



IEC60065

AUDIO, VIDEO AND SIMILAR ELECTRONIC APPARATUS – SAFETY REQUIREMENTS

音频、视频及类似电子设备 安全要求

FOREWORD 前言

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to **promote** international **co-operation** on all questions **concerning** standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is **entrusted** to technical committees; any IEC National Committee interested in the subject dealt with may participate in this **preparatory** work. International, governmental and non-governmental organizations **liaising with** the IEC also participate in this preparation. The IEC **collaborates closely with** the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

国际电工委员会是由各国家电工委员会(IEC国家委员会)组成的世界性标准化组织,其目的是促进电工电子领域标准化问题的国际合作。为此目的,除其它活动外,IEC发布国际标准。国际标准的制定/撰写由技术委员会承担,对所涉及内容关切的任何IEC(成员的)国家委员会均可参加标准的制定工作,与IEC有联系的任何国际、政府和非官方组织也可以参加国际标准的制定。IEC与国际标准化组织ISO根据两组织间协商确定的条件保持密切的合作关系。

2) The **formal** decisions or agreements of the IEC on technical matters express, as nearly as possible, an international **consensus of opinion** on the relevant subjects since each technical committee has representation from all interested National Committees.

IEC在技术问题上的正式决议或协议,是由对这些问题特别关切的国家委员会参加的技术委员会制定的,对所涉及的问题尽可能地代表了国际上的一致意见。

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

这些决议或协议以标准、技术报告或导则的形式发布,以推荐的形式供国际上使用,并在此意义上,为各国家委员会所认可。

4) In order to promote international **unification**, IEC National Committees **undertake** to apply IEC International Standards **transparently to the maximum extent possible** in their national and regional standards. Any **divergence** between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

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需要引起注意的是本国际标准的部分条款可能属专利,IEC不负责确认这些专利权。

International Standard IEC 60065 has been prepared by IEC technical committee 92: Safety of audio, video and similar electronic equipment.

国际标准IEC60065是由IEC/TC92“音频、视频及类似电子设备的安全”技术委员会制定的。

This sixth edition cancels and replaces the fifth edition published in 1985, its amendments 1 (1987), 2 (1989) and 3 (1992). This edition constitutes a technical revision.

本第六版标准取消并代替1985年出版的第五版标准及其修订件1(1987),修订件2(1989)和修订件3(1992)。本版包含有技术修订。

It has the status of a group safety publication in accordance with IEC Guide 104.

本标准具有符合IEC104导则规定的门类安全出版物的性质。

The text of this standard is based on the following documents: 本标准的正文以下列文件为依据

FDIS	Report on voting 投票报告
92/60/FDIS	92/61/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table. 投票赞成本标准的详细资料可查阅上表列出的投票报告。

In this standard, the following print types are used: 在本标准中,使用下列打印字体

– requirements proper: roman type 正文要求: 正体(罗马字体)

– test specifications: italic type 试验规程: 斜体

– NOTES: smaller roman type 备注: 小正体字

For terms defined in clause 2, SMALL CAPITALS are used. 在第2章的术语定义中,使用小一号大写字母。

Annexes A, B, C, D, E, F and G form an integral part of this standard.

附录A、B、C、D、E、F和附录G构成本标准整体的一部分。

Annexes N and P are for information only. 附录N和附录P只作为提示的附录。



INTRODUCTION 引言 Principles of safety 安全原则

General 总则

This introduction is intended to provide an appreciation of the principles on which the requirements of this standard are based. Such an understanding is essential in order that safe apparatus can be designed and manufactured.

此引言旨在介绍本标准的要求所依据的原则，理解这些原则对设计和生产安全的设备是很有必要的。

The requirements of this standard are intended to provide protection to persons as well as to the surroundings of the apparatus.

本标准的要求旨在提供对人身的保护和设备周围的保护。

Attention is drawn to the principle that the requirements, which are standardized, are the minimum considered necessary to establish a satisfactory level of safety.

需要注意的原则是，这些标准化的要求是建立满意的安全等级所考虑的最基本的要求。

Further development in techniques and technologies may entail the need for future modification of this standard. 随着技术和工艺的进一步发展，必然会要求进一步修订本标准。

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.

注：“对设备周围的保护”是指这种保护还应包括设备在预期使用时对所处自然环境的保护，要考虑设备的寿命周期，即制造、使用、维修、处理和设备寿命终了后可能的再循环利用。

Hazards 危险

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

应用本标准的目的在于避免由于下列各种危险所造成的人身伤害或财产损失

- electric shock; 触电
- excessive temperatures; 过高温度
- radiation; 辐射
- implosion; 爆炸
- mechanical hazards; 机械危险
- fire. 着火

Electric shock 触电

Electric shock is due to current passing through the human body. Currents of the order of a milliampere can cause a reaction in persons in good health and may cause secondary risks due to involuntary reaction. Higher currents can have more damaging effects. Voltages below certain limits are generally regarded as not dangerous under specified conditions. In order to provide protection against the possibility of higher voltages appearing on parts which may be touched or handled, such parts are either earthed or adequately insulated.

触电是由于电流通过人体而造成的。只要毫安级的电流就能在健康人体内产生反应，而且可能会由于不知不觉的反应导致间接的危害；更高的电流会对人体产生更大的危害。在特定条件下，低于某些限值的电压一般不认为是危险电压。为了对可以接触或操作的部件上可能出现的较高电压提供防护，应将这样的部件接地或充分绝缘。

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

对可触及的零部件，一般应提供双重保护以避免故障引起的触电。这样，单一故障和任何由此引起的故障都不会产生危险。附加保护措施，如附加绝缘或保护接地，不能取代设计完备的基本绝缘，或降低对基本绝缘的要求。

Cause 起因	Prevention 防护措施
Contacts with parts normally at hazardous voltage. 接触正常情况下带危险电压的零部件	Prevent access to parts at hazardous voltage by fixed or locked covers, interlocks, etc. Discharge capacitors at hazardous voltages. 用固定的或锁紧的盖，连锁装置等防止接触带危险电压的零部件；使带危险电压的电容器放电
Breakdown of insulation between parts normally at hazardous voltage and accessible parts	Either use double or reinforced insulation between parts normally at hazardous voltages and accessible parts so that breakdown is not likely to occur, or connect accessible conductive parts to protective earth so that the voltage which can develop is limited to a safe value. The insulations shall



<p>正常情况下带危险电压的零部件和可触及的导电零部件之间的绝缘被击穿</p>	<p>have adequate mechanical and electrical strength. 正常情况下带危险电压的零部件与可触及的导电零部件之间采用双重绝缘或加强绝缘,以便使其绝缘不会被击穿,或把可触及的导电零部件与保护地相连,以便使该导电零部件上可能出现的电压限制在安全值以内。使用的绝缘应有足够的机械强度和电气强度。</p>
<p>Breakdown of insulation between parts normally at hazardous voltage and circuits Normally at non-hazardous voltages, thereby putting accessible parts and terminals at hazardous voltage. 正常情况下带危险电压的零部件与带非危险电压的电路之间的绝缘被击穿,从而使可触及的零部件和端子带上危险电压。</p>	<p>Segregate hazardous and non-hazardous voltage circuits either by double or reinforced insulation so that breakdown is not likely to occur, or by a protective earthed screen, or connect the circuit normally at nonhazardous voltage to protective earth, so that the voltage which can develop is limited to a safe value. 将带危险电压的电路和带非危险电压的电路用双重绝缘或加强绝缘隔开,使绝缘不会被击穿,或用保护接地屏蔽隔开,或把正常情况下不带危险电压的电路和保护地相连,以便使可能出现的电压限制在安全值以内。</p>
<p>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 circuits and accessible parts or terminals.) 从带危险电压的零部件流过人体的接触电流 (接触电流包括由于连接在电网电源电路和可触及件或端子之间的 RFI 滤波元件产生的电流)。</p>	<p>Limit touch current to a safe value or provide protective earth connection to the accessible parts. 把接触电流限制在安全值内或将可触及件与保护接地相连。</p>

Excessive temperatures 过高温度

Requirements are included 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.

要求包括避免由于可触及件温度过高而引起的伤害,避免由于内部过高温度而引起的绝缘损坏,以及避免由于设备内部产生的过高温度而引起的机械不稳定性。

Radiation 辐射

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

要求包括避免由于过高的电离辐射和激光辐射能量等级引起的伤害,例如把辐射限制在非危险值以内。

Implosion 爆炸

Requirements are included to prevent injury due to implosion of picture tubes.

要求包括避免由于显像管的爆炸而引起的伤害。

Mechanical hazards 机械危险

Requirements are included 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.

要求包括确保设备和其零部件有足够的机械强度和稳定性,避免出现尖锐边缘,并对危险的运动部件提供防护或联锁装置。

Fire 着火

A fire can result from: 着火可能由于下列原因引起

- overloads; 过载
- component failure; 元器件失效
- insulation breakdown; 绝缘击穿
- bad connections; 接触不良
- arcing. 起弧

Requirements are included to prevent any fire 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.



PHILIPS

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要求包括避免设备内部产生的火焰蔓延到着火源近区以外的区域，或避免对设备的周围造成损害。

The following preventive measures are recommended: 推荐使用下列防护措施

- the use of suitable components and subassemblies; 使用适当的元器件和组件
- the avoidance of excessive temperatures which might cause ignition under normal or fault conditions;
防止在正常工作条件下或故障条件下产生可能引燃的过高温度
- the use of measures to eliminate potential ignition sources such as inadequate contacts, bad connections, interruptions; 采取措施以消除潜在的引燃源，如接触不充分、接触不良、断路。
- the limitation of the quantity of combustible material used; 限制易燃材料的用量
- the control of the position of combustible materials in relation to potential ignition sources;
控制易燃材料与可能的引燃源的相对位置
- the use of materials with high resistance to fire in the vicinity of potential ignition sources;
在可能的引燃源邻近使用高阻燃的材料
- the use of encapsulation or barriers to limit the spread of fire within the apparatus;
使用封装盒或挡板限制设备内火焰的蔓延
- the use of suitable fire retardant materials for the enclosure. 外壳使用适当的阻燃材料



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AUDIO, VIDEO AND SIMILAR ELECTRONIC APPARATUS – SAFETY REQUIREMENTS

1 General 总则

1.1 Scope 范围

1.1.1 This International Standard applies to electronic apparatus designed to be fed from the MAINS or from a SUPPLY APPARATUS and intended for reception, generation, recording or reproduction respectively of audio, video and associated signals. It also applies to apparatus designed to be used exclusively in combination with the above mentioned apparatus. This standard concerns only safety aspects of the above apparatus; it does not concern other matters, such as style or performance.

本标准适用于设计成由电网电源或电源设备供电的，预定用来分别接收、产生、录制或重放音频、视频和有关信号的设备，也适用于设计成专门与上述设备组合使用的设备。本标准仅涉及上述设备的安全而不涉及其他特性，如式样或性能。

For above-mentioned apparatus, which are fed from a supply source other than the MAINS or from a SUPPLY APPARATUS, and which contain a LASER SYSTEM or produce an internal OPERATING VOLTAGE greater than 4 000 V (peak), this standard applies as far as applicable.

对于上述涉及的由非电网电源或电源设备供电的，内含激光系统或内部工作电压大于4000V（峰值）的设备，只要适用，均可采用本标准。

NOTE 1 – In Australia, Canada, Denmark, Japan, Rumania, South Africa, United States of America and United Kingdom this standard is, where relevant, used as a guide for the testing of battery operated apparatus.

注1: 在澳大利亚、加拿大、丹麦、日本、罗马尼亚、南非、美国和英国，使用本标准的有关部分作为电池供电设备的测试指南。

This standard applies to the above-mentioned apparatus, if it is designed to be connected to the TELECOMMUNICATION NETWORK or similar network, for example by means of an integrated modem.

本标准适用于设计成诸如通过一集成的调制解调器连接到通信网络或类似网络的上述设备。

Some examples of apparatus within the scope of this standard are: 属于本标准范围内的设备举例如下:

- receiving apparatus and amplifiers for sound and/or vision; 声音和/或图像的接收设备和放大器
- independent LOAD TRANSDUCERS and SOURCE TRANSDUCERS; 独立负载换能器和源换能器
- SUPPLY APPARATUS intended to supply other apparatus covered by the scope of this standard; 预定为本标准范围内的其他设备供电的电源设备
- ELECTRONIC MUSICAL INSTRUMENTS, and electronic accessories such as rhythm generators, tone generators, music tuners and the like for use with electronic or non-electronic musical instruments; 电子乐器和与电子或非电子乐器连用的电子辅助设备，如节拍发生器、音调发生器、音乐调谐器以及类似设备
- audio and/or video educational apparatus; 音频和视频教学设备
- video projectors; 视频投影机
- video cameras and video monitors, 视频摄像机和视频监视器
- video games and flipper games; 视频游戏机和升降装置游戏机

NOTE 2 – Video and flipper games for commercial use are covered by IEC 60335-2-82 [7]*

注2: 商业用途的视频和升降装置游戏机包括在IEC 60335-2-82 [7]中

- juke boxes; 投币式自动电唱机
- electronic gaming and scoring machines; 电子博彩和评分机

NOTE 3 – Electronic gaming and scoring machines for commercial use are covered by IEC 60335-2-82 [7]

注3: 商业用途的电子博彩和评分机包括在IEC 60335-2-82 [7]中

- teletext equipment; 电报设备
- record and optical disc players; 电唱机和光盘机
- tape and optical disc recorders; 磁带录放机和光盘刻录机
- antenna signal converters and amplifiers; 天线信号转换器和放大器
- antenna positioners; 天线定位器
- Citizen's Band apparatus; 民用频段设备
- apparatus for IMAGERY; 成像设备
- light effect apparatus; 光效果设备
- intercommunication apparatus, using low voltage MAINS as the transmission medium.
使用低压电网作为传输媒质的相互通信设备。

* Figures in square brackets refer to the bibliography given in annex P. 方括号中的数字表示附录P中给出的参考文献

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

本标准适用于额定电源电压不超过下列数值的设备

- 250 V a.c. single phase or d.c. supply; 单相交流电源250V或直流电源250V



– 433 V a.c. in the case of apparatus for connection to a supply other than single phase.

对连接到非单相电源的设备为交流433V

1.1.3 This standard applies to apparatus for use at altitudes not exceeding 2 000 m above sea level, primarily in dry locations and in regions with moderate or tropical climates.

本标准适用于海拔高度为2000米以下，主要在干燥地区和温带或热带气候下使用的设备

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

防水溅设备的补充要求见附录A

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

预定要与通信网络连接的设备的补充要求见附录B

For apparatus intended to be used in vehicles, ships or aircraft, or at altitudes exceeding 2 000 m above sea level, additional requirements may be necessary.

预定在车辆、船舶或飞机上使用或在海拔高度2000米以上使用的设备，可能需要有附加要求

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

预定在特殊条件下使用的设备，除本标准规定的要求外，可能还需要有附加要求

1.1.4 For apparatus designed to be fed from the MAINS, this standard applies to apparatus intended to be connected to a MAINS supply with transient overvoltages not exceeding overvoltage category II according to IEC 60664-1.

对预定由电网电源供电的设备，本标准适用于预定与瞬态过电压不超过IEC 60664-1（GB16935.1）对过电压类别II的规定值的电网电源相连的设备。

For apparatus subject to transient overvoltages exceeding those for overvoltage category II, additional protection may be necessary in the MAINS supply of the apparatus.

对于要承受瞬态过电压超过电压类别II的规定值的设备，设备的电网电源可能需要附加的保护。

1.1.5 This standard does not apply to the following apparatus, except where this standard is referenced in the relevant standard: 本标准不适用于下列设备，除非相关标准引用本标准

– apparatus falling within the scope of IEC 60950; 在IEC60950（GB4943）范围内的设备

– dictation apparatus; 听写设备

– projectors not mentioned in 1.1.1, for example film projectors, slide projectors, overhead projectors, epidiascopes. (See IEC 60335-2-56 [6].)

1.1.1未提到的投影机，如电影投影机、幻灯机、悬吊投影机、实物幻灯机（见IEC 60335-2-56 [6]）。

1.2 Normative references 引用标准

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

下列标准所包含的条文，通过在本标准中的引用而构成为本标准的条文。本标准出版时，所示版本均为有效。所有标准都会被修订，使用本标准的各方应探讨使用下列标准最新版本的可能性。

IEC 60027 (all parts), Letter symbols to be used in electrical technology

（所有部分）电气技术用字母符合

IEC 60038:1983, IEC standard voltages

GB156 – 1993 标准电压

IEC 60068-2-3:1969, Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state

GB/T2423.3-1993 电工电子产品基本环境试验规程 – 试验Ca: 恒定湿热试验方法

IEC 60068-2-6:1995, Environmental testing – Part 2: Tests -Test Fc: Vibration (sinusoidal)

GB/T2423.10-1995 电工电子产品环境试验 第二部分: 试验方法 试验Fc和导则: 振动(正弦)

IEC 60068-2-32:1975, Environmental testing – Part 2: Tests – Test Ed: Free fall (Procedure 1)

GB/T2423.8-1995 电工电子产品环境试验 第二部分: 试验方法 试验Ed: 自由跌落

IEC 60068-2-75:1997, Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests

环境试验 第2-75部分: 试验 试验Eh: 冲击锤试验

IEC 60085:1984, Thermal evaluation and classification of electrical insulation

GB/T11021-1989 电气绝缘的耐热性评定和分级

IEC 60112:1979, Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions

GB/T4207-1984 固体绝缘材料在潮湿条件下相比漏电起痕指数和耐漏电起痕指数的测定方法

IEC 60127 (all parts), Miniature fuses

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- IEC 60227 (all parts), Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V
[GB5023](#) (所有部分) 额定电压450/750 V及以下聚氯乙烯绝缘电缆
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2 Definitions 定义

For the purpose of this International Standard, the following definitions apply. 本标准采用下列定义。

2.1 Definitions in alphabetical order 定义按对应的英文字母顺序

	Subclause 条款
ACCESSIBLE 可触及	2.8.3
ALL-POLE MAINS SWITCH 全极电源开关	2.7.11
AUDIO AMPLIFIER 音频放大器	2.2.1
AVAILABLE POWER 可获得功率	2.3.7
BASIC INSULATION 基本绝缘	2.6.3
BY HAND 手动	2.8.4
CLASS I I类	2.6.1
CLASS II II类.....	2.6.2
CLEARANCE 电气间隙	2.6.11
CONDUCTIVELY CONNECTED TO THE MAINS 与电网电源导电连接	2.4.4
CONDUCTIVE PATTERN 导电图形	2.7.13
CREEPAGE DISTANCE 爬电距离	2.6.12
DIRECTLY CONNECTED TO THE MAINS 与电网电源直接连接	2.4.3
DOUBLE INSULATION 双重绝缘	2.6.4
ELECTRONIC MUSICAL INSTRUMENT 电子乐器	2.2.2
FIRE ENCLOSURE 防火防护外壳	2.8.10



