, similar to IEC 60906-1, standard sheets 3-1 or 3-2, or according to GB 17465.2, standard sheets D or H.

For apparatus with socket-outlets providing MAINS power to other apparatus, measures shall be taken to ensure that plugs or appliance inlets for the connection of the apparatus to the MAINS cannot be overloaded, if the rated current of the plug or appliance connector is less than 16 A.

NOTE 5: Marking of the socket-outlets is not considered to be a suitable measure to prevent overloading.

Conductors of internal wiring of socket-outlets providing MAINS power to other apparatus either directly or via a MAINS SWITCH shall have a nominal cross-sectional area as specified in 16.2 for external flexible cords, except where the apparatus complies with Clause 11 when 4.3.9 is applied.

Compliance shall be checked according to the relevant standards, by inspection and according to 16.2.

15.1.2 Connectors other than for connecting MAINS power, shall be so designed that the plug has such a shape that insertion into a MAINS socket-outlet or appliance coupler is unlikely to occur.

NOTE: Examples of connectors meeting this requirement are those constructed according to IEC 60130-2, IEC 60130-9 [2], IEC 60169-2 or IEC 60169-3 [3], when used as prescribed. An example of a connector not meeting the requirements of this sub-clause is the so-called "banana" plug.

Sockets for audio and video circuit of LOAD TRANSDUCERS indicated with the symbol of 5.2 b) shall be so designed, that a plug for antenna and earth, for audio and video circuit of LOAD TRANSDUCERS and SOURCE TRANSDUCERS and for data and similar circuit which are not indicated with the symbol of 5.2 b), cannot be inserted into them.

Compliance shall be checked by inspection.

15.1.3 TERMINALS and connectors used in output circuit of SUPPLY APPARATUS, of which output voltage is not a standard nominal MAINS voltage according to GB 156, Table I, shall not be compatible with those specified for household and similar general purposes, for example those described in GB 1002, GB 1003, GB 17465, GB 2099, IEC 60906.

Compliance shall be checked by inspection and by manual tests.

The TERMINAL or connector shall be designed for the loading which may appear under normal operating conditions and during intended use.

Compliance shall be checked according to GB 17465 as far as safety is concerned, for instance with regard to shock hazard and heating.

15.2 Provisions for protective grounding

ACCESSIBLE conductive parts of CLASS I apparatus, which might assume a hazardous voltage in the event of a single insulation fault in BASIC INSULATION, and the protective grounding contacts of socket-outlets shall be reliably connected to a PROTECTIVE GROUNDING TERMINAL within the apparatus.

Protective grounding circuit shall not contain switches or fuses.

Protective grounding conductors may be bare or insulated. If insulated, the insulation shall be green/yellow except in the following two cases:

- a) For grounding braids, the insulation shall be either green/yellow or transparent;
- b) For internal protective conductors in assemblies such as ribbon cables, busbars, flexible printed wiring, etc., any color may be used provided that no misinterpretation of the use of the conductor is likely to arise.

Wires identified by the color combination green/yellow shall be used only for protective grounding connections.

For PERMANENTLY CONNECTED APPARATUS and for apparatus provided with a non-detachable flexible cord or cable, a separate PROTECTIVE GROUNDING

TERMINAL shall be used, located adjacent to the MAINS TERMINALS, and shall comply with the requirements of 15.3 and, moreover, shall not serve to fix any other component.

If parts removable BY HAND have a protective grounding connection, this connection shall be made before the current-carrying connections are established when placing the part in position, and the current-carrying connections shall be separated before the protective grounding connection is interrupted when removing the part.

Conductive parts in contact with protective grounding connections shall not be subject to significant corrosion due to electrochemical action. Combinations above the line in annex F shall be avoided.

The PROTECTIVE GROUNDING TERMINAL shall be resistant to significant corrosion.

NOTE 1: Corrosion resistance may be achieved by a suitable plating or coating process.

Compliance shall be checked by inspection and by reference to the table of electro-chemical potentials in annex F.

The resistance of the connection between the PROTECTIVE GROUNDING TERMINAL or contact, and parts required to be connected thereto, shall not exceed 0.1 Ω .