HAZARDOUS LIVE 危险带电.....	2.6.10
IMAGERY 成像.....	2.2.8
INSTRUCTED PERSON 经过指导的人员.....	2.8.6
ISOLATING TRANSFORMER 隔离变压器.....	2.7.1
LASER 激光器.....	2.2.7
LASER SYSTEM 激光系统.....	2.2.6
LOAD TRANSDUCER 负载换能器.....	2.5.4
MAINS 电网电源.....	2.4.1
MANUALLY OPERATED MECHANICAL SWITCH 手动机械开关.....	2.7.10
MICRO-DISCONNECTION 微断开.....	2.7.7
NOISE SIGNAL 噪声信号.....	2.5.2
NON-CLIPPED OUTPUT POWER 非削波输出功率.....	2.3.4
OPERATING VOLTAGE 工作电压.....	2.3.2
PERMANENTLY CONNECTED APPARATUS 永久连接式设备.....	2.4.2
PINK NOISE 粉红噪声.....	2.5.1
PORTABLE APPARATUS 便携式设备.....	2.2.10
POTENTIAL IGNITION SOURCE 潜在引燃源.....	2.8.11
PRINTED BOARD 印制板.....	2.7.12
PROTECTIVE EARTH TERMINAL 保护接地端子.....	2.4.6
PROTECTIVE SCREENING 保护屏蔽.....	2.6.8
PROTECTIVE SEPARATION 保护隔离.....	2.6.7
PTC-S THERMISTOR PTC-S热敏电阻器.....	2.7.8
RATED CURRENT CONSUMPTION 额定消耗电流.....	2.3.6
RATED LOAD IMPEDANCE 额定负载阻抗.....	2.3.5
RATED SUPPLY VOLTAGE 额定电源电压.....	2.3.1
REINFORCED INSULATION 加强绝缘.....	2.6.6
REMOTE CONTROL 遥控.....	2.2.9
RIPPLE FREE 无纹波.....	2.3.3
ROUTINE TEST 例行检验.....	2.8.2
SAFETY INTERLOCK 安全联锁装置.....	2.7.9
SEPARATING TRANSFORMER 分离变压器.....	2.7.2
SKILLED PERSON 技术人员.....	2.8.5
SOURCE TRANSDUCER 源换能器.....	2.5.3
SPECIAL SUPPLY APPARATUS 专用电源设备.....	2.2.5
STAND-BY 待机.....	2.8.8
SUPPLEMENTARY INSULATION 附加绝缘.....	2.6.5
SUPPLY APPARATUS 电源设备.....	2.2.3
SUPPLY APPARATUS FOR GENERAL USE 通用电源设备.....	2.2.4
TELECOMMUNICATION NETWORK 通信网络.....	2.4.7
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THERMAL CUT-OUT 热断路器.....	2.7.4
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TOUCH CURRENT 接触电流.....	2.6.9
TRANSPORTABLE APPARATUS 移动式设备.....	2.2.11
TRIP-FREE 自动脱扣.....	2.7.6
TYPE TEST 型式试验.....	2.8.1
USER 用户.....	2.8.7



WOOD-BASED MATERIAL 木制基材..... 2.8.9

2.2 Types of apparatus 设备的类型

2.2.1 AUDIO AMPLIFIER 音频放大器

either an independent audio signal amplifying apparatus or the audio signal amplifying part of an apparatus to which this standard applies 一种独立的音频信号放大设备或本标准所适用的某种设备的音频信号放大部分。

2.2.2 ELECTRONIC MUSICAL INSTRUMENT 电子乐器

electronic apparatus such as an electronic organ, electronic piano or music synthesizer that produces music under the control of the player 在弹奏者操作下产生音乐的电子设备，如：电风琴、电子钢琴或电子音乐合成器。

2.2.3 SUPPLY APPARATUS 电源设备

apparatus which takes power from the MAINS and from which one or more other apparatus are fed 从电网电源吸取能量，并由它给一个或多个设备供电的设备。

2.2.4 SUPPLY APPARATUS FOR GENERAL USE 通用电源设备

SUPPLY APPARATUS which can be used without special measures not only for the supply of apparatus within the scope of this standard, but also for the supply of other appliances or devices, for example pocket-calculators 无需采用特殊的方法就能使用的、不仅能给本标准范围内的设备供电，而且也能给其他设备或装置，如袖珍计算器供电的电源设备。

2.2.5 SPECIAL SUPPLY APPARATUS 专用电源设备

SUPPLY APPARATUS which is designed to be used only for the supply of specified apparatus within the scope of this standard 设计成只用于给本标准范围内的设备供电的电源设备。

2.2.6 LASER SYSTEM 激光系统

LASER in combination with an appropriate laser energy source with or without additional incorporated components (see 3.44 of IEC 60825-1)

激光器与相适应的带或不带其他组合元件（见GB7247.1-2001的3.44）的激光能源的组合。

2.2.7 LASER 激光器

device which can be made to produce or amplify electromagnetic radiation in the wavelength range from 180 nm to 1 mm primarily by the process of controlled stimulated emission (see 3.36 of IEC 60825-1)

主要通过受控激光发射技术（见GB7247.1-2001的3.36）能使其产生或放大波长180 nm至1 mm范围的电磁辐射的装置。

2.2.8 IMAGERY 成像

processing, editing, manipulation and/or storing of video signals 设计、编辑、处理和/或存储视频信号。

2.2.9 REMOTE CONTROL 遥控

controlling of an apparatus from a distance, for example mechanically, electrically, acoustically or by means of radiation 采用诸如机械、电气、声音或辐射的方法从一定距离处对设备进行的控制。

2.2.10 PORTABLE APPARATUS 便携式设备

specific apparatus designed to be carried easily BY HAND, the mass of which does not exceed 18 kg 设计成便于用手携带、其质量不超过18 kg的特定设备。

2.2.11 TRANSPORTABLE APPARATUS 移动式设备

apparatus specifically designed to be moved frequently from place to place 专门设计成可以频繁地从一个地方移动到另一个地方的设备。

2.3 Ratings and electrical values 额定值和电压值

2.3.1 RATED SUPPLY VOLTAGE 额定电源电压

supply voltage or voltage range (for three-phase supply, the line-to-line voltage) for which the manufacturer has designed the apparatus 制造厂商设计设备时规定使用的电源电压或电压范围（对三相电源是指相线间的电压）。

2.3.2 OPERATING VOLTAGE 工作电压

highest voltage, non-repetitive transients being disregarded, to which the insulation under consideration is, or can be subjected when the apparatus is operating at its RATED SUPPLY VOLTAGE under normal operating conditions 正常工作条件下，设备在其额定电源电压下工作时，所考虑的绝缘上承受的或能承受的最高电压，不考虑非重复性瞬态值。

2.3.3 RIPPLE FREE 无纹波

d.c. voltage with a r.m.s. value of a ripple content of not more than 10 % of the d.c. component. The maximum peak voltage does not exceed 140 V for a nominal 120 V ripple free d.c. system, and does not exceed 70 V for a nominal 60 V ripple free d.c. system 纹波分量有效值不大于直流分量10%的直流电压。对标称值为120 V的无纹波直流系统，最高峰值电压不超过140 V，对标称电压为60 V的无纹波直流系统，最高峰值电压不超过70 V。

2.3.4 NON-CLIPPED OUTPUT POWER 非削波输出功率

sine-wave power dissipated in the RATED LOAD IMPEDANCE, measured at 1 000 Hz at the onset of clipping on either one, or both peaks.



在1 000 Hz频率下，在任意一个或两个波峰刚要削波时测得的消耗在额定负载阻抗上的正弦波功率

In cases where an amplifier is not intended for operation at 1 000 Hz, a test frequency at the peak response shall be used 如果放大器预定不在1 000 Hz下工作，则试验频率应使用在引起峰值响应时的频率。

2.3.5 RATED LOAD IMPEDANCE 额定负载阻抗

resistance, specified by the manufacturer, by which an output circuit should be terminated 由制造厂商规定的，其输出电路应端接的电阻器。

2.3.6 RATED CURRENT CONSUMPTION 额定消耗电流

current consumption of an apparatus operating at its RATED SUPPLY VOLTAGE under normal operating conditions 正常工作条件下，设备在额定电源电压下工作时的消耗电流。

2.3.7 AVAILABLE POWER 可获得功率

maximum power which can be drawn from the supplying circuit through a resistive load whose value is chosen to maximise the power for more than 2 min when the circuit supplied is disconnected (see figure 1)

当断开被供电电路时（见图1），通过调节阻性负载使阻性负载从供电电路上得到的持续2 min以上的最大功率。

2.4 Supply and external connections 电源和外部连接

18.2.4 MAINS 电网电源

power source with a nominal voltage of more than 35 V (peak) a.c or d.c. which is not used solely to supply apparatus specified in 1.1.1

标称电压大于交流35 V（峰值）或直流35 V，又限于对1.1.1规定的设备供电的电源。

18.2.5 PERMANENTLY CONNECTED APPARATUS 永久连接性设备

apparatus which is intended for connection to the MAINS by a connection which cannot be loosened BY HAND 预定要采用一种不能用手动松动的连接方式与电网电源连接的设备。

18.2.6 DIRECTLY CONNECTED TO THE MAINS 与电网电源直流连接

electrical connection with the MAINS in such a way that a connection to either pole of the MAINS causes in that connection a permanent current equal to or greater than 9 A, protective devices in the apparatus being not short-circuited 与电网电源的电气连接，当设备中的保护装置不短路时，与电网电源的任一极连接时会在此连接处产生大于或等于9 A的稳定电流。

NOTE – A current of 9 A is chosen as the minimum breaking current of a 6 A fuse.

注：9A的电流是按6A熔断器的最小熔断电流选定的。

18.2.7 CONDUCTIVELY CONNECTED TO THE MAINS 与电网电源导电连接

electrical connection with the MAINS in such a way that a connection through a resistance of 2 000 Ω to either pole of the MAINS causes in that resistance a permanent current greater than 0,7 mA (peak), the apparatus not being connected to earth 与电网电源的电气连接，当设备不接地时，通过2 000 Ω 电阻器与电网电源的任一极连接时，会在电阻器上产生大于0,7 mA（峰值）的额定电流。

18.2.8 TERMINAL 端子

part of an apparatus by which connection is made to external conductors or other apparatus. It may contain several contacts 与外部导体或其他设备进行连接的设备的零部件。它可以含有几个接触件。

18.2.9 PROTECTIVE EARTH TERMINAL 保护接地端子

TERMINAL to which parts are connected which must be connected to earth for safety reasons 与出于安全原因必须接地的零部件相连接的端子。

18.2.10 TELECOMMUNICATION NETWORK 通信网络

metallically-terminated circuit intended to carry TELECOMMUNICATION SIGNALS for voice, data or other communication. Such networks may be publicly or privately owned. They may be subjected to overvoltages due to atmospheric discharges and power line failures 预定传输声音、数据或其他信息的通信信号的金属端接电路。这种网络可以是公共的，也可以是私人拥有的。它们可能承受由于大气层放电或电源线路故障引起的过电压。

NOTE – It is assumed that adequate measures according to ITU-T Recommendation K.11 have been taken to reduce the risk that over-voltages presented to apparatus exceed 1,5 kV (peak).

注：假定已采用符合ITU-T K.11建议规定的足够的措施，以减小设备中出现的过电压超过1,5 kV（峰值）的危险。

Excluded are: 不包括下列设备

- MAINS systems for supply, transmission and distribution of electrical power, used as telecommunication transmission medium; 被用来作为通信传输媒体的供电、输电和配电的电网电源系统;
- TV distribution systems using cable; 使用电缆的TV分配系统;
- public or private mobile radio systems; 公共的或私人的移动无线电系统;
- radio paging systems. 无线电呼叫系统。

2.5 Signals, sources, loads 信号，源，负载

18.2.4 PINK NOISE 粉红噪声

NOISE SIGNAL whose energy per unit bandwidth ($\Delta W/\Delta f$) is inversely proportional to frequency



每单位带宽的能量与频率成反比的噪声信号。

18.2.5 NOISE SIGNAL 噪声信号

stationary random signal having normal probability distribution of instantaneous values. Unless otherwise stated, the mean value is zero 瞬时值呈正态概率分布的稳态随机信号，如无其他说明，其平均值为零。

18.2.6 SOURCE TRANSDUCER 源换能器

apparatus intended to convert the energy of a non electrical signal to electrical energy

预定将非电气信号能量转换成电气能量的设备。

NOTE – Examples are microphone, image sensor, magnetic reproducing head, laser pick-up.

注：如麦克风、图像传感器、重放磁头、激光检拾器。

18.2.7 LOAD TRANSDUCER 负载换能器

apparatus intended to convert the energy of an electrical signal into another form of energy

预定将电气信号能量转换成其他形式能量的设备。

NOTE – Examples are loudspeaker, picture tube, liquid crystal display, magnetic recording head.

注：如扬声器、显像管、液晶显示器、记录磁头。

2.6 Protection against electric shock, insulations 防触电保护，绝缘

18.2.4 CLASS I I类

design in which protection against electric shock does not rely on BASIC INSULATION only, but which includes an additional safety precaution in such a way that means are provided for the connection of ACCESSIBLE conductive parts to the protective (earthing) conductor in the fixed wiring of the installation, in such a way that ACCESSIBLE conductive parts cannot become HAZARDOUS LIVE in the event of a failure of the BASIC INSULATION (see 3.2 of IEC 60536) 防触电不仅依靠基本绝缘而且采用附加安全措施的设计，在基本绝缘万一失效时，有措施使可触及的导电零部件与设施中的固定线路中的保护（接地）导体相连接，从而使可触及的导电零部件不会危险带电（见GB/T 12501-1990的3.2）。

NOTE – Such a design may have parts of CLASS II. 注：这类设计中可以有属于II类设计的零部件。

18.2.5 CLASS II II类

design in which protection against electric shock does not rely on BASIC INSULATION only, but in which additional safety precautions, such as DOUBLE INSULATION or REINFORCED INSULATION, are provided, there being no provision for protective earthing or reliance upon installation conditions (see 3.3 of IEC 60536)

防触电保护不仅依靠基本绝缘而且采用诸如双重绝缘或加强绝缘之类的附加安全措施的设计，它不具有保护接地措施，也不依靠设施的条件（见GB/T 12501-1990的3.3）。

18.2.6 BASIC INSULATION 基本绝缘

insulation applied to HAZARDOUS LIVE parts to provide basic protection against electric shock

对危险带电零部件所加的提供防触电基本保护的绝缘。

NOTE – BASIC INSULATION does not necessarily include insulation used exclusively for functional purposes.

注：基本绝缘不一定包括专用于功能目的的绝缘。

18.2.7 DOUBLE INSULATION 双重绝缘

insulation comprising both BASIC INSULATION and SUPPLEMENTARY INSULATION (see 2.3 of IEC 60536)

同时具有基本绝缘和附加绝缘的绝缘（见GB/T 12501-1990的2.3）。

18.2.8 SUPPLEMENTARY INSULATION 附加绝缘

independent insulation applied in addition to BASIC INSULATION in order to provide protection against electric shock in the event of a failure of the BASIC INSULATION (see 2.2 of IEC 60536)

基本绝缘以外所使用的独立绝缘，以便在基本绝缘一旦失效时提供防触电保护（见GB/T 12501-1990的2.2）。

18.2.9 REINFORCED INSULATION 加强绝缘

single insulation applied to HAZARDOUS LIVE parts which provides a degree of protection against electric shock equivalent to DOUBLE INSULATION 对危险带电零部件所加的单一绝缘，其防触电等级相当于双重绝缘。

NOTE – REINFORCED INSULATION may comprise several layers which cannot be tested singly as BASIC INSULATION or SUPPLEMENTARY INSULATION. 注：加强绝缘可以由几层材料构成，但各层不能单独按基本绝缘或附加绝缘进行试验。

18.2.10 PROTECTIVE SEPARATION 保护隔离

separation between circuits by means of basic and supplementary protection (BASIC INSULATION plus SUPPLEMENTARY INSULATION or plus PROTECTIVE SCREENING) or by an equivalent protective provision, for example REINFORCED INSULATION (see 2.9 of IEC 60536-2) 电路之间使用基本保护和附加保护（基本绝缘加附加绝缘或加保护屏蔽）或使用诸如加强绝缘的等效的保护措施的隔离（见GB/T 12501.2-1997的2.9）。

18.2.11 PROTECTIVE SCREENING 保护屏蔽

separation from HAZARDOUS LIVE parts by means of an interposed conductive screen, connected to the PROTECTIVE EARTH TERMINAL 用与保护接地端子相连的内插导电屏蔽层与危险带电零部件的隔离。

18.2.12 TOUCH CURRENT 接触电流

current which passes through the human body when it touches one or more ACCESSIBLE parts of an apparatus



under normal operating or fault conditions

正常工作条件下或故障条件下，当人体接触设备的一个或多个可触及零部件时通过人体的电流。

18.2.13 HAZARDOUS LIVE 危险带电

electrical condition of an object from which a hazardous TOUCH CURRENT (electric shock) could be drawn (see 9.1.1) 从物体上可获得危险接触（触电）电流的物体的电气条件（见9.1.1）。

18.2.14 CLEARANCE 电气间隙

shortest distance in air between two conductive parts. 在两个导电零部件间在空气中的最短距离。

18.2.15 CREEPAGE DISTANCE 爬电距离

shortest distance along the surface of an insulating material between two conductive parts 在两个导电零部件间沿绝缘材料表面的最短距离。

2.7 Components 元器件

18.2.4 ISOLATING TRANSFORMER 隔离变压器

transformer with PROTECTIVE SEPARATION between the input and output windings

在输入绕组和输出绕组之间有保护隔离的变压器。

18.2.5 SEPARATING TRANSFORMER 分离变压器

transformer, the input windings of which are separated from the output windings by at least BASIC INSULATION.

在输入绕组和输出绕组之间至少采用基本绝缘隔离的变压器。

NOTE – Such transformers may have parts meeting the requirements of ISOLATING TRANSFORMERS.

注：这类变压器可能有符合隔离变压器要求的零部件。

18.2.6 THERMAL RELEASE 热释放器

device which prevents the maintenance of excessively high temperatures in certain parts of the apparatus by disconnecting these parts from their supply

通过断开设备某些零部件的供电来防止这些零部件持续过高温度的装置。

NOTE – PTC-S THERMISTORS (see 2.7.8) are not THERMAL RELEASES in the sense of this definition.

注：就本定义而言，PTC-S热敏电阻器（见2.7.8）不是热释放器。

18.2.7 THERMAL CUT-OUT 热断路器

THERMAL RELEASE with reset which has no provision for temperature setting by the USER

能复位的且用户不可预置温度的热释放器。

NOTE – A THERMAL CUT-OUT may be of the automatic or of the manual reset type.

注：热断路器可以是自动复位型或手动复位型。

18.2.8 THERMAL LINK 热熔断体

THERMAL RELEASE without reset, which operates only once and then requires partial or complete replacement

不能复位的而且只能动作一次，然后需部分或全部更换的热释放器。

18.2.9 TRIP-FREE 自动脱扣

automatic action, with a reset actuating member, so designed that the automatic action is independent of manipulation or position of the reset mechanism

复位驱动装置的自动动作，其设计使自动动作不依赖于复位机构的人工操作或位置。

18.2.10 MICRO-DISCONNECTION 微断开

adequate contact separation so as to ensure functional security 为确保功能安全而需要的足够的触点分离。

NOTE – There is a requirement for the dielectric strength of the contact gap but no dimensional requirement.

注：对触点间隙的抗电强度有要求，但对其尺寸无要求。

18.2.11 PTC-S THERMISTOR 热敏电阻器

thermally sensitive semiconductor resistor, which shows a step-like increase in its resistance when the increasing temperature reaches a specific value. The change of temperature is obtained either by the flow of current through the thermosensitive element, or by a change in the ambient temperature, or by a combination of both 当温度升高达到某一特定值时，其阻值呈阶跃增长的热敏半导体电阻器。温度的变化是由流过热敏元件的电流，或由环境温度变化，或由以上两者组合引起的。

18.2.12 SAFETY INTERLOCK 安全联锁装置

means either of preventing access to a hazardous area until the hazard is removed or of automatically removing the hazardous condition when access is gained

在消除危险前能避免接触危险区域或当接触时能自动消除危险状态的装置。

18.2.13 MANUALLY OPERATED MECHANICAL SWITCH 手动机械开关

device operated BY HAND, not incorporating semiconductors, and situated anywhere in the circuit of the apparatus, which can interrupt the intended function, such as sound and/or vision, by moving contacts

可以安装在设备电路中任何地方，通过移动触点能中断诸如声音和/或图像等预期功能的手动操作的装置，但不包括半导体器件。



NOTE – Examples of MANUALLY OPERATED MECHANICAL SWITCHES are single-pole or ALL-POLE MAINS SWITCHES, functional switches and switching systems which for example can be a combination of relays and switches controlling the relays. 注：手动机械开关的例子有：单极或全极电源开关、功能开关以及由诸如继电器和控制继电器的开关组成的开关系统。

18.2.14 ALL-POLE MAINS SWITCH 全极电源开关

MANUALLY OPERATED MECHANICAL SWITCH which interrupts all poles of the MAINS supply except the protective earth conductor 能断开除保护接地导体以外的所有电网电源各极的手动机械开关。

18.2.15 PRINTED BOARD 印制板

base material cut to size, containing all needed holes and bearing at least one CONDUCTIVE PATTERN 按要求尺寸切成的、其上带有全部所需的孔且至少贴有一个导电图形的基材。

18.2.16 CONDUCTIVE PATTERN 导电图形

configuration formed by electrically conductive material of a PRINTED BOARD 由印制板上的电气导电材料形成的图形。

2.8 Miscellaneous 其他

18.2.4 TYPE TEST 型式试验

test of one or more specimens made on a certain design to show that the design meets all requirements of this standard 在按某种设计制造一个或多个样品来确定该设计是否符合本标准的全部要求而进行的试验。

18.2.5 ROUTINE TEST 例行试验

test to which each specimen is subjected during or after manufacture to ascertain whether it complies with certain criteria 在制造过程中或在制成之后，为确定其是否符合某些要求而对每个样品进行的试验。

18.2.6 ACCESSIBLE 可触及

possibility of touching by the test finger according to IEC 61032, test probe B 用符合GB/T16842-1997试具B要求的试验指接触的可能性。

NOTE – Any ACCESSIBLE area of a non-conductive part is considered as being covered with a conductive layer (see figure 3 as an example). 注：非导电零部件的任何可触及区域被认为覆盖有一层导电层（见图3示例）。

18.2.7 BY HAND 手动

operation that does not require the use of any object such as a tool, coin, etc. 不需要用诸如工具、硬币等任何物品进行的操作。

18.2.8 SKILLED PERSON 技术人员

person with relevant education and experience to enable him or her to avoid dangers and to prevent risks which electricity may create 具备能使其避免危险和防止电可能产生危险的相关知识和经验的人员。

18.2.9 INSTRUCTED PERSON 经过指导的人员

person adequately advised or supervised by SKILLED PERSONS to enable him or her to avoid dangers and to prevent risks which electricity may create

在技术人员的充分指导和监督下能避免危险和防止电可能产生危险的人员。

18.2.10 USER 用户

any person, other than a SKILLED PERSON or an INSTRUCTED PERSON, who may come into contact with the apparatus 除技术人员和经过指导的人员以外的可能接触设备的任何人员。

18.2.11 STAND-BY 待机

operating condition where the main functions, such as sound and/or vision, are switched-off and where the apparatus is only partly in operation. In this condition, permanent functions, such as a clock, are maintained and it allows the apparatus to be brought into full operation, for example by REMOTE CONTROL or automatically 诸如声音和/或图像的主要功能关闭且设备仅部分在工作的一种工作状态。在此状态下诸如时钟等常设功能仍在工作，可以通过诸如遥控或自动方式使设备完全进入运行状态。

18.2.12 WOOD-BASED MATERIAL 木制材料

material in which the main ingredient is machined natural wood, coupled with a binder 其主要的组成部分为用粘剂粘合的经过机械加工的天然木材的一种材料。

NOTE – Examples of WOOD-BASED MATERIAL are materials incorporating ground or chipped wood, such as hard fibre board or chip board. 注：木制材料的例子有含锯末或刨花的材料，如硬纤维板或刨花板。

18.2.13 FIRE ENCLOSURE 防火防护外壳

part of the apparatus intended to minimize the spread of fire or flames from within 预定使设备内部产生的燃烧或火焰的蔓延减小到最低限度的设备的零部件。

18.2.14 POTENTIAL IGNITION SOURCE 潜在引燃源

possible fault such as a faulty contact or interruption in an electrical connection, including a CONDUCTIVE PATTERN on PRINTED BOARDS, which can start a fire if, under normal operating conditions, the open circuit voltage exceeds 50 V (peak) a.c. or d.c. and the product of this open circuit voltage and the measured current through this possible fault exceeds 15 VA 如果在正常工作条件下，开路电压超过交流50 V（峰值）或直流50 V，以及该开路电压与测得通过可能的故障点的电流的乘积超过15 VA就可能引起着火的故障点。例如在电气连接中，包括印制板



导电图形中的某个故障接触点或断开点。

3. General requirements 一般要求

3.1 The apparatus shall be so designed and constructed as to present no danger when used for its intended purpose, either in normal operating conditions or under fault conditions, particularly providing protection against: 设备的设计和结构应保证在按其预定用途, 在正常工作条件下或故障条件下使用时不会出现危险, 特别是对下列危险提供防护

- hazardous currents passing through the human body (electric shock); 通过人体的危险电流 (触电)
- excessive temperatures; 过高温度
- hazardous radiations; 危险辐射
- effects of implosion and explosion; 内爆或爆炸的影响
- mechanical instability; 机械不稳定性
- injury by mechanical parts; 机械零部件引起的伤害
- start and spread of fire. 起火或火势蔓延

In general, compliance is checked under normal operating conditions and under fault conditions, as specified in 4.2 and 4.3, by carrying out all the relevant tests specified.

一般情况下, 按4.2和4.3的规定, 在正常工作条件和故障条件下进行全部规定的相关试验来检验是否合格。

NOTE – Australia has special requirements with respect to d.c. components in the equipment neutral conductor.

注: 澳大利亚对在设备中线上使用的直流元器件有特殊要求。

3.2 Apparatus designed to be fed from the MAINS shall be constructed according to the requirements of CLASS I, or CLASS II apparatus. 设计成由电网电源供电的设备的结构应符合I类设备或II类设备的要求。

4. General test conditions 一般测试条件

4.1 Conduct of tests 试验导则

4.1.1 Tests according to this standard are TYPE TESTS. 按本标准进行的试验型式试验。

NOTE – For ROUTINE TEST, recommendations are given in annex N. 注: 在附录N中给出了对例行检验的建议。

4.1.2 The sample or samples under test shall be representative of the apparatus the USER would receive, or shall be the actual equipment ready for shipment to the USER.

样品或被试样品应是用户将要接收的设备的代表性样品, 或者是准备向用户交货的设备。

As an alternative to carrying out tests on the complete apparatus, tests may be carried out separately on circuits, components or subassemblies outside the apparatus, provided that inspection of the apparatus and circuit arrangements ensures that such testing will indicate that the assembled apparatus would conform to the requirements of this standard. 如果对设备和电路图的检查确认, 在设备外单独对电路、元器件或组件进行试验就能证明组装成的设备符合本标准的要求, 则可以用这些试验来代替对完整设备进行的试验。

If any such test indicates a likelihood of non-compliance in the complete apparatus, the test shall be repeated in the apparatus. 如果任何这样的试验表明, 在完整设备上有可能不符合要求, 则该试验应在设备上重新进行。

If a test specified in this standard could be destructive, it is permitted to use a physical model to represent the condition to be evaluated.

如果本标准规定的某项试验可能是破坏性的, 则允许使用一个能代表被评定状态的模型样机。

NOTE 1 – The tests should be carried out in the following order: 注1: 试验应按下列顺序进行

- component or material pre-selection; 元器件或材料的预选
- component or subassembly bench tests; 元器件或部件的工作台试验
- tests where the apparatus is not energized; 设备不通电情况下的试验
- live tests 在下列条件下的带电试验
 - under normal operating conditions, 在正常工作条件下
 - under abnormal operating conditions, 故障条件下
 - involving likely destruction. 可能会引起破坏的

NOTE 2 – In view of the amount of resources involved in testing and in order to minimize waste, it is recommended that all parties concerned jointly consider the test programme, the test samples and the test sequence.

注2: 由于在试验时要涉及一定量的资源, 为了减少浪费, 建议有关各方共同商定试验大纲、试验样品和试验顺序。

4.1.3 Unless otherwise specified, the tests are carried out under normal operating conditions at:

除另有规定外, 试验在下列正常工作条件下进行

- an ambient temperature between 15 °C and 35 °C, and 环境温度 15°C ~ 35°C , 以及
- a relative humidity of 75 % maximum. 相对湿度最大为75%

4.1.4 Any position of intended use of the apparatus, normal ventilation not being impeded.

在不妨碍正常通风的条件下, 设备在预定使用时所处的任何位置。



The temperature measurements shall be carried out with the apparatus positioned in accordance with the instructions for use provided by the manufacturer, or, in the absence of instructions, the apparatus shall be positioned 5 cm behind the front edge of an open-fronted wooden test box with, 1 cm free space along the sides and top, and 5 cm depth behind the apparatus. 在进行温度测量时, 设备应按制造厂商提供的说明书的规定放置, 或者在没有使用说明书时, 设备应放置在有前开口的木制试验箱中, 位于距木箱前边缘5cm处, 而且沿侧面和顶面要有1cm自由空间, 在设备后面要有5cm深度空间。

Tests on apparatus, intended to be part of an assembly not provided by the apparatus manufacturer, shall be carried out according to the instructions for use provided by the manufacturer, specifically those dealing with the proper ventilation of the apparatus. 若设备制造厂商未提供预定由设备构成一部分的某种组合装置, 则试验应按该设备制造厂商提供的说明书的规定进行, 特别是涉及设备的适当通风。

4.1.5 The characteristics of the supply source, except those specified in 4.2.1, used during the tests shall not appreciably influence the test results.

试验时所使用的供电电源, 除4.2.1规定的以外, 其特性不应影响试验结果有明显的变化。

Examples of such characteristics are source impedance and waveform. 这种特性的例子有电源阻抗和波形。

4.1.6 Where relevant, a standard signal consisting of PINK NOISE, band-limited by a filter whose response conforms to that given in figure C.1 in annex C. 在适用的情况下, 对粉红噪声组成的标准信号用一个其频率响应符合附录C中图C1给出的频率响应的滤波器来限制带宽。

NOTE – If appropriate, the standard signal may be used to modulate a carrier wave. 注:如果适用,可以用标准信号来调制载波
The output measuring equipment shall indicate true r.m.s. values for crest factors up to at least 3, and the frequency response shall conform to that shown in annex C.

输出测量设备应能显示波峰系数至少为3的真实有效值, 且其频率响应应符合附录C所示的频率响应。

4.1.7 The a.c. values given in this standard are r.m.s. values, unless specified otherwise.

The d.c. values given in this standard are RIPPLE FREE values.

除非另有规定, 本标准给出的交流值为有效值, 本标准给出的直流值为无纹波值

4.2 Normal operating conditions 正常工作条件

Normal operating conditions are the most unfavourable combination of the following conditions.

正常工作条件是由下列条件进行最不利的组合而成的条件

4.2.1 The apparatus is connected to a supply voltage of 0,9 times or 1,06 times of any RATED SUPPLY VOLTAGE for which the apparatus is designed.

设备接到电压等于其设计时的任一额定电压的0,9倍或1,06倍(国标中为1.1倍,下同)的供电电源上。

In case of doubt, tests may also be performed at the value of any RATED SUPPLY VOLTAGE.

如有疑问, 也可以在任何额定电源电压上试验。

For apparatus having a RATED SUPPLY VOLTAGE range not requiring the adjustment of a voltage setting device, the apparatus is connected to a supply voltage of 0,9 times the lower limit or 1,06 times the upper limit of any RATED SUPPLY VOLTAGE range; moreover, the apparatus is connected to any nominal supply voltage within the RATED SUPPLY VOLTAGE range marked on the apparatus.

对具有某个额定电压范围而又需要电压设定装置来调整的设备, 应将设备接到电压等于任何额定电源电压范围下限的0,9倍或上限的1,06倍的电源上。此外, 该设备还要接到设备上标定的额定电源电压范围内的任何标称电压上。

Any rated supply frequency marked on the apparatus is used. 使用设备上标定的任何额定电源频率。

For a.c./d.c. apparatus, an a.c. or d.c. supply is used. 对交流/直流设备, 使用交流电源或直流电源。

For d.c. supply any polarity is used, unless this is prevented by the construction of the apparatus.

对直流电源, 使用任何极性, 除非受设备结构的限制。

4.2.2 Any position of controls which are ACCESSIBLE to the USER for adjustment BY HAND, including REMOTE CONTROLS, excluding voltage setting devices complying with 14.8 and volume controls and tone controls. 用户可触及的手动调节的控制件, 包括遥控件调到任何位置, 但符合14.8的电压设定装置、音量控制件和音调控制件除外。

Any cable connected REMOTE CONTROL device, detachable by a connector or a similar device, is connected or not. 电缆连接遥控装置与可拆卸连接器或类似装置的连接或不连接。

A cover, enclosing a LASER SYSTEM, which can be opened BY HAND, is opened fully, opened partly or closed.

能手动打开的封闭激光系统的盖子全部打开、部分打开或关闭。

4.2.3 In the case of single-phase supply any earth TERMINAL and any PROTECTIVE EARTH TERMINAL may be connected to either pole of the isolated supply source used during the test.

对单相电源供电的情况下, 任何接地端子和任何保护接地端子可以连接到试验时所使用的隔离电源的任一极上。

In the case of a supply other than single phase any earth TERMINAL and any PROTECTIVE EARTH TERMINAL may be connected to the neutral or to any phase of the isolated supply source used during the test. 对非单相电源供电的情况下, 任何接地端子和任何保护接地端子可以连接到试验时所使用的隔离电源的中线上或任一相线上。



4.2.4 In addition, for an AUDIO AMPLIFIER: 此外, 对音频放大器

a) The apparatus is operated in such a way as to deliver one-eighth of the NON-CLIPPED OUTPUT POWER to the RATED LOAD IMPEDANCE using the standard signal described in 4.1.6 with the tone controls set to their mid position. 音调控制件置于中间位置, 用4.1.6所述的标准信号使设备向额定负载提供1/8非削波输出功率。Where the NON-CLIPPED OUTPUT POWER cannot be obtained using the standard signal, one-eighth of the maximum attainable output power is taken. 对用标准信号不能获得非削波输出功率的情况下, 取1/8最大可获得输出功率。

When determining whether a part or TERMINAL contact is HAZARDOUS LIVE according to 9.1.1 and 11.1, at the manufacturer's option the apparatus may also be operated in such a way as to deliver the NON-CLIPPED OUTPUT POWER to the RATED LOAD IMPEDANCE using a sinusoidal signal of 1 000 Hz or another frequency corresponding to the mid-frequency of the relevant amplifier part of the apparatus.

当按9.1.1和11.1确定某个零部件或端子接触件是否危险带电时, 根据制造厂商的选择, 也可以使用1000 Hz或与设备的放大器部分的中间频率值对应的另一个频率的正弦波信号, 使设备向额定负载阻抗提供非削波输出功率。

b) The most unfavourable RATED LOAD IMPEDANCE of any output circuit is connected or not.

连接或不连接任何输出电路的最不利的额定负载阻抗。

c) Organs or similar instruments which have a tone-generator unit are operated with any combination of two bass pedal keys, if any, and ten manual keys depressed, and all stops and tabs which can increase the output power are activated. 具有音调发生器单元的风琴或类似乐器, 在按下两个低音脚踏键(如果有的话)、十个手动键以及起动能增加输出功率的所有音栓和键的任意组合下工作。

For AUDIO AMPLIFIERS used in an ELECTRONIC MUSICAL INSTRUMENT which does not generate a continuous tone, the standard signal described in 4.1.6 is applied to the signal input TERMINAL or to the appropriate input stage of the AUDIO AMPLIFIER. 对于不产生连续音调的电子乐器的音频放大器, 在信号输入端子或者音频放大器适当的输入级施加4.1.6所述的标准信号。

4.2.5 For apparatus incorporating motors, load conditions for the motor are chosen which may occur during intended use, including stalling BY HAND if this is possible.

对含有电动机的设备, 选择电动机在预定使用时可能发生的负载条件, 如果堵转可能发生的话, 还包括手动堵转。

4.2.6 An apparatus supplying power to other apparatus is loaded to give its rated power or not loaded.

对其他设备供电的设备, 加负载使其输出额定功率或空载。

4.2.7 A SUPPLY APPARATUS to be used inside apparatus for which it is intended exclusively, is tested within such apparatus after installation according to the manufacturer's instruction for use.

专门预定要在设备内部使用的电源设备, 按制造厂商使用说明书的规定安装好后, 在设备内进行试验。

4.2.8 In addition for Citizen's Band apparatus, the RATED LOAD IMPEDANCE is connected or not to the antenna TERMINAL or, if applicable, a telescopic antenna extended to any length. The transmitting test conditions are specified in IEC 61149. 此外, 对于民用频段设备, 天线端子连接或不连接额定负载阻抗或者如果适用, 将拉杆天线拉伸到任一长度。发送试验条件按IEC 61149的规定。

4.2.9 Antenna positioners 天线定位装置

4.2.9.1 In addition for antenna positioners in combination with their control and SUPPLY APPARATUS:

此外, 对与其控制装置和电源设备组合的天线定位装置

- four consecutive movements from one endstop to the opposite endstop;
从一个停止端到与其相反的停止端连续移动4次
- 15 min resting period. 静止时间15 min

The movements and the resting periods are repeated as many times as necessary for the relevant tests. For temperature measurements the movements and the resting periods are repeated until a steady state of temperature has been reached but not longer than 4 h. 移动和静止时间要按有关试验需要的次数重复。对温度测量, 移动和静止时间一直重复到温度达到稳定状态为止, 但时间不大于4h。

After the last movement period, the 15 min resting period does not apply to the temperature measurements. 在最后一次移动时间到达后, 其15min的静止时间不适用于温度测量。

4.2.9.2 In addition, for satellite antenna positioners consisting of a power supply and control unit without a motor drive system, the power supply unit shall be loaded in accordance with the marked output rating and operated with a duty cycle of 5 min on, and 15 min off. 此外, 对由一个电源单元和无电动机驱动系统的控制单元组成的卫星天线定位装置, 其电源单元应按其标定的额定输出值施加负载, 并按开机5min关机15min来循环工作。

4.2.10 Apparatus designed to be supplied exclusively by a SPECIAL SUPPLY APPARATUS specified by the manufacturer of the apparatus, shall be tested together with this SPECIAL SUPPLY APPARATUS. The supply voltage for the SPECIAL SUPPLY APPARATUS IS determined in accordance with 4.2.1.