Compliance shall be checked by the following test:

The test shall be carried out for 1 min with a test current of 25 A a.c. or d.c. The test voltage shall not exceed 12 V.

NOTE 2: In Canada, a 30 A test current is used.

The voltage drop between the PROTECTIVE GROUNDING TERMINAL or contact and the part to be connected thereto shall be measured and the resistance is calculated from the current and this voltage drop. The resistance of the protective grounding conductor of the power supply cord shall not be included in the resistance measurement.

NOTE 3: Care should be taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test result.

15.3 TERMINALS for external flexible cords and for permanent connection to the

replaced 10 times in the intended way.

After this test the cover shall still comply with the tests by means of the rigid test finger and the test hook described in 9.1.7 a) and b).

17.8 Detachable legs or stands supplied by the manufacturer of the apparatus shall be delivered with the relevant fixing means.

Compliance shall be checked by inspection.

17.9 Internal pluggable connections shall be so designed that unintended loosening is unlikely, if the loosening can impair the safety in the sense of this Standard.

Compliance shall be checked by inspection and in case of doubt by applying a pull of 2 N in any direction to the connection.

NOTE: For other internal connections, see 8.11.

18 Mechanical strength of CRT and anti-explosive impact

CRT shall comply with the requirements of 18.1.

18.1 General

CRT with a maximum face dimension exceeding 16 cm shall itself protect explosive impact and mechanical impact. Or the enclosure of the apparatus shall provide adequate protection against the explosive impact.

A protective film, attached to the faceplate of the CRT as part of the explosion protection system, shall be covered on all edges by the enclosure of the apparatus.

A non-intrinsically protected CRT shall be provided with an effective protective screen, which cannot be removed BY HAND. If a separate screen of glass is used, it shall not be in contact with the surface of the CRT.

Compliance shall be checked by inspection, by measurement, and by the tests of:

- For self-anti-explosive CRT, including those having integral protective screens, test specified in GB 27701 shall be executed;

- 18.3 for apparatus having non-intrinsically protected CRT.

NOTE 1: A CRT is considered to be intrinsically protected with respect to the effects of explosion if, when it is correctly mounted, no additional protection is necessary.

NOTE 2: To facilitate the tests, the tube manufacturer may indicate the most vulnerable area on the tubes to be tested.

18.2 Non-intrinsically protected CRT

The apparatus, with the picture tube and the protective screen in position, is placed on a horizontal support at a height of (75 ± 5) cm above the floor, or directly on the floor if the apparatus is obviously intended to be positioned on the floor.

The tube is made to implode inside the enclosure of the apparatus by the method described in following test methods.

An area on the side or on the face of each tube is scratched (see Figure 12) with a diamond stylus and this place is repeatedly cooled with liquid nitrogen or the like until a fracture occurs. To prevent the cooling liquid from flowing away from the test area, a dam of modelling clay or the like should be used.

After this test, no particles having a mass exceeding 2 g shall have passed a 25 cm high barrier, placed on the floor, 50 cm from the projection of the front of the apparatus, and no particle shall have passed a similar barrier at 200 cm.

19 Stability and mechanical hazards

Apparatus having a mass of 7 kg or more shall have adequate stability. In addition, the stability shall be ensured when legs, carts or stands supplied or recommended by the manufacturer are fitted.

Compliance shall be checked by the tests of 19.1, 19.2 and 19.3.

Apparatus intended to be fastened in place is not required to be subjected to these tests, and the test of 19.3 applies only to

inspection shall show that water, which may have entered the apparatus, does not cause any damage in the sense of this Standard; in particular, there shall be no trace of water on insulations for which CREEPAGE DISTANCES are specified.

A.10.2.2 Humidity treatment

Sub-clause 10.2 applies, except that the duration of the test is seven days (168 h).

The specimens are stored for 2 h in an oven at a temperature of $(100 \pm 2) ^\circ\text{C}$.

Clause 11 - Evaluation of test results

The existing text is replaced by the following:

After the first application of the test flame, the test specimen shall not be consumed completely. After any application of the test flame, any self-sustaining flame shall extinguish within 30 s. No burning of the tissue paper shall occur and the board shall not scorch.