对设计成只能采用设备制造厂商规定的专用电源设备供电的设备, 应与其专用电源设备一起进行试验。专用电源设



备的电源电压应按4.2.1的规定来确定。

Where a voltage setting device for the output voltage of the SPECIAL SUPPLY APPARATUS is provided, it shall be adjusted to the RATED SUPPLY VOLTAGE of the apparatus under test.

若专用电源设备提供了输出电压设定装置，则应将其调整到被试设备的额定电源电压。

4.2.11 Apparatus, which can be supplied by SUPPLY APPARATUS FOR GENERAL USE, shall be supplied by a test power supply according to table 1 corresponding to the RATED SUPPLY VOLTAGE of the apparatus under test. The values of no-load voltage given in table 1 are subject to the under- and over-voltage provisions specified in 4.2.1. 对能使用通用电源设备供电的设备，应使用符合表1中与被试设备额定电源电压相对应的试验电源来供电。表1中给出的空载电压值是按4.2.1规定的欠电压和过电压变化的。

Table 1 – Test power supply 表1 - 试验电源		
RATED SUPPLY VOLTAGE 额定电源电压 Vd.c.	Nominal no-load voltage 标称空载电压 Vd.c.	Internal resistance 内阻 Ω
1.5	2.25	0.75
3.0	4.50	1.50
4.5	6.75	2.25
6.0	9.00	3.00
7.5	11.25	3.75
9.0	13.50	4.50
12.0	18.00	6.00

NOTE – Table 1 provides a standardized set of supply parameters intended to represent 3.00those found in SUPPLY APPARATUS FOR GENERAL USE in the range 1,5 V to 12 V and with a rated output current of 1 A.
注：表1给出了一组能代表电压范围在1,5V至12V之间，额定输出电流为1A的通用电源的标准化的电源参数。
Supply parameters for voltages >12 V and output currents >1 A are under consideration.
电压大于12V和输出电流大于1A的电源参数正在考虑中

4.2.12 Apparatus intended to be used with optional detachable legs or stands supplied by the manufacturer of the apparatus are tested with or without legs or stands fitted.

预定要使用制造厂商提供的选配的可拆卸的腿或台架一起使用的设备，则应装上或不装上腿或台架来进行试验。

4.3 Fault conditions 故障条件

For operation under fault conditions, in addition to the normal operating conditions mentioned in 4.2, each of the following conditions is applied in turn and, associated with it, those other fault conditions which are a logical consequence. 对故障条件下的工作，除4.2规定的正常工作条件外，依次施加下列每一个条件，以及与之有逻辑的、逻辑推理得出的那些其他故障条件。

NOTE 1 – The logical consequences of a fault condition are those which occur when a fault is applied.

注1：逻辑推理得出的故障条件是指设置某一故障时所发生的那些故障条件。

Circuits, or parts of a circuit supplied with an open circuit voltage not exceeding 35 V (peak) a.c. or d.c. and not generating voltages above that value, are not considered to present a fire hazard if the current which may be drawn from the supplying circuit for more than 2 min at any load, including short-circuit, is limited to not more than 0,2 A. Such supplied circuits are not subject to fault conditions testing.

对于其供电电压不超过交流35V（峰值）或直流35V且不会产生电压超过该电压值的电路或电路的零部件，如果其供电电路在任何负载包括短路的条件下输出持续2分钟以上的电流被限制在不超过0,2 A，则认为这样的被供电电路不会出现着火的危险。这样的被供电电路不承受故障条件试验。

An example of a test circuit to measure the voltage and the current is given in figure 1.

图1给出测量电压和电流的试验电路的示例。

NOTE 2 – Examination of the apparatus and all its circuit diagrams, excluding the internal circuit diagrams of integrated circuits, generally shows the fault conditions which are likely to create a hazard and which need to be applied. These are applied in sequence, in the order which is most convenient.

注2：除集成电路的内部电路图外，对设备及其所有电路图进行检查，通常可以看出有必要施加的可能会产生危险的故障条件。这些故障条件按方便的顺序依次施加。

NOTE 3 – When carrying out the examination in note 2, the operating characteristics of integrated circuits are taken into consideration. 当进行注2的检查时，应考虑集成电路的工作特性。

NOTE 4 – The fault tests are only to be made in the wooden test box mentioned in 4.1.4, if there is a possibility that this will influence the results. 如果故障试验有可能影响试验结果，则故障试验只能在4.1.4规定的木制试验箱中进行。

When a specified fault condition test is carried out, it can cause consequential faults which either interrupt or short-circuit a component. In case of doubt, the fault condition test shall be repeated up to two more times with replacement components in order to check that the same result is always obtained. Should this not be the case, the most unfavourable consequential fault, whether interruption or short circuit, shall be applied together with the



specified fault condition. 当进行某一规定的故障条件试验时, 可能引起某个元器件开路或短路的间接故障。在有怀疑时, 应更换元器件再将该故障条件试验重复进行两次以上, 以检查是否总能得到同样的结果。如果不是这种情况, 则无论是否开路或短路, 应以最不利的间接故障与所规定的故障条件一起施加。

4.3.1 Short-circuit across CLEARANCES and CREEPAGE DISTANCES if they are less than the values specified in clause 13 for BASIC and SUPPLEMENTARY INSULATION.

如果电气间隙和爬电距离小于第13章对基本绝缘和附加绝缘的规定值, 则将该电气间隙和爬电距离短路。

4.3.2 Short-circuit across parts of insulating material, the short-circuiting of which might cause an infringement of the requirements regarding protection against electric shock hazard or overheating, with the exception of insulating parts which comply with the requirements of 10.3. 如果绝缘材料零部件的短路可能会不满足关于防触电危险或过热的要求, 则将该绝缘材料零部件短路, 但符合10.3要求的绝缘零部件除外。

NOTE – This subclause does not imply a need to short-circuit the insulation between turns of coils.

注: 本条不意味着需要将线圈的匝间绝缘短路。

4.3.3 Short-circuit, or if applicable, interruption of: 将下列部位短路, 或如果适用, 将其开路

- heaters of electronic tubes; 电子管的灯丝
- insulation between heaters and cathodes of electronic tubes; 电子管的灯丝与阴极间的绝缘
- spacings in electronic tubes, excluding picture tubes; 电子管内的间隙, 但显像管除外
- semiconductor devices, one lead at a time interrupted or any two leads connected together in turn (but see 4.3.4 d)). 半导体器件, 一次断开一条引线或任意两条引线依次连接在一起 (但见4.3.4 d))

NOTE – If electronic tubes are so constructed that a short circuit between certain electrodes is highly improbable or even impossible, the electrodes concerned need not be short-circuited.

注: 如果电子管的结构使电极之间的短路明显不太可能或甚至根本不可能发生, 则不必短路有关电极。

4.3.4 Short-circuit or disconnection, whichever is more unfavourable, of resistors, capacitors, windings (for example transformers, degaussing coils), loudspeakers, optocouplers, varistors or non-linear passive components, the short-circuiting or disconnection of which might cause an infringement of the requirements regarding protection against electric shock or overheating.

如果电阻器、电容器、绕组 (例如变压器, 消磁线圈)、扬声器、光电耦合器、压敏电阻器或非线性无源器件的短路或开路可能会不满足关于防触电或过热的要求, 则将其短路或开路, 取其较不利者。

These fault conditions do not apply to: 这些故障条件不适用于

- a) resistors complying with the requirements of 14.1 and, as far as applicable, of 11.2; 符合14.1和11.2中适用要求的电阻器
- b) PTC-S THERMISTORS complying with IEC 60738; 符合IEC 60738要求的PTC-S热敏电阻器
- c) capacitors and RC-units complying with the requirements of 14.2, provided that the voltage at their terminations does not exceed their rated voltage and that their application is in accordance with 8.5 or 8.6; 符合14.2要求的电容器和阻容单元, 其端子上的电压不超过其额定电压以及其应用符合8.5或8.6的要求
- d) the insulation between the input and output terminations of optocouplers complying with the requirements of 14.11; 符合14.11要求的光电耦合器的输入端和输出端之间的绝缘
- e) windings and the insulation of transformers and other windings mentioned in 14.3 complying with the requirements of that subclause. 符合14.3要求的变压器的绕组和绝缘, 以及14.3提到的其他绕组

4.3.5 For apparatus containing an AUDIO AMPLIFIER, using the standard signal described in 4.1.6 so as to deliver the most unfavourable output power from zero up to the maximum attainable output power to the RATED LOAD IMPEDANCE or, if applicable, to the most unfavourable load impedance connected to the output TERMINALS including short-circuit and open circuit.

对含有音频放大器的设备, 使用4.1.6所述的标准信号, 使设备对额定负载阻抗输出从零到最大可得到的输出功率间的最不利输出功率, 或者如果适用, 使输出端子上连接最不利的负载阻抗, 包括短路或开路。

4.3.6 Motors are stalled if this is possible during the use of the apparatus by internal or external influences.

如果在设备使用过程中因内部或外部影响可能使电动机堵转, 则将电动机堵转。

4.3.7 Motors, relay coils or the like, intended for short-time or intermittent operation, are operated continuously if this can occur during operation of the apparatus. 对预定短时或间歇工作的电动机、继电器线圈或类似装置, 如果在设备使用过程中可能发生连续工作, 则使其连续工作。

4.3.8 The apparatus is connected simultaneously to alternative types of supply unless this is prevented by the construction. 设备同时连接到替换类型的电源上, 除非受到结构上的阻止。

4.3.9 Output TERMINALS of apparatus supplying power to other apparatus, except MAINS socket-outlets DIRECTLY CONNECTED TO THE MAINS, are connected to the most unfavourable load impedance, including short circuit.

向其他设备供电的设备输出端子, 与最不利的负载阻抗连接, 包括短路, 但直接与电网电源连接的输出插座除外。

4.3.10 Each group of ventilation openings that are likely to be covered simultaneously, shall be covered in turn



and tested separately. 对可能会同时被覆盖的每一组通风孔应依次覆盖并分别进行试验。

Ventilating openings that are likely to be covered simultaneously are: 因下列原因, 可能会同时被覆盖的通风孔有

- openings on top of the apparatus, for example by a newspaper; or 例如被一张报纸覆盖的设备顶部开孔或者
- openings on the sides and the back, excluding the front, for example when pushed into a hanging curtain. 例如被推入一悬挂的窗帘中的设备侧面、背面, 不包括前面的开孔。

4.3.11 If it is possible to insert USER replaceable batteries with reversed polarity, the apparatus is tested with one or more batteries with both intended and reversed polarity. 如果有可能将用户可更换电池以反极性方式插入, 则用一个或多个电池, 以预定极性和相反极性两种方式插入对设备进行试验。

NOTE – CAUTION, there is a danger of explosion when this test is applied. 注意, 当进行该项试验时会有爆炸危险。

4.3.12 For Citizen's Band apparatus, the most unfavourable load impedance including short circuit is connected to the antenna TERMINAL or to the antenna itself, for example a telescopic antenna, when no antenna TERMINAL is provided. The transmitting test conditions are specified in IEC 61149.

对民用频段设备, 将最不利的负载阻抗(包括短路)连接到天线端子, 或者当未提供天线端子时, 连接到天线本身(例如拉杆天线)。发送试验条件按IEC 61149的规定。

4.3.13 For PORTABLE APPARATUS to be supplied from an a.c. MAINS and provided with a voltage setting device to be set by the USER, connection to a supply voltage of 250 V a.c., with the MAINS voltage setting device at the most unfavourable position. 对由交流电源供电的, 装有可由用户调整的电压设定装置的便携式设备, 连接到250V交流电源电压, 电源电压设定装置置于最不利的位置上。

4.3.14 Apparatus designed to be supplied by a SPECIAL SUPPLY APPARATUS with a voltage setting device for the output voltage, specified by the manufacturer of the apparatus, shall be tested by adjusting this voltage setting device to any output voltage. 对设计成要用设备制造商规定的、装有输出电压设定装置的专用电源设备供电的设备, 应将该电压设定装置调整到任意输出电压来进行试验。

During this test, 4.2.1 is applied, except that the SPECIAL SUPPLY APPARATUS is fed by its RATED SUPPLY VOLTAGE.

The test need not be made if the current consumption of the apparatus under test cannot exceed 0,2 A for more than 2 min, for example by the operation of a fuse. 在进行本试验时, 采用4.2.1的规定, 但对专用电源设备以其额定电源电压供电。如果被试设备的消耗电流持续2 min以上不超过0.2 A, 例如熔断器动作, 则本试验不必进行。

4.3.15 Apparatus which can be supplied by SUPPLY APPARATUS FOR GENERAL USE shall be tested by using a test power supply as specified in table 1 step by step upwards, starting with the value one step above the value specified for the RATED SUPPLY VOLTAGE of the apparatus under test. 对能用通用电源设备供电的设备, 应使用表1规定的试验电源逐步升级进行试验, 起始值应为被试设备额定电源电压规定值高一个等级的值。

This test is not applied to apparatus having a RATED SUPPLY VOLTAGE equal to or higher than the maximum RATED SUPPLY VOLTAGE in table 1. 本试验不适用于额定电源电压等于或大于表1的最大额定电源电压的设备。

During this test, 4.2.1 is applied, except that the no-load voltages have their nominal values.

The test need not be made if the current consumption of the apparatus under test cannot exceed 0,2 A for more than 2 min, for example by the operation of a fuse. 在进行本试验时, 采用4.2.1的规定, 但空载电压采用空载电压标称值。如果被试设备的消耗电流持续了2 min以上不超过0.2 A, 例如熔断器动作, 则本试验不必进行。

5 Marking and instructions 标记和使用说明

Markings shall be permanent, comprehensible and easily discernible on the apparatus when ready for use.

准备使用时, 设备上的标记应是耐久的、能理解的和易识别的。

The information should preferably be on the exterior of the apparatus, excluding 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.

标记的信息最好在设备外部, 但不包括设备的底部。但是如果使用说明书提供了标记的位置, 则允许将其放在手容易触及的部位, 例如盖子的下面, 或者便携式设备或质量不大于7kg的设备的底部外侧。

Compliance is 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 be legible; it shall not be easily possible to remove marking plates and they shall show no curling. 通过检查和擦拭来检验是否合格。擦拭标记时, 用一块浸有水的布手动擦拭15s, 再在不同的部位或者在第二个样品上用一块浸有汽油的布手动擦拭15s。在此擦拭后, 标记仍应是清楚可辨的, 标牌应不可能轻易被揭掉, 而且不应出现卷边。

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

为了提供参考, 所使用的汽油的指标规定如下

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. 试验用汽油是脂肪族(无环)溶剂乙烷,其最大芳香烃的体积百分比含量约为0,1%,贝壳松脂丁醇(溶解溶液)值约为29,初始沸点值约为65°C,干涸点值约为69°C,密度约为0,7 kg/l. Letter symbols for quantities and units shall be in accordance with IEC 60027.

量值和单位的字母符号应符合IEC60027。

Graphical symbols shall be in accordance with IEC 60417 and ISO 7000, as appropriate.

图形符号应按相应情况符合IEC 60417和ISO 7000 (GB/T5465.2和GB/T16273.1)。

The on-position, and where relevant, the off-position of switches shall be indicated in accordance with 14.6.3.

开关的通位,以及在涉及的情况下开关的断位应符合14.6.3的规定。

Compliance is checked by inspection. 通过检查来检验是否合格。

5.1 Identification and supply ratings 标记符合和电源额定值

The apparatus shall be marked with the following: 设备应标有下列标记

a) maker's or responsible vendor's name, trade mark or identification mark;

制造厂或责任经销商的名称、商标或识别标记

b) model number or type reference; 机型代号或型号标志


c) the symbol for CLASS II, if applicable:  (60417-2-IEC-5172)


如果适用,标出II类设备符号(GB/T5465.2-1996中编号5172)


d) NOTE – Marking for apparatus designed for use in tropical climates is under consideration.

注:用于热带气候的设备的标记的设计正在考虑中

e) Nature of supply: 电源性质

– a.c. only with the symbol:  (60417-2-IEC-5032) 交流仅用符号(GB/T5465.2-1996中编号5032)

– d.c. only with the symbol:  (60417-2-IEC-5031) 直流仅用符号(GB/T5465.2-1996中编号5032)

– a.c. or d.c. with the symbol:  (60417-2-IEC-5033) 交流或直流用符号(GB/T5465.2-1996中编号5032)

– for three-phase systems, reference shall be made to IEC 61293; 对三相系统,应按照IEC 61293 (GB17285)

f) RATED SUPPLY VOLTAGE or range of the RATED SUPPLY VOLTAGES which can be applied without operating a voltage setting device. 无需操作电压设定装置即可使用的额定电源电压或额定电源电压范围。

Apparatus which can be set to different RATED SUPPLY VOLTAGES or ranges of RATED SUPPLY VOLTAGES shall be so constructed that the indication of the voltage or range of voltages to which the apparatus is set, is discernible on the apparatus when ready for use; 对可以设定不同的额定电源电压或额定电源电压范围的设备,在结构上应确保在准备使用时可识别设备设定的电压或电压范围的指示。

A solidus shall be used for USER selectable ratings, for example “110/230 V” and a hyphen shall be used for a rating range, for example “110-230 V”; 对可供用户选择的额定值应使用一斜线,例如“110/230 V”,而对一个额定值范围应使用一短横线,例如“110-230 V”; (对于单一的额定电压,应标示220V;对于额定电压范围,应覆盖220V;对于多个额定电压,其中这一必须是220V,并在出厂时设定为220V)

g) Rated MAINS frequency (or range of frequencies) in hertz, if safety is dependent on the use of the correct MAINS frequency; 如果安全性依赖于使用正确的电源频率,则标出额定电网电源频率(或频率范围),单位为Hz; (对于额定频率或额定频率范围,应为50Hz或包含50Hz)。

h) RATED CURRENT CONSUMPTION or rated power consumption of apparatus which can be supplied by SUPPLY APPARATUS FOR GENERAL USE. As an alternative the information may be given in the instruction manual.

能使用通用电源设备供电的设备的额定消耗电流或额定消耗功率。作为一种替代方法,可以在说明书中给出此信息。


i) Power consumption marking for apparatus intended for connection to an a.c. MAINS supply other than single phase. 预定要连接到非单相交流电网电源的设备的消耗功率的标志。

NOTE – Details for the measurement of the power consumption are under consideration. 消耗功率的测量细节正在考虑中

Compliance is checked by inspection. 通过检查来检验是否合格。


5.2 TERMINALS 端子

TERMINALS shall be marked as follows: 端子应按下列规定进行标记

a) The wiring TERMINAL intended for connection of the protective earthing conductor associated with the supply wiring:  (60417-2-IEC-5019)

对预定要连接与电源配线相关的保护接地导线的接线端子(GB5465.2-1996中编号5019)

This symbol shall not be used for other earthing TERMINALS. 对其他接地端子,不应使用该符号。

b) TERMINALS which are HAZARDOUS LIVE under normal operating conditions, except TERMINALS for MAINS supply:  (60417-2-IEC-5036)

对正常工作条件下危险带电的接线端子,电网电源端子除外(GB5465.2-1996中编号5036)

c) Output TERMINALS provided for supply of other apparatus except MAINS supply shall be marked with the



nominal output voltage and, in addition, the maximum output current, if with the most unfavourable load higher temperature rises than allowed in table 2 can occur, unless the TERMINALS are marked with the type references of the apparatus which are permitted to be connected.


对其他设备供电而配备的端子，电网电源输出端子除外，应标上标称输出电压。此外，如果连接最不利负载时的温升大于表2的允许值，则还要标出最大输出电流，除非端子标有允许与其连接的设备的型号。


Socket-outlets providing MAINS power to other apparatus shall be marked with the power or current which may be drawn. 对其他设备提供电网电源的输出插座，应标上允许输出的功率或电流。

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.

如果向其他设备供电只配备一个端子，标记可以标在设备上的任何部位，但应考虑第5章第一段的要求。

Compliance is checked by inspection. 通过检查来检验是否合格。

5.3 Where in a manufacturer's service documentation, for example in circuit diagrams or lists of components, a symbol is 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:  (ISO 7000-0434)

在制造厂商的维修文件中，例如在电路图或元器件表中使用一种符号，表示某一特定的元器件由于安全的原因，只能用该文件中规定的元器件来更换，在这种情况下，请使用下列符号： (GB/T16273.1-1996中编号129)

This symbol may also be put adjacent to the relevant component. 该符号也可以标在有关元器件的附近。

This symbol shall not be placed on components. 该符号不应标在元器件上。

Compliance is checked by inspection. 通过检查来检验是否合格。

5.4 Instructions 说明书

When information with regard to safety is required according to this standard, this information shall be given in an instruction for installation or use and supplied with the apparatus. This information shall be given in a language acceptable to the country where the apparatus is intended to be used. 按本标准的要求，需要与安全有关的资料时，这些资料应在安装和使用说明书中给出，并随同设备一起提供，这些资料应采用规范中文来表述。

NOTE 1 – Reference is made to ISO/IEC Guide 37 [12]. 注1：参见ISO/IEC Guide 37 [12].

NOTE 2 – The following information with regard to safety are recommended to be included as far as applicable:

注2：根据适用的情况，建议包括下列有关安全的资料

- minimum distances around the apparatus for sufficient ventilation; 为了充分通风，设备周围的最小间隙
- the ventilation should not be impeded by covering the ventilation openings with items, such as newspapers, table-cloths, curtains, etc.; 通风孔不应覆盖诸如报纸、桌布和窗帘等物品而妨碍通风
- no naked flame sources, such as lighted candles, should be placed on the apparatus; 设备上不应放置裸露的火焰源，如点燃的蜡烛
- attention should be drawn to the environmental aspects of battery disposal; 废弃电池对环境影响的注意事项
- the use of apparatus in tropical and/or moderate climates. 设备在热带和/或温带气候条件下的使用说明。

11.2.1 In addition, the instructions shall include the following as far as applicable.

此外，根据适用的情况，说明书应包括下列内容。

- a) For MAINS powered apparatus and for apparatus producing internal voltages greater than 35 V (peak) a.c. or d.c., having no protection against splashing water according to annex A, the instructions for use shall state that the apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus. 对不具有符合附录A的水溅防护的电网电源供电的设备以及内部产生的电压大于交流35V（峰值）或直流35V的设备，使用说明中应说明设备不应遭受水滴或水溅，而且还应说明设备上不应放置诸如花瓶一类的装满液体的物品。
- b) A warning that TERMINALS marked with the symbol according to 5.2 b) are HAZARDOUS LIVE and that the external wiring connected to these TERMINALS requires installation by an INSTRUCTED PERSON or the use of ready-made leads or cords. 对标有符合5.2 b)的符号的端子是危险带电的警告，以及对与这些端子连接的外部导线需要由经过指导的人员来安装或使用现成的引线或软线的警告。
- c) If an apparatus is provided with a replaceable lithium battery, the following applies:
如果设备装有可更换的锂电池，则要符合下列要求
 - if the battery is intended to be replaced by the USER, there shall be a warning close to the battery or in both the instructions for use and the service instructions; 如果电池准备由用户来更换，则应在电池附近给出警告，或在用户使用说明书和维修说明书中同时给出警告
 - if the battery is not intended to be replaced by the USER, there shall be a warning close to the battery or in the service instructions. 如果电池不准备由用户来更换，则应在电池附近或维修说明书中给出警告

This warning shall include the following or similar text: 该警告语应包括下列语句或类似语句

CAUTION 注意



Danger of explosion if battery is incorrectly replaced. 如果电池更换不当会有爆炸危险
Replace only with the same or equivalent type. 只能用同样类型或等效类型的电池来更换

d) Information as required according to 14.6.3. 14.6.3所要求的的信息

Compliance is checked by inspection. 通过检查来检验是否合格。

11.2.2 If a PERMANENTLY CONNECTED APPARATUS is not provided with an ALL-POLE MAINS SWITCH according to 14.6.1, the instructions shall state that an ALL-POLE MAINS SWITCH with a contact separation of at least 3 mm in each pole shall be incorporated in the electrical installation of the building.

如果永久连接式设备未按14.6.1要求提供全极电源开关, 则说明书中应说明在建筑物的电气设施中应接入一个各极触点的分开距离至少为3 mm的电源开关。

6 Hazardous radiations 辐射危险

6.1 Ionizing radiation 电离辐射

Apparatus including a potential source of ionizing radiation shall be so constructed that personal protection against ionizing radiation is provided under normal operating conditions and under fault conditions.

含有潜在电离辐射源的设备的结构应在正常工作条件和故障条件下提供对电离辐射的人身防护。

Compliance is checked by measurement under the following conditions 在下列条件下通过测量来检验是否合格
In addition to the normal operating conditions, all controls adjustable from the outside BY HAND, by any object such as a tool or a coin, and those internal adjustments or pre-sets which are not locked in a reliable manner, are adjusted so as to give maximum radiation whilst maintaining an intelligible picture for 1 h, at the end of which the measurement is made. 除了正常工作条件外, 对通过手动或用诸如工具或硬币的任何物体从外部可调节的所有控制件以及对未用可靠方法锁定的那些内部调节件或预调装置, 将其调节到能给出最大的辐射, 同时将可辨图像保持1 h, 在1 h结束时进行测量。

NOTE 1 – Soldered joints and paint lockings are examples of adequate locking. 注1: 可靠锁定的例子如焊接如漆封。

The exposure rate at any point outside the apparatus is determined by means of a radiation monitor with an effective area of 10 cm², at a distance of 5 cm from the outer surface of the apparatus.

在距离设备外表面5 cm处, 用有效面积为10 cm²的辐射监测器测定设备外部任意一点的照射量率。

Moreover, the measurement shall be made under fault conditions causing an increase of the high voltage, provided an intelligible picture is maintained for 1 h, at the end of which the measurement is made.

此外, 还应在能使高压升高的故障条件下测量, 只要将可辨图像保持1 h, 在1 h结束时进行测量即可。

The exposure rate shall not exceed 36 pA/kg (0,5 mR/h). 照射量率不应超过36 pA/kg.

NOTE 2 – The value is according to ICRP 15, clause 289 [16]. 注2: 该值根据ICRP 15第289章的规定。

A picture is considered to be intelligible if the following conditions are met:

如果符合下列条件, 则认为图像是可辨的

- a scanning amplitude of at least 70 % of the usable screen width; 扫描宽度至少为有效屏幕宽度的70%
- a minimum luminance of 50 cd/m² with locked blank raster provided by a test generator; 用测试信号发生器产生的锁定消隐光栅的最低亮度为50 cd/m²
- a horizontal resolution corresponding to at least 1,5 MHz in the centre, with a similar vertical degradation; 中心处的水平分辨率至少相当于1,5 MHz, 且有相同的垂直分辨率
- not more than one flash-over per 5 min. 每5min内的闪烁次数不多于一次。

6.2 Laser radiation 激光辐射

An apparatus containing a LASER SYSTEM shall be so constructed that personal protection against laser radiation is provided under normal operating conditions and under fault conditions.

含有激光系统的设备的结构在正常工作条件下和故障条件下应能提供对激光辐射的人身防护。

An apparatus containing a LASER SYSTEM is exempt from all further requirements of this subclause if:

含有激光系统的设备, 如果满足下列要求, 则免除本条所有进一步的要求

- classification by the manufacturer according to IEC 60825-1, clauses 3, 8 and 9 shows that the approachable emission level does not exceed class 1 under all conditions of operation, maintenance, service and failure, and 制造厂商按IEC 60825-1 (GB7247.1-2001) 第3、第8和第9章的分类表明, 设备在工作、维护、维修和故障的所有条件下可达发射水平不会超过1类, 并且
- it does not contain an embedded LASER according to IEC 60825-1.

该设备不含有符合IEC 60825-1 (GB7247.1) 要求的封闭激光器

NOTE 1 – Information about the measuring equipment is given in IEC 61040 [8].

注1: 有关测量设备的信息在IEC 61040 [8] (GB/T6360) 中给出。

NOTE 2 – The term "approachable emission level" denotes "ACCESSIBLE EMISSION LIMIT (AEL)" in the sense of IEC 60825-1. 注2: 术语“可达发射水平”在IEC 60825-1 (GB7247.1) 的意义上是指“可达发射极限 (AEL)”。

Apparatus shall be classified and labelled in accordance with the approachable emission level measured under



fault conditions, except that for apparatus not exceeding class 1, IEC 60825-1, clause 5 does not apply.

设备应按故障条件下测得的可达发射水平来进行分类和标记, 但对不超过1类的设备, IEC 60825-1第5章不适用。

All controls adjustable from the outside BY HAND or any object such as a tool or a coin, and those internal adjustments or pre-sets which are not locked in a reliable manner, are adjusted so as to give maximum radiation.
对通过手动或用诸如工具或硬币的任何物体从外部可调节的所有控制件以及对未用可靠方法锁定的那些内部调节件或预调装置, 将其调节到能给出最大的辐射。

NOTE 3 – Soldered joints and paint locking are examples of adequate locking. 注3: 可靠锁定的例子如焊接如漆封。

The laser radiation emitted by redirection as mentioned in IEC 60825-1, 3.32 b), shall not be measured for a LASER SYSTEM of class 1. 对1类激光系统, 不测量IEC 60825-1的3.32 b提到的改变发射方向的激光辐射。

Compliance is met by satisfying the relevant requirements as specified in IEC 60825-1 with the following modifications and additions:

通过检查是否满足IEC 60825-1规定的有关要求以及下列修改要求和补充要求来检验是否合格

6.2.1

- a) The apparatus shall meet under normal operating conditions, the approachable emission limits of class 1 as specified in IEC 60825-1, table 1. Time basis of the classification is 100 s. 设备在正常工作条件下应满足IEC 60825-1 (GB7247.1-2001) 表1规定的1类可达发射限值。该类别的时间基准为100 s。

Compliance is checked by performing the relevant measurements as specified in IEC 60825-1, 8.2.

通过进行IEC 60825-1 (GB7247.1-2001) 的8.2规定的有关测量来检验是否合格。

- b) If the apparatus incorporates a LASER SYSTEM which meets, under normal operating conditions, the approachable emission limits of class 1, the requirements mentioned under c) and d) do not apply.

如果设备含有一个在正常工作条件下符合1类可达发射限值的激光系统, 则c项和d项规定的要求不适用。

- c) Adequate measures shall be taken to prevent the opening of any cover BY HAND giving access to laser radiation in excess of class 1 limits. 应采取适当措施来防止手动打开任何盖子而接触超过1类限值的激光辐射。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

- d) Where safety is dependent on the proper functioning of a mechanical SAFETY INTERLOCK, this interlock shall be fail-safe (in the failure mode the apparatus is rendered inoperative or non hazardous), or shall withstand a switching test of 50 000 cycles of operation with current and voltage applied as under normal operating conditions.

对安全依赖于机械安全联锁装置正确动作的情况, 该联锁装置应是具有失效保护的联锁装置(在失效状态下能使设备不工作或无危险), 或者在施加正常工作条件下的电流和电压下应能承受50 000次循环的开关试验。

Compliance is checked by inspection or test. 通过检查或试验来检验是否合格。

6.2.2

- a) When the apparatus is operated under fault conditions as specified in 4.3, the approachable emission level from the apparatus shall be not higher than class 3A outside the wavelength range of 400 nm to 700 nm and not higher than five times the limit for class 1 within the wavelength range of 400 nm to 700 nm.

当设备在4.3规定的故障条件下工作时, 设备可达发射水平在400 nm~700 nm波长范围外应不大于3A类, 在400 nm~700 nm波长范围内应不超过1类限值的5倍。

NOTE – The class 3A limits are as specified in IEC 60825-1, table 3. 注: 3A类限值在IEC 60825-1表3中规定。

Compliance is checked by performing the relevant measurements as specified in IEC 60825-1, 8.2

通过进行IEC 60825-1 (GB7247.1-2001) 的8.2规定的有关测量来检验是否合格。

- b) If the apparatus incorporates a LASER SYSTEM which meets, under fault conditions, the approachable emission limits given in 6.2.2 a), the requirements mentioned under c) and d) do not apply.

如果设备含有一个在故障条件下能满足6.2.2 a) 给出的可达发射限值的激光系统, 则c项和d项规定的要求不适用。

- c) Adequate measures shall be taken to prevent the opening of any cover BY HAND giving access to laser radiation in excess of the limits given in 6.2.2 a).

应采取适当措施来防止手动打开任何盖子而接触超过6.2.2 a) 规定的限值的激光辐射。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

- d) Where safety is dependent on the proper functioning of a mechanical SAFETY INTERLOCK, this interlock shall be fail-safe (in the failure mode the apparatus is rendered inoperative or non hazardous), or shall withstand a switching test of 50 000 cycles of operation with current and voltage applied as under normal operating conditions.

对安全依赖于机械安全联锁装置正确动作的情况, 该联锁装置应是具有失效保护的联锁装置(在失效状态下能使设备不工作或无危险), 或者在施加正常工作条件下的电流和电压下应能承受50 000次循环的开关试验。

Compliance is checked by inspection or test. 通过检查或试验来检验是否合格。



7 Heating under normal operating conditions 正常工作条件下的发热

7.1 General 一般要求

During intended use, no part of the apparatus shall attain an excessive temperature.

在正常使用时，设备的零部件不应出现过高的温度。

Compliance is checked by measuring the temperature rises under normal operating conditions when a steady state has been attained. 通过测量设备在正常工作条件下达到稳定状态时的温升来检查其是否合格。

NOTE 1—In general, a steady state is assumed to be attained after 4 h of operation. 注:通常认为工作4h后即达到了稳定状态。

Temperature rises are determined: 用下列方法测量温升

- *in the case of winding wires, by the change in resistance method or any other method giving the average temperature of the winding wires; 对绕组线，则用电阻变化法或能给出绕组线平均温度的任何其他方法*

NOTE 2 – Care should be taken to ensure that during the measurement of the resistance of winding wires, the influence of circuits or loads connected to these winding wires is negligible.

注2: 应注意确保在测量绕组线的电阻时，连接这些绕组线的电路或负载的影响可忽略不计。

- *in other cases, by any suitable method. 在其他情况下，用任何合适的方法。*

Temperature rises shall not exceed the values specified in 7.1.1 to 7.1.5 inclusive.

温升不应超过7.1.1至7.1.5的规定值。

Protective devices, except THERMAL CUT-OUTS with automatic reset and PTC-S THERMISTORS, affecting the safety of the apparatus shall not operate during the test.

影响设备安全的保护装置在试验期间不应动作，但能自动复位的热断路器和PTC-S热敏电阻器除外。

7.1.1 ACCESSIBLE parts 可触及零部件

The temperature rise of ACCESSIBLE parts shall not exceed the values given in table 2, item a), "normal operating conditions". 可触及零部件的温升不应超过表2的a项“正常工作条件”的规定值。

7.1.2 Parts, other than windings, providing electrical insulation 除绕组外提供电气绝缘的零部件

The temperature rise of insulating parts, other than windings, providing BASIC, SUPPLEMENTARY, OR REINFORCED INSULATION, and of insulating parts, the failure of which would cause an infringement of the requirements of 9.1.1 or a fire hazard, shall not exceed the values given in table 2, item b) "normal operating conditions", taking into account note 4 of table 2.

除绕组外，提供基本绝缘、附加绝缘或加强绝缘的绝缘零部件，和其失效会导致不满足9.1.1要求或引起着火危险要求的绝缘零部件，其温升不应超过表2的b项正常工作条件下的规定值，并考虑表2的注4。

If an insulating part is used to establish a CLEARANCE or to contribute to a CREEPAGE DISTANCE and its permissible temperature rise is exceeded, then the relevant area of the insulating part is disregarded when compliance with clauses 8 and 11 is checked. 如果某个绝缘零部件是用来建立电气间隙或爬电距离的，而且已超过其允许温升，则在检查是否符合第8章和第11章要求时，该绝缘零部件的有关区域应忽略不计。

7.1.3 Parts acting as a support or a mechanical barrier 用作支架或机械隔板的零部件

The temperature rise of parts, a mechanical failure of which would cause an infringement of the requirements of 9.1.1, shall not exceed the value given in table 2, item c) "normal operating conditions".

其机械失效会导致不满足9.1.1要求的零部件，其温升不应超过表2的c项“正常工作条件”的规定值。

7.1.4 Windings 绕组

The temperature rise of windings comprising insulation providing protection against electric shock or fire hazard shall not exceed the values given in table 2, items b) and d) "normal operating conditions".

对提供防触电或防着火危险保护的绝缘的绕组，其温升不应超过表2的b项和d项“正常工作条件”的规定值。

If an insulating part is used to establish a CLEARANCE or to contribute to a CREEPAGE DISTANCE and its permissible temperature rise is exceeded, then the relevant area of the insulating part is disregarded when compliance with clauses 8 and 11 is checked. 如果某个绝缘零部件是用来建立电气间隙或爬电距离，而且已超过其允许温升限值，则在进行第8章和第11章的检查时，该绝缘零部件的有关区域应忽略不计。

NOTE – If the insulation is incorporated in a winding in such a way that its temperature rise cannot be measured directly, the temperature is assumed to be the same as that of the winding wire.

注：如果包括在绕组内的绝缘体，其温升不能直接进行测量，则认为绝缘体的温度与绕组导线的温度相同。

7.1.5 Parts not subject to a limit under 7.1.1 to 7.1.4 inclusive 不受7.1.1至7.1.4规定限值限制的零部件

According to the nature of the material, the temperature rise of the part shall not exceed the values given in table 2, item e) "normal operating conditions".