G.1.3 If flammability category V-2 according to GB/T 11020 is required, in addition, the following applies with regard to GB/T 5169.5.

Clause 7 - Severities

The values of duration of application of the test flame are as follows:

The test flame is applied for 10 s. If a self-sustaining flame does not last longer than 30 s, the test flame is applied again for 1 min at the same point or at any other point. If again a self-sustaining flame does not last longer than 30 s, the test flame is then applied for 2 min at the same point or at any other point.

Clause 11 - Evaluation of test results

The existing text is replaced by the following:

After the first application of the test flame, the test specimen shall not be consumed completely.

After any application of the test flame, any self-sustaining flame shall extinguish within 30 s.

G.1.4 If flammability category HB75 or HB40 according to GB/T 11020 is required, the following applies with regard to GB/T 5169.16.

Three specimens, 125 mm $\pm$ 5 mm in length by 13 mm $\pm$ 0.5 mm in width, cut from the thinnest part to be tested, are subjected to the burning test as described in GB/T 5169.16,

clause 8, Test method A.

The material shall be classified HB75 or HB40 respectively as described in 8.4 of GB/T 5169.16.

G.2 Compliance of cables and insulation of wires is checked according to GB/T 5169.5.

For the purpose of this Standard, the following applies with regard to GB/T 5169.5.

Clause 7 - Severities

The values of duration of the application of the test flame are as follows:

- First specimen: 10 s
- Second specimen: 60 s
- Third specimen: 120 s

Clause 9 - Test procedure

- Add the following to 9.2:

The burner is supported so that its axis is in an angle of 45° to the vertical. The cable or wire is held in an angle of 45° to the vertical, its axis being in a vertical plane perpendicular to the vertical plane containing the axis of the burner.

- Sub-clause 9.3 is replaced by the following:

The test is made on three specimens taken from each type of cable or wire as used in the apparatus, for example with additional screening and sleeves.

Clause 10 - Observations and measurements

The second paragraph is replaced by the following:

Duration of the burning denotes the time interval from the moment the test flame is removed until any flame has extinguished.

Clause 11 - Evaluation of the results

The existing text is replaced by the following:

During the test, any burning of the insulating materials shall be steady and shall not spread appreciably. Any flame shall self-extinguish in 30 s from the removal of the test flame.

G.3 A barrier shall comply with the following requirements.

Three specimens are subjected to the following tests:

1) In case of a non-metallic barrier, each test specimen is fixed horizontally and a needle flame as specified in GB/T 5169.5 is applied from below with an angle of 45°.

The top of the flame shall be:

- a) Applied to the barrier as used in the appliance, at a location likely to become ignited because of its actual proximity and distance to the potential ignition source or
- b) Applied to a sample plate with the same thickness and made of the same material, touching the undersurface of this sample plate in the middle.

The flame shall be applied for 60 s in the same position.

The needle flame shall not penetrate the test specimen and after the application there shall be no hole in the test specimen.

No failure is allowed.

2) In case of openings in a barrier regardless of its material, the requirements shown in Figure 13 apply, unless it is not possible for the needle flame as specified in GB/T 5169.5 to penetrate the barrier.

Compliance is tested according to 1) above. After the test there shall be no change with regard to the openings in the barrier. No failure is allowed.

L.5 Marking and instructions

Add the following to 5.4, after Note 2:

L.5.4 Battery chargers and supply apparatus shall be accompanied by an instruction leaflet in which shall be indicated the type or model number of flash apparatus with which they are to be used.

The flash apparatus shall be accompanied by an instruction leaflet in which shall be indicated the type or model number of supply apparatus or battery charger with which it is to be used.

NOTE: It is also permitted to give this information on the apparatus themselves.

Compliance shall be checked by inspection.

L.7 Heating under normal operating conditions

Add the following to 7.1.5 after the first paragraph:

L.7.1.5 Lithium batteries shall meet the permissible temperature-rise in Table 3, "Normal operating conditions", unless such batteries comply with the applicable electrical tests of 6.2.2.1 or 6.2.2.2 of GB 8897.4.