根据材料的特性，零部件的温升不应超过表2的e项“正常工作条件下”的规定值。

Table 2 – Permissible temperature rise of parts of the apparatus 表2 设备的零部件的允许温升



Parts of the apparatus 设备零部件	Normal operating conditions 正常工作条件(K)	Fault conditions 故障条件(K)
a) ACCESSIBLE parts 可触及零部件		
Knobs, handles, etc. if 旋钮、手柄等, 如果是		
- metallic 金属	30	65
- non-metallic (note 3) 非金属 (注3)	50	65
Enclosures if 外壳, 如果是		
- metallic (note 2) 金属 (注2)	40	65
- non-metallic (notes 2 et 3) 非金属 (注2和注3)	60	65
b) Parts providing electrical insulation (note 4) 提供电气绝缘的零部件 (注4)		
Supply cords and wiring insulation with 用下列材料的电源线和导线绝缘		
- polyvinyl chloride or synthetic rubber 聚氯乙烯或合成橡胶	60	100
- not under mechanical stress 不承受机械应力	45	100
- under mechanical stress 承受机械应力	45	100
- natural rubber 天然橡胶		
Other insulations of: 用下列材料组成的其他绝缘		
- thermoplastic materials (note 5) 热塑性材料 (注5)	(note 6)	(note 6)
- non-impregnated paper 未浸渍纸	55	70
- non-impregnated cardboard 未浸渍纸板	60	80
- impregnated cotton, silk, paper and textile 浸渍棉纱、丝、纸和织物	70	90
- laminates based on cellulose or textile, bonded with 以纤维素和织物为基材用下列材料结合的层压板		
- phenol-formaldehyde, melamine-formaldehyde, phenol-furfural or polyester 酚醛、三聚氰胺甲醛、苯酚糠醛或聚酯	85	110
- epoxy 环氧树脂	120	150
- mouldings of 下列材料的模压件		
- phenol-formaldehyde or phenol-furfural, melamine and melamine phenolic compounds with 酚醛或苯酚糠醛、三聚氰胺和三聚氰胺酚醛混合物加下列填料	100	130
- cellulose fillers 纤维素填料	110	150
- mineral fillers 无机物填料	95	150
- thermosetting polyester with mineral fillers 热固性聚酯加无机物填料	95	150
- alkyd with mineral fillers 醇酸树脂加无机物填料	95	150
- composite materials of 含下列材料的复合材料		
- polyester with glass-fibre reinforcement 用玻璃纤维增强的聚酯	95	150
- epoxy with glass-fibre reinforcement 用玻璃纤维增强的环氧树脂	100	150
- silicone rubber 硅酮橡胶	145	190
c) Parts acting as a support or a mechanical barrier including the inside of enclosures (note 4) 包括外壳内部用作支架和机械隔板的零部件 (注4)		
Wood and WOOD-BASED MATERIALS 木材和木制材料	60	90
Thermoplastic materials (note 5) 热塑性材料 (注5)	(note 6)	(note 6)
d) Winding wires (note 4) 绕组线 (注4)		
- insulated with 用下列材料来绝缘		
- non-impregnated silk, cotton, etc. 未浸渍的纱、丝等	55	75
- impregnated silk, cotton, etc. 浸渍的纱、丝等	70	100
- oleoresinous materials 油基树脂材料	70	135
- polyvinyl-formaldehyde or polyurethane resins 聚乙烯醇缩甲醛或聚氨酯树脂	85	150
- polyester resins 聚酯树脂	120	155
- polyesterimide resins 聚酰亚胺树脂	145	180
e) Other parts 其他零部件等于		
These temperature rises apply to parts not covered by items a), b), c) and d): 这些温升值适用于未包括在a,b,c和d项的零部件		
Parts of wood and WOOD-BASED MATERIAL 木材和木制材料的零部件	60	140
Lithium batteries 锂电池	40	50
All other parts, except resistors and parts of metal, glass, ceramic. 除电阻器和金属、玻璃、陶瓷零部件外的所有其它零部件	200	300



NOTE 1 – General 根据与材料conditions applicable to table 2: 注1: 适用于表2的通用条件

For tropical climates, permissible temperature rises of 10 K less than those specified in this table are required. 对热带气候要求允许温升比本表的规定值低10K.

The values of the temperature rises are based on a maximum ambient temperature of 35 °C for moderate climates and of 45 °C for tropical climates. 温升值对温带是以最高环境温度35 °C为基准, 对热带是以45 °C为基准。

NOTE 2 – For areas having no dimension exceeding 5 cm and for heat sinks or metallic parts directly covering heat sinks, without a dimensional restriction, which are not likely to be touched during intended use, temperature rises up to 65 K are allowed under normal operating conditions. 对尺寸不超过5 cm的表面, 以及对无尺寸限制的散热片或直接覆盖散热片的金属零部件, 在预期使用时不可能被触及, 则在正常工作条件下允许温升达到65K。

For outside parts of metal which are covered with plastic material, the thickness of which is at least 0,3 mm, a temperature rise which corresponds to the permissible temperature rise of the insulating material is allowed. 对覆盖至少有0,3 mm厚塑料材料的外部金属零部件, 允许其温升等于绝缘材料的允许温升。

NOTE 3 – If these temperature rises are higher than those allowed by the class of the relevant insulating material, the nature of the material is the governing factor. 如果这些温升高于有关绝缘材料等级的允许值, 则材料的特性是决定因素。

NOTE 4 – For the purpose of this standard, the permissible temperature rises are based on service experience in relation to the thermal stability of the materials. The materials quoted are examples. For materials for which higher temperature limits are claimed, and for materials other than those listed, the maximum temperatures should not exceed those which have been proved to be satisfactory, for example in accordance with IEC 60085. 就本标准而言, 允许的温升是根据与材料热稳定性有关的使用经验确定的。所引用的材料是实际例子。要求有较高温度限值的材料和所列材料以外的材料, 其最高温度不应超过那些已被证实是符合要求的那些温度值, 例如符合IEC 60085 (GB/T11021) 规定的温度值。

NOTE 5 – Natural rubber and synthetic rubbers are not considered as being thermoplastic materials.

天然橡胶和合成橡胶不作为热塑性材料考虑。

NOTE 6 – Due to their wide variety, it is not possible to specify permissible temperature rises for thermoplastic materials.

While the matter is under consideration, the following method shall be used:

因为热塑性材料种类的范围很宽, 不可能规定其允许温升值。鉴于此问题正在考虑的阶段, 应使用下列方法确定:

a) a softening temperature of the material is determined on a separate specimen, under the conditions specified in ISO 306 with a heating rate of 50 K/h and modified as follows:

用单独的样品按ISO306规定的加热速率50 K/h并作如下修改来测定材料的软化温度

– the depth of penetration is 0,1 mm; 压透深度为0,1 mm

– the total thrust of 10 N is applied before the dial gauge is set to zero or its initial reading noted.

先施加10N的总推力, 然后将表盘刻度调零或记下初始刻度。

b) the temperature limits to be considered for determining the temperature rises are: 确定温升所考虑的温度限值如下

– under normal operating conditions, a temperature of 10 K below the softening temperature as obtained under item a);

在正常工作条件下, 比a项测得的软化温度低10K

– under fault conditions, the softening temperature itself. 在故障条件下, 即为软化温度。

If the required softening temperature exceeds 120 °C, note 3 shall be taken into account.

如果所需要的软化温度超过120 °C, 应考虑注3。

7.2 Heat resistance of insulating material 绝缘材料的热阻

Insulating material supporting parts CONDUCTIVELY CONNECTED TO THE MAINS shall be resistant to heat if, during intended use, these parts carry a steady-state current exceeding 0,2 A and can generate substantial heat due to imperfect contact. 如果在预期使用时, 与电网电源导电连接的零部件承载的稳态电流大于0,2 A, 而且会由于接触不良而大量发热, 则支撑这些零部件的材料应是耐热的绝缘材料。

Compliance is checked by subjecting the insulating material to the test specified in table 2 under item a) of note 6. 通过使绝缘材料承受表2注6的a项试验来检验是否合格。

The softening temperature of the insulating material shall be at least 150 °C. 绝缘材料的软化温度应至少为150°C In those cases where two groups of conductors, each supported by insulating parts, can be rigidly connected or joined together, for example by plug and socket, only one of the insulating parts need meet the test. Where one of the insulating parts is fixed in the apparatus, this part shall meet the test.

对分别用绝缘零部件支撑的两组导体, 能刚性连接或插接在一起的情况, 例如插头和插座, 则仅需其中一个绝缘零部件满足试验要求。对其中一个绝缘零部件是固定在设备中的情况, 则该绝缘零部件应满足试验要求。

NOTE 1 – Examples of parts which can generate substantial heat during intended use are contacts of switches and of voltage setting devices, screw TERMINALS and fuse holders.

NOTE 2 – This test need not be performed on parts which are in accordance with a relevant IEC standard.

注1: 在预期使用时, 会出现大量发热的零部件的实例有: 开关的触点和电压设定装置的触点、螺纹端子和熔断器座。

注2: 对符合相应的(国家标准、行业标准或)IEC标准的零部件不必进行本试验。

8 Constructional requirements with regard to the protection against electric shock

防触电的结构要求

8.1 Conductive parts, covered only by lacquer, solvent-based enamel, ordinary paper, untreated textile, oxide films or beads are considered to be bare.



仅用清漆、有溶剂漆、普通纸、未经处理的织物、氧化膜或绝缘珠覆盖的导电零部件被认为是裸露零部件。
Compliance is checked by inspection. 通过检查来检验是否合格。

8.2 The apparatus shall be designed and constructed so that operation BY HAND, like

设备的设计和结构应确保在进行下列手动操作时不会引起触电危险

- changing the setting for the voltage or nature of supply; 改变电压设定或改变电源性质
- replacing fuse-links and indicator lights; 更换熔断器和指示灯
- handling of drawers etc., 操作抽屉等。

does not involve a risk of electric shock.

Compliance is checked by application of the tests of 9.1.1. 通过进行9.1.1的试验来检验是否合格。

8.3 The insulation of HAZARDOUS LIVE parts shall not be provided by hygroscopic materials.

吸湿性材料不应用来作为危险带电零部件的绝缘。

Compliance is checked by inspection and, in case of doubt, by the following test.

通过检查, 和在有怀疑时, 通过下列试验来检验是否合格。

A specimen of the material, as specified in IEC 60167, clause 9, is subjected to a temperature of $(40 \pm 2)^\circ\text{C}$, and a relative humidity of 90 % to 95 %, the conditioning period being: 材料的样品按IEC 60167 (GB/T10064-1988) 第9章的规定, 承受温度为 $40 \pm 2^\circ\text{C}$, 相对湿度为90 % ~95 %的处理, 处理时间为:

- 7 days (168 h) for apparatus to be used under tropical conditions; 对在热带条件下使用的设备, 7天 (168小时)
- 4 days (96 h) for other apparatus. 对其他设备, 4天 (96小时)。

Within 1 min after this preconditioning, the specimen shall withstand the tests of 10.3 without the humidity treatment according to 10.2. 在完成本预处理后1分钟内, 样品应承受10.3的试验, 但不进行10.2的湿热处理。

8.4 The apparatus shall be so constructed that there is no risk of an electric shock from ACCESSIBLE parts or from those parts rendered ACCESSIBLE following the removal BY HAND of a cover.

设备的结构应确保可触及零部件或手动打开盖子后变成可触及的零部件不会引起触电危险。

This requirement applies also to internal parts of battery compartments which become ACCESSIBLE by the removal of a cover when replacing the batteries.

本要求也适用于在更换电池时, 因打开电池仓盖而变成可触及的电池仓内的零部件。

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

本要求不适用于预定不由用户来更换其电池 (例如记忆用电池) 的设备内部电池仓。

Compliance is met by satisfying the requirements of 8.5 or 8.6.

通过检查是否满足8.5或8.6的要求来检验是否合格。

NOTE - Inaccessible contacts of TERMINALS are regarded as ACCESSIBLE parts, unless marked with the symbol according to 5.2 b) or intended to connect the apparatus to the MAINS or to provide MAINS power to other apparatus.

注: 认为端子的不可触及接触件是可触及零部件, 除非其标有5.2 b)规定的符号或要用来将设备与电网电源连接或要用来向其他设备提供电网电源。

8.5 For CLASS I apparatus, the ACCESSIBLE conductive parts, except for those parts of the apparatus which have DOUBLE or REINFORCED INSULATION (CLASS II construction), shall be separated from HAZARDOUS LIVE parts by BASIC INSULATION meeting the insulation requirements as specified in clause 10 and the requirements for CLEARANCES and CREEPAGE DISTANCES as specified in clause 13.

对I类设备, 其可触及导电零部件应用符合第10章规定的绝缘要求以及符合第13章规定的电气间隙和爬电距离要求的基本绝缘与危险带电零部件隔离, 具有双重绝缘或加强绝缘 (II类结构) 的那些设备零部件除外。

This requirement does not apply to insulations whose short-circuiting does not cause any electric shock hazard.

本要求不适用于其短路不会引起任何触电危险的绝缘。

NOTE 1 - For example, if one end of a secondary winding of a SEPARATING TRANSFORMER is connected to an

ACCESSIBLE conductive part, the other end need not meet any special insulation requirement with regard to the same

ACCESSIBLE conductive part. 注1: 例如, 如果分离变压器次级绕组的一端连接到可触及的导电零部件上, 则另一端对该相同的可触及导电零部件就不必满足任何特殊的绝缘要求。

A resistor bridging BASIC INSULATION shall comply with the requirements as specified in 14.1 a).

跨接在基本绝缘上的电阻器应符合14.1 a)的要求。

NOTE 2 - Parts of the apparatus which have DOUBLE or REINFORCED INSULATION (CLASS II construction) may be bridged by a resistor in compliance with the requirements as specified in 14.1 a).

注2: 符合14.1 a)要求的电阻器可以跨接在具有双重绝缘或加强绝缘 (II类结构) 的设备的零部件上。

A capacitor or RC-unit bridging BASIC INSULATION between a HAZARDOUS LIVE part and an ACCESSIBLE conductive part connected to the PROTECTIVE EARTH TERMINAL, shall comply with the requirements of 14.2.1 a). 跨接在危险带电零部件与和保护地端子连接的可触及导电零部件之间的基本绝缘上的电容器或阻容单元应符合14.2.1a)的要求。

Such resistors, capacitors or RC-units shall be positioned inside the enclosure of the apparatus.



这种电阻器、电容器或阻容单元应安装在设备外壳的内部。

CLASS I apparatus shall be provided with a PROTECTIVE EARTH TERMINAL or contact to which the protective earth contacts of socket-outlets, if any, and ACCESSIBLE conductive parts shall be reliably connected. Such connection is not necessary for those ACCESSIBLE conductive parts which are insulated from HAZARDOUS LIVE parts by DOUBLE OR REINFORCED INSULATION (CLASS II construction) or those which are protected from becoming HAZARDOUS LIVE by a conductive part reliably connected to the PROTECTIVE EARTH TERMINAL.

I类设备应装有保护接地端子或连接件，将输出插座的接地插套（如果有的话），以及可触及导电零部件与其可靠相连接。对用双重绝缘或加强绝缘（II类设备）与危险带电零部件隔离的那些可触及导电零部件，或者利用与保护接地端子可靠连接的导电零部件来防止使之变成危险带电的那些可触及导电零部件不必进行这种连接。

NOTE 3 – Examples of such a conductive part are a metal screen in a transformer between the primary and the secondary windings, a metal chassis, etc. 注3：这种接地的导电零部件的例子有，变压器初级与次级绕组之间的金属屏蔽层、金属底板等。

Compliance is checked by inspection. 通过检查来检验是否合格。

8.6 For CLASS II apparatus, the ACCESSIBLE parts shall be separated from HAZARDOUS LIVE parts either by DOUBLE INSULATION specified under item a) or by REINFORCED INSULATION specified under item b).

II类设备的可触及零部件应用a项规定的双重绝缘或b项规定的加强绝缘与危险带电零部件隔离。

This requirement does not apply to insulations whose short-circuiting does not cause any electric shock hazard. 本要求不适用于其短路不会引起任何触电危险的绝缘。

NOTE 1 – For example, if one end of a secondary winding of a SEPARATING TRANSFORMER is connected to an ACCESSIBLE conductive part, the other end need not meet any special insulation requirement with regard to the same ACCESSIBLE conductive part. 注1：例如，如果分离变压器次级绕组的一端连接到可触及导电零部件上，则另一端对该相同的可触及导电零部件就不必满足任何特殊的绝缘要求。

A component complying with the requirements of 14.1 a) or 14.3, except components according to 14.3.4.3, may bridge BASIC, SUPPLEMENTARY, DOUBLE OR REINFORCED INSULATION. 符合14.1 a)或14.3要求的元器件可以跨接在基本绝缘、附加绝缘、双重绝缘或加强绝缘上，但符合14.3.4.3要求的元件除外。

Components according to 14.3.4.3 may bridge BASIC INSULATION only. 符合14.3.4.3的元件只能跨接在基本绝缘上。

BASIC and SUPPLEMENTARY INSULATIONS may each be bridged by a capacitor or RC-unit, having the same rated values, complying with the requirements of 14.2.1 a).

符合14.2.1 a)要求、具有相同额定值的电容器或阻容单元可以分别跨接在基本绝缘和附加绝缘上。

DOUBLE OR REINFORCED INSULATION may be bridged by two capacitors or RC-units in series, having the same rated values, each complying with the requirements of 14.2.1 a).

均符合14.2.1 a)要求、具有相同额定值的两个串联的电容器或阻容单元可以跨接在双重绝缘或加强绝缘上。

Alternatively DOUBLE OR REINFORCED INSULATION may be bridged by a single capacitor or RC-unit complying with the requirements of 14.2.1 b).

另外，符合14.2.1 b)的一个电容器或阻容单元可以跨接在双重绝缘或加强绝缘上。

NOTE 2 – For external insulation, bridging DOUBLE or REINFORCED INSULATION, also see 8.8.

注2：对跨接双重绝缘或加强绝缘的外部绝缘，见8.8。

Such resistors, capacitors or RC-units shall be positioned inside the enclosure of the apparatus.

这种电阻器、电容器或阻容单元应安装在设备外壳的内部。

Compliance is checked by inspection. 通过检查来检验是否合格。

a) If ACCESSIBLE parts are separated from HAZARDOUS LIVE parts by BASIC and SUPPLEMENTARY INSULATION, the following shall apply: 如果可触及零部件用基本绝缘和附加绝缘与危险带电零部件隔离，则应采用下列要求：

Each of these insulations shall comply with the insulation requirements as specified in clause 10 and with the requirements for CLEARANCES and CREEPAGE DISTANCES specified in clause 13.

这些绝缘的每一种绝缘应符合第10章的绝缘要求以及符合第13章的电气间隙和爬电距离的要求。

Enclosures of wood not complying with the requirements of 8.3 are permitted as SUPPLEMENTARY INSULATION if they withstand the dielectric strength test of 10.3.

不符合8.3要求的木质外壳如果能承受10.3的抗电强度试验，则可以用作附加绝缘。

Compliance is checked by inspection and/or measurement. 通过检查（和/或测量）来检验是否合格。

b) If ACCESSIBLE parts are separated from HAZARDOUS LIVE parts by REINFORCED INSULATION the following shall apply: 如果可触及零部件用加强绝缘与危险带电零部件隔离，则应采用下列要求：

The insulation shall comply with the insulation requirements specified in clause 10. Moreover, it shall comply with the requirements for CLEARANCES and CREEPAGE DISTANCES specified in clause 13.

这些绝缘的每一种绝缘应符合第10章的绝缘要求以及符合第13章的电气间隙和爬电距离的要求。

NOTE 3 – An example of assessment of REINFORCED INSULATION is given in figure 2.

注3：图2给出了评定加强绝缘的示例。

Compliance is checked by inspection and/or measurement. 通过检查和/或测量来检验是否合格。



8.7 For voltages above 35 V (peak) up to and including 71 V (peak) a.c. or above 60 V d.c. up to and including 120 V d.c. (RIPPLE FREE), measured at the RATED SUPPLY VOLTAGE under normal operating conditions and under fault conditions, in deviation from 8.5 or 8.6 respectively, BASIC INSULATION meeting the requirements of clause 10 and clause 13 is sufficient, between circuits with the voltages above and ACCESSIBLE parts or parts connected to ACCESSIBLE conductive parts. 对不属于8.5或8.6的情况,在正常工作条件下和故障情况下,在额定电源电压下测得的交流电压在35V(峰值)以上至71V(包括71V)(峰值),或直流电压在60V至120V(包括120V)(无纹波)的电路与可触及零部件或和可触及零部件相连的零部件之间,满足第10章和第13章要求的基本绝缘就足以符合要求。Circuits with the voltages above shall be separated from HAZARDOUS LIVE parts with higher voltages by DOUBLE or REINFORCED INSULATION according to 8.6 or by an ISOLATING TRANSFORMER according to 14.3.2 (CLASS II construction) or by a conductive part connected to the PROTECTIVE EARTH TERMINAL according to 8.5 or by a transformer according to 14.3.3 (CLASS I construction). 带上述电压的电路与带较高电压的危险带电零部件的隔离应用符合8.6规定的双重绝缘或加强绝缘,或者用符合14.3.2规定的隔离变压器(II类结构),或者用符合8.5规定的与保护接地端子连接的导电零部件,或者用符合14.3.3规定的隔离变压器(I类结构)

Compliance is checked by inspection. 通过检查来检验是否合格。

8.8 BASIC, SUPPLEMENTARY and REINFORCED INSULATION shall each withstand the dielectric strength test as specified in 10.3. 基本绝缘、附加绝缘和加强绝缘应各自承受10.3规定的抗电强度试验。

For DOUBLE INSULATION either the BASIC or the SUPPLEMENTARY INSULATION shall have a thickness of at least 0,4 mm. 对双重绝缘,其基本绝缘或附加绝缘的厚度应至少为0,4 mm。

REINFORCED INSULATION shall have a minimum thickness of 0,4 mm when not subject to any mechanical stress which, at the temperatures during normal operating conditions and under fault conditions, would be likely to lead to deformation or deterioration of the insulating material. 当加强绝缘不承受在正常工作条件和故障条件的温度下可能会导致绝缘材料变形或劣变的任何机械应力时,则该加强绝缘的最小厚度应为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.

注:在承受机械应力条件下,加强绝缘的厚度必须增加到符合第10章规定绝缘的要求,以及第12章规定的机械强度要求。

The above requirements are not applicable to insulation in thin sheet materials irrespective of their thickness provided that: 上述要求不适用于不考虑其厚度的薄层绝缘材料,只要符合下列要求即可

- it is used within the enclosure of the apparatus, and 在设备的外壳内使用; 以及
- 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 基本绝缘或附加绝缘至少由两层材料组成,两层中的每一层均应通过10.3对基本绝缘或附加绝缘规定的抗电强度试验; 或者
- 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 基本绝缘或附加绝缘由三层材料组成,三层中两层合并的所有组合均应通过10.3对基本绝缘或附加绝缘规定的抗电强度试验; 或者
- 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 加强绝缘至少由两层材料组成,两层中的每一层均应通过10.3对加强绝缘规定的抗电强度试验; 或者
- REINFORCED INSULATION comprises three layers of insulation material for which all combinations of two layers together pass the dielectric strength test specified in 10.3 for REINFORCED INSULATION. 加强绝缘由三层材料组成,三层中两层合并的所有组合均应通过10.3对加强绝缘规定的抗电强度试验。

There is no requirement for all layers of insulation to be of the same insulating material.

不要求所有绝缘层使用相同的材料。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

8.9 The insulation of internal wiring between HAZARDOUS LIVE conductors in wires or cables and ACCESSIBLE parts, or between HAZARDOUS LIVE parts and conductors in wires or cables connected to ACCESSIBLE conductive parts, shall have a thickness of at least 0,4 mm if made of polyvinyl chloride. Other materials are allowed provided that they withstand the dielectric strength test specified in 10.3 and that their thickness ensures an equivalent mechanical strength, where the construction so requires.

电线或电缆中的危险带电导体与可触及零部件之间,或者危险带电零部件与电线或电缆中和可触及导电零部件连接的导体之间的内部导线绝缘,如果是由聚氯乙烯材料制成,则厚度至少应为0,4 mm。其他材料如果能承受10.3规定的抗电强度试验,而且其厚度能保证结构所要求的等效机械强度,则也允许使用。

NOTE – For example a polytetrafluoroethylene (PTFE) insulation having a thickness of at least 0,24 mm is considered to fulfil this requirement. 注:例如,认为厚度至少为0.24mm的聚四氟乙烯(PTFE)绝缘能满足本要求。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

8.10 In CLASS II apparatus DOUBLE INSULATION shall be provided between



II类设备中，下列零部件之间应具有双重绝缘

- ACCESSIBLE parts and conductors in wires or cables CONDUCTIVELY CONNECTED TO THE MAINS and 可触及零部件与电线或电缆中和电网电源导电连接的电线或电缆中的导体之间；以及
- conductors in wires or cables connected to ACCESSIBLE conductive parts and parts CONDUCTIVELY CONNECTED TO THE MAINS. 电线或电缆中和可触及导电零部件连接的导体和与电网电源导电连接的零部件之间。

Either the BASIC or the SUPPLEMENTARY INSULATION shall comply with the requirements of 8.9. The other insulation shall withstand the dielectric strength test specified in 10.3 for BASIC or SUPPLEMENTARY INSULATION.

基本绝缘或附加绝缘应符合8.9的要求，其他绝缘则应承受10.3对基本绝缘或附加绝缘规定的抗电强度试验。

If DOUBLE INSULATION consists of two layers which cannot be tested separately, it shall withstand the dielectric strength test specified in 10.3 for REINFORCED INSULATION.

如果双重绝缘是由不能分别进行试验的二层绝缘组成，则应按10.3对加强绝缘规定的要求进行抗电强度试验。

The test voltage of 10.3 is applied between the conductor and metal foil wrapped tightly around the insulation of the wire over a length of 10 cm.

10.3中的试验电压应施加在导体与紧密缠绕在电线绝缘上长度超过10 cm的金属箔之间。

In the case of insulating sleeves, the test voltage of 10.3 is applied between a tight-fitting metal rod inserted into the sleeve and a metal foil wrapped tightly around the sleeve over a length of 10 cm. 对于绝缘套管，10.3的试验电压应施加在恰好插入套管的金属棒与紧密缠绕在绝缘套管上长度超过10 cm的金属箔之间。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

8.11 The construction of the apparatus shall be such that, should any wire become detached, the CLEARANCES and CREEPAGE DISTANCES are not reduced below the values specified in clause 13 by the natural movement of a detached wire. This requirement does not apply if there is no risk of a wire becoming detached.

设备的结构应保证一旦任何导线松脱而不会因松脱的导线的自然移动使电气间隙和爬电距离减小到小于第13章的规定值。如果导线没有松脱危险，则本要求不适用。

NOTE 1 – It is assumed that not more than one connection will become detached at the same time.

注1：假定一个以上的连接点不会同时松脱。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

NOTE 2 – Examples of methods deemed to prevent a wire from becoming detached are:

注2：认为能防止电线松脱的方法的例子有

- a) the conductor of the wire is anchored to the tag before soldering, unless breakage close to the soldering place is likely to occur as a result of vibration; 电线的导体在焊接前先固定到卡子上，由于振动使靠近焊接点处可能发生断裂的情况除外；
- b) wires are twisted together in a reliable manner; 用可靠的方法将电线扭绞在一起；
- c) wires are fastened together reliably by cable ties, adhesive tapes with thermosetting adhesives according to IEC 60454, sleeves or the like; 用电缆绑扎线、符合IEC 60454带热固性粘剂的胶带、套管或类似材料将电线可靠地拴在一起；
- d) the conductor of the wire is inserted into a hole in a PRINTED BOARD before soldering, the hole having a diameter slightly greater than that of the conductor, unless breakage close to the PRINTED BOARD is likely to occur as a result of vibration; 电线的导体在焊接前，先将导体插入印制板的孔中，该孔的直径稍大于电线导体的直径，由于振动使靠近印制板处发生断裂的情况除外；
- e) the conductor of the wire and its insulation, if any, are securely wrapped around the termination by means of a special tool; 用专用工具将电线的导体及其绝缘（如果有的话）可靠地绕接在端子上；
- f) the conductor of the wire and its insulation, if any, are crimped to the termination by means of a special tool.

用专用工具将电线的导体及其绝缘压接在端子上。

The methods under items a) up to and including f) apply to internal wires and the methods under items a) up to and including c) to external flexible cords. a项至f项的方法适用于内部导线，a项至c项的方法适用于外接软线。

In case of doubt, the vibration test of 12.1.2 is carried out to verify compliance.

如有怀疑，进行12.1.2的振动试验来检验是否合格。

8.12 Conductors of internal wiring connecting MAINS socket-outlets incorporated in the apparatus to the MAINS TERMINALS either directly or via a MAINS switch shall comply with the cross-sectional area requirements of 16.2.

设备内部直接或通过电源开关将电网电源输出插座与电网电源端子相连的机内连线的导体，其横截面积应符合16.2的要求。

Compliance is checked by inspection. 通过检查来检验是否合格。

8.13 Windows, lenses, signal lamp covers, etc. shall be fastened by positive means if HAZARDOUS LIVE parts are rendered ACCESSIBLE by their absence.

危险带电零部件要依靠其防触及的窗口、透镜、信号灯罩等应用可靠的方法将它们固定。

NOTE – Friction only is not regarded as a positive means. 注：仅靠摩擦力不能认为是可靠的方法。

Compliance is checked by inspection and, in case of doubt, by applying a force from the outside of 20 N for 10 s at the most unfavourable place and in the most unfavourable direction.

通过检查，和在有怀疑时，在最不利的部位从最不利的方向施加20N的力持续10s。



8.14 Covers which may be subjected to forces during intended use, for example covers supporting TERMINALS (see clause 15) shall be fastened by positive means if HAZARDOUS LIVE parts are rendered ACCESSIBLE by their absence. 危险带电零部件要依靠其防触及的, 在预期使用时可能承受力的外壳, 例如支撑端子(见15章)的外壳应用可靠的方法将它们固定。

NOTE – Friction only is not regarded as a positive means. 注: 仅靠摩擦力不能认为是可靠的方法。

Compliance is checked by inspection and, in case of doubt, by applying a force of 50 N for 10 s at the most unfavourable place and in the most unfavourable direction.

通过检查, 以及如有怀疑时, 在最不利的部位从最不利的方向施加50N的力持续10s。

After the tests of 8.13 and 8.14, the apparatus shall show no damage in the sense of this standard; in particular no HAZARDOUS LIVE parts shall become ACCESSIBLE.

在完成8.13和8.14试验后, 设备不应出现本标准意义上的损伤, 特别是危险带电零部件不应变成可触及。

8.15 Internal wiring of the apparatus, damage to the insulation of which is liable to cause a hazard in the sense of this standard, shall 对设备的内部导线, 若其绝缘的损伤容易引起本标准意义上的危险, 则应:

- be secured so as not to contact parts exceeding the permissible temperature rise for the insulation of the wires as specified in table 2 when a force of 2 N is applied to any part of the wiring or their surroundings, and 将其固定以便当对该导线的任何一部分或其周围的零部件施加2N的力时, 不会使其接触到其温升值超过表2对该种导线绝缘的允许温升的零部件; 以及
- be so constructed that there is no risk of damage to the insulation of the wires, for example sharp edges, moving parts or pinches, which may come into contact with other parts of the apparatus, when a force of 2 N is applied to any part of the wiring or their surroundings. 在其结构上, 应使其绝缘不会受到损伤, 例如: 对该导线任何一部分或其周围的零部件施加2N的力时, 而使其与设备其他零部件接触时, 导线的绝缘不会受到诸如尖锐边缘、运动零部件或挤压损伤的危险。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

8.16 Apparatus designed to be supplied exclusively by a SUPPLY APPARATUS specified by the manufacturer of the apparatus, shall be so constructed that the SPECIAL SUPPLY APPARATUS cannot be replaced, without modification, by a SUPPLY APPARATUS FOR GENERAL USE. 设计成专门要由制造厂商规定的电源设备来供电的设备, 其结构应保证通用电源设备不加修改就不可能替换该专用电源设备。

NOTE – The required non-interchangeability may be obtained for example by special connections.

注: 所需的不可互换性可以用诸如专用连接器来实现。

Compliance is checked by inspection. 通过检查来检验是否合格。

9 Electric shock hazard under normal operating conditions 正常工作条件下的触电危险

9.1 Testing on the outside 外部试验

9.1.1 General 一般要求

HAZARDOUS LIVE parts shall not be ACCESSIBLE. 危险带电零部件应是不可触及的。

NOTE 1 – For interconnection with apparatus under the scope of other standards, circuits should comply with 9.1.1 and, depending upon the construction, with 8.5 or 8.6.

注1: 当与属于其他标准范围内的设备相连时, 其电路应符合9.1.1的要求, 以及根据结构情况应符合8.5或8.6的要求。

In addition, when not connected to another apparatus, inaccessible contacts of TERMINALS shall not be HAZARDOUS LIVE, with the following exceptions:

另外, 当不与其他设备相连时, 端子的不可触及接触件不应危险带电, 但下列情况除外

- contacts of signal output TERMINALS, if they have to be HAZARDOUS LIVE for functional reasons, provided the contacts are separated from the supply source as required according to clause 8 for ACCESSIBLE conductive parts. 信号输出端子的接触件, 由于功能原因, 这些接触件必须危险带电, 则只要这些接触件按第8章对可触及导电零部件规定的要求与电源隔离即可。

NOTE 2 – Inaccessible input TERMINALS, for example of loudspeakers, are permitted to be HAZARDOUS LIVE when connected to such output TERMINALS.

注2: 不可触及的输入端子, 例如扬声器的输入端子, 与上述这种输出端子连接时允许危险带电。

NOTE 3 – For the marking of such output TERMINALS see 5.2 b). 注3: 这种输出端子的标记见5.2 b)。

- TERMINALS complying with 15.1.1 provided for connecting the apparatus to the MAINS, socket-outlets and contacts of connecting blocks for providing power to other apparatus.

符合15.1.1条要求的将设备连接到电网电源的端子、输出插座和向其他设备供电的连接件。

In order to verify that a part or a contact of a TERMINAL is not HAZARDOUS LIVE, the following measurements are carried out between any two parts or contacts, then between any part or contact and either pole of the supply source used during the test. Discharges shall be measured to the TERMINAL provided for connecting the apparatus to the supply source, immediately after the interruption of the supply. 为了确定某一零部件或某一端子的某个接触件是否危险带电, 应在任意两个零部件或接触件之间, 以及任意一个零部件或接触件与试验时所用电源



的任意一极之间进行下列测量。对将设备连接到电源的端子，应在断开电源后立即测量放电量。

NOTE 4 – For discharges between the poles of the MAINS plug, see 9.1.6. 注4：电源插头极间的放电量，见9.1.6。

The part or contact of a TERMINAL is not HAZARDOUS LIVE if:

如果满足下列要求，则零部件或端子的接触件是非危险带电的

- a) the open-circuit voltage does not exceed 35 V (peak) a.c. or 60 V d.c., or, if a) is not met, 开路电压不超过交流35V（峰值）或直流60V；或者，如果不满足a项，则
- b) the measurement of the TOUCH-CURRENT shall be carried out in accordance with IEC 60990, with the measuring network described in annex D of this standard. 按IEC 60990（GB/T12113-1996）的规定使用本标准附录D的测量网络进行接触电流的测量。

The TOUCH CURRENT expressed as voltages U_1 and U_2 , does not exceed the following values:

以电压 U_1 和 U_2 表示的接触电流不应超过下列规定值

- for a.c.: $U_1 = 35$ V (peak) and $U_2 = 0,35$ V (peak); 对交流： $U_1=35$ V（峰值）， $U_2=0.35$ V（峰值）
- for d.c.: $U_1 = 1,0$ V, 对直流： $U_1=1.0$ V

NOTE 5 – The limit values of $U_2 = 0,35$ V (peak) for a.c. and $U_1 = 1,0$ V for d.c. correspond to the values 0,7 mA (peak) a.c. and 2,0 mA d.c.

The limit value $U_1 = 35$ V (peak) for a.c. corresponds to the value 70 mA (peak) a.c. for frequencies greater than 100 kHz.

注5：交流限值 $U_2=0.35$ V（峰值）和直流限值 $U_1=1.0$ V相当于交流限值0.7mA（峰值）和直流限值2.0mA。

交流限值 $U_1=35$ V（峰值）相当于频率大于100KHz时的交流限值70mA（峰值）。

and moreover, 此外

- c) the discharge does not exceed 45 μ C for stored voltages between 60 V and 15 kV, or 贮存电压在60V到15KV之间者，放电量不超过45 μ C；或
- d) the energy of discharge does not exceed 350 mJ for stored voltages exceeding 15 kV. 贮存电压超过15KV者，放电能量不超过350 mJ。

NOTE 6 – It is recommended that for apparatus intended to be used in tropical climates, the values given in a) and b) above, be halved. 建议对要在热带环境中使用的设备，上述a项和b项给出的数值减半。

NOTE 7 – To avoid unnecessarily high TOUCH CURRENTS when several apparatus are interconnected, it is recommended that the individual TOUCH CURRENT values are not higher than needed for functional reasons.

注7：当几个设备互连时，为了避免不必要的大接触电流，建议单台设备的接触电流值不大于因功能原因所需要的电流值。

In order to determine whether a HAZARDOUS LIVE part is ACCESSIBLE, the jointed test finger according to test probe B of IEC 61032, is pushed against the enclosure or inserted through any openings of the enclosure, including openings in the bottom, without appreciable force.

为了确定危险带电零部件是否可触及，要用符合IEC 61032（GB/T16842-1997）的试具B要求的有关试验指（接缝测试指）按压外壳或不施加明显的外力插入外壳上的任何开孔，包括底部的开孔。

Through openings, the test finger is applied to any depth that the finger will permit and is rotated or angled before, during and after insertion to any position. If the opening does not allow the entry of the finger, the force on the finger in the straight position is increased to $20 \text{ N} \pm 2 \text{ N}$ and the test repeated with the finger in angled position. 试验指通过开孔，插入到能使试验指到达的任何深度，并在插入到任何位置之前、插入到任何位置期间和插入到任何位置之后，转动或改变插入角度。如果试验指不能进入开孔，则将沿试验指方向的作用力增加到 $20 \text{ N} \pm 2 \text{ N}$ ，并以不同的角度用试验指反复试验。

Conductive parts, covered only by lacquer, solvent-based enamel, ordinary paper, untreated textile, oxide films or beads are considered to be bare.

认为仅用清漆、有溶剂漆、普通纸、未经处理的织物、氧化膜或绝缘珠覆盖的导电零部件是裸露的零部件。

For CLASS II constructions, the test probe 13 of IEC 61032 shall not touch HAZARDOUS LIVE parts when applied with a force of $3 \text{ N} \pm 0,3 \text{ N}$ in every possible position. 对II类结构，当使用IEC 61032（GB/T16842-1997）的试具13在每一个可能的位置上施加 $3 \text{ N} \pm 0,3 \text{ N}$ 的力时，试具不应接触危险带电零部件。

The test probe is not applied to socket-outlets, connectors providing MAINS power, fuse holders and the like.