L.9 Electric shock hazard under normal operating conditions

Add the following to 9.1.1 after Note 1:

L.9.1.1 terminals for the connection to the synchronizer of the camera shall not be HAZARDOUS LIVE.

Add the following to 9.1.1.1 after the first paragraph:

L.9.1.1.1 If possible, flashing is made during the measurements.

L.10 Insulation requirements

Add the following to 10.3.2 directly before Table 5:

L.10.3.2 In the case of apparatus with high frequency pulse ignition, the ignition pulse is

ignored in computing the test voltage if the duration of the pulse does not exceed 1 ms.

L.11 Fault conditions

Add the following to 11.2.6 after the first paragraph:

L.11.2.6 Lithium batteries shall meet the permissible temperature-rise in Table 3, “Fault conditions”, unless such batteries comply with all electrical tests of 6.3.2 of GB 8897.4.

L.12 Mechanical strength

Add the following after the fourth paragraph of 12.1.3:

L.12.1.3 Windows for flash tubes are excluded from the steel ball impact test.

L.14 Components

Add the following sub-clause at the end of 14.6:

L.14.6.6 Furthermore, for mains switches, the characteristics of the switch, with reference to the marking, shall be appropriate for the function of the switch in the apparatus under normal conditions.

Compliance shall be checked by inspection and by measurement.

The rated MAINS current of a flash apparatus is determined by the following formula:

$$I_r = 1/3 \sqrt{\hat{I}_0^2 + \hat{I}_0 \hat{I}_1 + \hat{I}_1^2}$$

Where

$\hat{I}_0$ is the maximum MAINS current (peak value) immediately after a flash has been made.

$\hat{I}_1$ is the MAINS current (peak value) at the end of the re-charge period of the flash capacitor.

The end of the re-charge period is determined by the indicator or, if there is no indicator, by the measured voltage on the flash capacitor, which shall be 85 % of the maximum peak

voltage, the apparatus supplied at its RATED SUPPLY VOLTAGE.

The apparatus is operated under normal operating conditions except that the apparatus is connected to its RATED SUPPLY VOLTAGE.

$\hat{I}_0$ and $\hat{I}_1$ are measured when the apparatus is ready for flash operation and has been connected to the MAINS supply for at least 30 min.

The peak surge current is the maximum peak value of the MAINS current when the flash apparatus is switched on, after the flash capacitor has been discharged completely. Current spikes up to 100 μ s duration are disregarded.

The measured peak surge current and calculated rated MAINS current (I_r) shall not exceed the marked current rating of the MAINS SWITCH.

L.20 Resistance to fire

Add the following to 20.1:

L.20.1 c) A trigger coil circuit for discharge purposes in a flash apparatus is not considered to be a POTENTIAL IGNITION SOURCE.

Annex M

(Informative)

Examples of requirements for quality control program

NOTE: This annex gives examples of requirements for quality control program as specified in 13.3 and annex J for reduced CLEARANCES.

M.1 Reduced CLEARANCES (see 13.3)

A manufacturer wishing to use reduced CLEARANCES permitted by 13.3 and annex J should implement a quality control program for those features of the construction listed in Table M.1. This program should include specific quality controls for the tools and materials that affect CLEARANCES.

The manufacturer should also identify and plan the protection and, where applicable, installation processes which directly affect quality and should ensure that these processes are carried out under controlled conditions. Controlled conditions should include the following:

- Documented work instructions defining process, apparatus, environment, and manner of production where the absence of such instructions would adversely affect quality, suitable working environment, compliance with reference standards or specifications and quality plans;
- Monitoring and control of suitable processes and product characteristics during production and installation in the apparatus;
- Criteria for workmanship stipulated to the extent necessary in written specifications or by means of representative samples;
- Records maintained for qualified processes, apparatus and personnel as appropriate.

Table M.1 provides the sampling plan for attributes and tests necessary to conform to the requirements of 13.3 and annex J. The number of samples of production parts or assemblies should be based on IEC 60410 [7] or GB/T 2828.1 [20] or equivalent national

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