试具不应施加到输出插座、提供电网电源的连接器和熔断器座等类似装置上。

NOTE 8 – For indication of electrical contact a voltage of not less than 40 V and not more than 50 V in series with a suitable lamp may be used. 注8：可以使用一个合适的灯泡与大于40V但小于50V的电压串联来指示电接触。

The above requirements to determine whether a HAZARDOUS LIVE part is ACCESSIBLE apply only to HAZARDOUS LIVE voltages not exceeding 1 000 V a.c. or 1 500 V d.c. For higher voltages, there shall be a CLEARANCE between the part at HAZARDOUS LIVE voltage and the test finger or the test pin as specified in 13.1.1 for BASIC INSULATION (see figure 3).

上述用来确定危险带电零件是否可触及的要求只适用于危险带电电压不超过交流1000V或直流1500V。对更高的电压，在危险带电零部件与试验指或试验针之间应有符合13.1.1对基本绝缘规定的电气间隙（见图3）

9.1.2 Shafts of operating knobs, handles, levers and the like 操作旋钮、把手和操纵杆等的轴

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Shafts of operating knobs, handles, levers and the like shall not be HAZARDOUS LIVE.

操作旋钮、把手和操纵杆等的轴不应危险带电。

Compliance is checked by inspection, in case of doubt by measurement according to 9.1.1.

通过检查，在有怀疑时，通过9.1.1规定的测量来检验是否合格。

9.1.3 Openings of the enclosure 外壳开孔

The apparatus shall be so designed that suspended foreign bodies cannot become HAZARDOUS LIVE, when introduced through ventilation or other holes.

设备的设计应保证使悬挂的外来物在进入通风孔或其他孔洞时不会变成危险带电件。

Compliance is checked by applying to the holes a metal test pin having a diameter of 4 mm and a length of 100 mm. The test pin is suspended freely from one end, the penetration is limited to the length of the test pin.

用一个直径为4 mm、长度为100 mm的金属试验针插到孔内来检验是否合格。以试验针一端悬空自由地插入，插入深度不超过其长度。

The test pin shall not become HAZARDOUS LIVE. 试验针不应成为危险带电件。

9.1.4 TERMINALS 端子

The use of a single-pole plug or a bare wire to make connection with a contact of a TERMINAL for earth or antenna or for audio, video or associated signals, shall not involve the risk of an electric shock.

用单极插头或裸线去连接接地端或天线端子接触件，或与音频、视频或有关信号端子的接触件，不应有触电危险。

The test is not applied to TERMINALS marked with the symbol of 5.2 b). 对标有5.2b规定的符号的端子不进行本试验

NOTE – See also 15.1.2. 注：见15.1.2

Compliance is checked by the following tests: 通过下列试验来检验是否合格

Within 25 mm measured from each contact of the TERMINAL, a test pin according to IEC 61032, test probe 16, is applied in every possible position, in case of doubt with a force of $10\text{ N} \pm 1\text{ N}$. 在从端子的每一个接触件算起的25 mm范围内，在每一个可能的位置施加符合IEC 61032的试具16的金属丝，在有怀疑时，施加 $10\text{ N} \pm 1\text{ N}$ 的力。

Each contact is tested with a straight test probe according to IEC 61032, test probe D, in case of doubt with a force of $1\text{ N} \pm 0,1\text{ N}$.

用符合IEC 61032的试具D要求的直的金属丝对每一个接触件进行试验，如果有怀疑时，施加 $1\text{ N} \pm 0,1\text{ N}$ 的力。

The test probes shall not become HAZARDOUS LIVE. 金属丝不应变成危险带电件。

9.1.5 Pre-set controls 预调控制件

If a hole giving access to pre-set controls is marked as such on the enclosure or in the instruction for use, and the setting of this control requires a screwdriver or other tool, the adjustment of the control shall not involve the risk of an electric shock. 如果在外壳上或使用说明书上标出了通向预调控制件的孔，而且调节该控制件需要改锥或其他工具，则调节预调控制件时不应有触电危险。

Compliance is checked by applying to the opening a test probe according to IEC 61032, test probe C.

通过用符合IEC 61032的试具C规定的试验棒对开孔检查来检验是否合格。

The test probe is applied in every possible position, in case of doubt with a force of $10\text{ N} \pm 1\text{ N}$.

用试验棒对每一个可能的位置进行检查，在有怀疑时，施加 $10\text{ N} \pm 1\text{ N}$ 的力。

The test probe shall not become HAZARDOUS LIVE. 试验探头不应变成危险带电件。

9.1.6 Withdrawal of MAINS plug 拔出电源插头

Apparatus intended to be connected to the MAINS by means of a MAINS plug shall be so designed that there is no risk of an electric shock from stored charge on capacitors, when touching the pins or contacts of the plug after its withdrawal from the socket-outlet. 对预定采用电源插头与电网电源连接的设备，其设计应保证在插头从电源插座拔出后，当接触插头的插脚或插销时，不应因电容器贮存的电荷而产生触电危险。

NOTE – For the purpose of this subclause, male interconnection couplers and male appliance couplers are regarded as MAINS plugs. 注：就本条而言，阳互连耦合器或阳器具耦合器被认为电源插头。

Compliance is checked by measurement according to 9.1.1 a) or c) or by calculation.

The MAINS switch, if any, is in the off-position, unless it is more unfavourable in the on-position.

Two seconds after withdrawal of the MAINS plug, the pins or contacts of the plug shall not be HAZARDOUS LIVE.

The test may be repeated up to 10 times to obtain the most unfavourable situation.

If the nominal capacitance across the MAINS poles does not exceed $0,1\text{ }\mu\text{F}$, no test is conducted.

通过9.1.1 a项或c项规定的测量，或通过计算来检验是否合格。

电源开关，如果有，置于“断”位，除非置于“通”位会产生更不利的情况。

在拔出插头后2s，插头上的插脚或插销不应变成危险带电。

为了能找到最不利的情况，此试验可重复10次。

如果电源两极之间的标称电容量不超过 $0,1\text{ }\mu\text{F}$ ，则不必进行本试验。

9.1.7 Resistance to external forces 抗外力



The enclosure of the apparatus shall be sufficiently resistant to external forces.

设备的外壳应有足够的强度来抵挡外力的作用。

Compliance is checked by the following tests: 通过下列试验来检验是否合格

a) by means of a rigid test finger according to IEC 61032, test probe 11, a force of $50\text{ N} \pm 5\text{ N}$, directed inwards, is applied for 10 s to different points of the enclosure including openings and textile coverings.

用符合IEC 61032 (GB/T16842-1997)的试具11要求的刚性试验指在外壳的不同部位上, 包括在开孔和织物外罩上, 向内施加 $50\text{ N} \pm 5\text{ N}$ 的力, 持续10 s。

The force shall be so exerted by the tip of the test finger as to avoid wedge or lever action.

用试验指顶端加力时, 应避免楔或撬的动作。

During the test the enclosure shall not become HAZARDOUS LIVE, HAZARDOUS LIVE parts shall not become ACCESSIBLE, textile coverings shall not touch HAZARDOUS LIVE parts;

试验期间, 外壳不应变成危险带电, 危险带电零部件不应变成可触及, 织物外罩不应触及危险带电零部件。

b) by means of a test hook as shown in figure 4, a force of $20\text{ N} \pm 2\text{ N}$, directed outwards, is applied for 10 s at all points where this is possible. 用图4所示的试验钩, 在所有可能的部位上, 向外施加 $20 \pm 2\text{ N}$ 的力, 持续10s。

During the test, HAZARDOUS LIVE parts shall not become ACCESSIBLE; 试验期间, 危险带电零部件不应变成可触及。

c) external conductive enclosures and conductive parts of an external enclosure shall be subjected for 5 s to a steady force of $(250 \pm 10)\text{ N}$ for floorstanding apparatus or $(100 \pm 10)\text{ N}$ for other apparatus, applied to the enclosure or to a part of the enclosure fitted to the apparatus, by means of a suitable test tool providing contact over a circular plane surface 30 mm in diameter.

通过一个直径30 mm的圆形接触平面的试验工具对外部导电的外壳和外外部外壳上的导电零部件施加稳定的作用力5 s, 对落地式设备, 作用力为 $250 \pm 10\text{ N}$; 对其他设备为 $100\text{ N} \pm 10\text{ N}$ 。

NOTE 1 – Contacts of TERMINALS are not considered to be a conductive part of the external enclosure.

注1: 端子的接触件不认为是外部外壳的导电零部件。

After the tests, the apparatus shall show no damage in the sense of this standard.

试验后, 设备不应出现本标准意义上的损伤。

NOTE 2 – The apparatus need not be connected to the supply source during the tests.

注2: 试验时, 设备不必连接到供电电源上。

9.2 Removal of protective covers 移去保护盖

A part which becomes ACCESSIBLE by the removal of a cover BY HAND shall not be HAZARDOUS LIVE.

手动移去保护盖后变成可触及的零部件不应是危险带电的。

This requirement applies also to internal parts of battery compartments which become ACCESSIBLE by the removal of a cover either BY HAND or with the use of a tool, coin or other object, when replacing the batteries. An exception is made in the case of batteries which are not intended to be replaced by the USER, for example batteries for memories. 本要求也适用于在更换电池时, 手动或使用工具、硬币或其他物体来移去盖子而变成可触及的电池仓内的零部件, 但对预定不由用户来更换电池(如记忆用电池)的情况除外。

Compliance is checked by application of the tests of 9.1.1, except that the measurements are made 2 s after removal of the cover. 通过9.1.1规定的试验来检验是否合格, 但测量要在移去保护盖后2 s进行。

NOTE – Any part removable BY HAND of a voltage setting device is considered to be a protective cover.

注: 对电压设定装置, 认为手动可移去的任何零部件就是保护盖。

10 Insulation requirements 绝缘要求

10.1 Surge test 电涌试验

Insulation between ACCESSIBLE parts or parts connected to them and HAZARDOUS LIVE parts, shall be able to withstand surges due to transients, caused for example by thunderstorms and entering the apparatus through the antenna TERMINAL. 可触及零部件或和它们相连接的零部件与危险带电零部件之间的绝缘应能承受诸如由于雷击并通过天线端子注入设备而引起瞬态电涌冲击。

Compliance is checked by the following test: 通过下列试验来检验是否合格

The insulation between 下列部位之间的绝缘应承受如图5a所示试验电路中充电到10 kV的1 nF的电容器以12次/分的最大速率进行的50次的放电

– TERMINALS for the connection of antenna and MAINS supply TERMINALS, 天线连接端子与电网电源端子之间; and between 以及

– MAINS supply TERMINALS and any other TERMINAL in case of apparatus which may be interconnected to other apparatus with antenna TERMINALS, 电网电源端子与设备上任何其他与带天线的其他设备相连接的端子之间 is subjected to 50 discharges at a maximum rate of 12/min, from a 1 nF capacitor charged to 10 kV in a test circuit, as shown in figure 5a.

NOTE – During this test, the apparatus should not be energized. 注: 试验期间, 设备不应通电。

After the test, the tested insulation shall comply with the requirements of 10.3.



在本试验后, 受试绝缘应满足10.3的要求。

10.2 Humidity treatment 湿热处理

The safety of the apparatus shall not be impaired by humidity conditions which may occur in the intended use. 设备的安全不应受到在预期使用中可能出现的湿热环境的损害。

Compliance is checked by the humidity treatment described in this subclause, followed immediately by the tests of 10.3. 通过本条规定的湿热处理, 然后立即进行10.3规定的试验来检验是否合格。

Cable entries, if any, are left open. If knock-outs are provided, they are opened.

如果有电缆进线口, 将其打开, 如果具有敲落孔, 则应将它们敲碎。

Electrical components, covers and other parts which can be removed BY HAND are removed and subjected, if necessary, to the humidity treatment with the main part.

可以手动拆除的电气元件、盖板和其他零部件均予以拆除, 如有必要, 则将它们随同主件一起承受湿热处理。

The humidity treatment is carried out in a humidity chamber containing air with a relative humidity of $93_{+2-3}\%$.

The temperature of the air, at all places where the apparatus can be located, is maintained at $30_{+0-2}\text{ }^{\circ}\text{C}$.

湿热处理在空气相对湿度为 $93_{+2-3}\%$ 的湿热箱中进行。在能搁置设备的所有地方的空气温度应保持在 $30_{+0-2}\text{ }^{\circ}\text{C}$ 。

Apparatus intended to be used in tropical climates are subjected to a temperature of $40_{+2-2}\text{ }^{\circ}\text{C}$ and a relative humidity of $93_{+2-3}\%$. 预定要在热带使用的设备承受温度为 $40_{+2-2}\text{ }^{\circ}\text{C}$ 、相对湿度为 $93_{+2-3}\%$ 的湿热处理。

Before being placed in the chamber, the apparatus is brought to a temperature between the specified temperature and a 4 K higher temperature. 设备在放进湿热箱之前, 先置于温度在规定的 t 和 $t+4\text{K}$ 之间的环境中。

The apparatus is kept in the chamber for 设备在湿热箱内搁置时间为

– 5 days (120 h) for apparatus intended to be used in tropical climates, 预定要在热带使用的设备: 5天

– 2 days (48 h) for other apparatus. 其他设备: 2天 (48小时)。

NOTE 1 – In most cases, the apparatus may be brought to the specified temperature by keeping it at this temperature for at least 4 before the humidity treatment. 注1: 多数情况下, 设备在进行湿热处理前可以先放置在该规定的环境温度中至少保持4h。

NOTE 2 – Some methods of achieving the specified relative humidities are described in IEC 60260 [5].

注2: 获得规定的相对湿度的某些方法在IEC 60260 [5]中作出规定。

NOTE 3 – The air in the chamber should be stirred and the chamber should be so designed that mist or condensed water will not precipitate on the apparatus. 注3: 湿热箱中的空气应是流通的, 湿热箱的设计应不使湿气或冷凝水凝结在设备上。

NOTE 4 – During this test, the apparatus should not be energized. 注4: 试验期间, 设备不应通电。

After this treatment, the apparatus shall show no damage in the sense of this standard.

经过该处理后, 设备不应出现本标准意义上的损伤。

10.3 Insulation resistance and dielectric strength 绝缘电阻和抗电强度

10.3.1 The insulation of the insulating materials shall be adequate. 绝缘材料的绝缘应是充分满足要求的。

Compliance is checked in accordance with 10.3.2, and, unless otherwise stated, immediately after the humidity treatment according to 10.2. 除另有规定外, 应在10.2湿热处理后, 立即按10.3.2的规定来检验是否合格。

NOTE – In order to facilitate dielectric strength testing, components and subassemblies may be tested separately.

注: 为了方便抗电强度试验, 元器件和部件可以单独进行试验。

10.3.2 The insulations listed in table 3 shall be tested: 表3中列出的绝缘应按下列条件进行试验

– for insulation resistance with 500 V d.c.; and 对绝缘电阻, 用直流500V;

– for dielectric strength as follows: 对抗电强度, 按下列规定

– insulations stressed with d.c. voltage (RIPPLE FREE) are tested with a d.c. voltage;

对承受直流(无纹波)电压应力的绝缘, 用直流电压进行试验;

– insulations stressed with a.c. voltage are tested with an a.c. voltage at MAINS frequency.

对承受交流电压应力的绝缘, 用电网电源频率的交流电压进行试验。

However, where corona, ionization, charge effects or the like may occur, a d.c. test voltage is recommended.

但是, 在可能发生电晕、电离、充电效应或类似效应的情况下, 推荐用直流试验电压。

NOTE 1 – Where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used.

注1: 在有电容器跨接在被试绝缘上的情况下, 推荐用直流试验电压。

Test voltages shall be as specified in table 3 for the appropriate grade of insulation (BASIC, SUPPLEMENTARY or REINFORCED INSULATION) and for the OPERATING VOLTAGE U across the insulation. 试验电压应按表3的规定与对应的绝缘等级(基本绝缘、附加绝缘或加强绝缘)和绝缘上的工作电压 U 相对应。

For the purpose of determining the OPERATING VOLTAGE U , the following applies: 为了确定工作电压, 采用下列规定

– the apparatus is fed by its RATED SUPPLY VOLTAGE; 设备由额定电源电压供电;

– in case of a.c. voltages, the true peak value including periodic and non-periodic superimposed pulses with a half value time longer than 50 ns shall be measured;

对于交流电压, 应测量其真实峰值, 计入半峰值时间大于50 ns的周期或非周期的叠加脉冲;

– in case of d.c. voltages, the peak value of any superimposed ripple shall be included;

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对于直流电压，应计入任何叠加纹波的峰值；

- periodic and non-periodic transients with a half value time up to 50 ns shall be disregarded; 不考虑半峰值时间小于或等于50 ns的周期或非周期的瞬态电压；
- unearthed ACCESSIBLE conductive parts shall be assumed to be connected to an earth TERMINAL or to a PROTECTIVE EARTH TERMINAL or contact; 不接地的可触及导电零部件应假定与接地端子或者与保护接地端子或接触件相连；
- where a transformer winding or other part is floating, i.e. not connected to a circuit which establishes its potential relative to earth, it shall be assumed to be connected to an earth TERMINAL or to a PROTECTIVE EARTH TERMINAL or contact at the point which results in the highest OPERATING VOLTAGE being obtained; 对于变压器的绕组或其他零部件是浮地情况，即不与相对于地有确定电位的电路相连，则应假定该变压器绕组或其他零部件在与保护接地端子或接触件相连来获得最高工作电压；
- where DOUBLE INSULATION is used, the OPERATING VOLTAGE across the BASIC INSULATION shall be determined by imagining a short-circuit across the SUPPLEMENTARY INSULATION, and vice versa. For insulation between transformer windings, the short-circuit shall be assumed to take place at the point at which the highest OPERATING VOLTAGE is produced across the other insulation; 对于使用双重绝缘的情况，基本绝缘上的工作电压应假设附加绝缘短路来确定，反之亦然。对变压器绕组之间的绝缘，应假定该点绝缘发生短路而能使其他绝缘上产生最高工作电压；
- for insulations between two transformer windings, the highest voltage between any two points in the two windings shall be used, taking into account external voltages to which the windings may be connected; 对变压器两个绕组之间的绝缘，在考虑到绕组可能连接的外部电压后，应采用两个绕组中任意两点之间的最高电压；
- for insulations between a transformer winding and another part, the highest voltage between any point of the winding and the other part shall be used. 对变压器的一个绕组与其他零部件之间的绝缘，应采用该绕组任意一点与其他零部件之间的最高电压。

The test voltages shall be obtained from a suitable source so designed that, when the output TERMINALS are short-circuited after the test voltage has been adjusted to the appropriate level, the output current is at least 200 mA. 试验电压应由合适的电源提供，该电源的设计应保证当试验电压调节到相应的等级后后短路输出端子时，输出电流应至少为200 mA。

An over-current device shall not trip when the output current is less than 100 mA.

当输出电流小于100 mA，过流装置不应断开。

Care shall be taken that the value of the test voltage applied is measured within $\pm 3\%$.

应注意，所施加的试验电压值的误差应在 $\pm 3\%$ 的范围内。

Initially, not more than half of the prescribed test voltage is applied, then it is raised rapidly to the full value which is held for 1 min.

开始时，预先施加的试验电压不应大于规定电压值的一半，然后迅速将试验电压升高到全值并持续1 min。

The measurements of the insulation resistance and the dielectric strength tests are made in the humidity chamber, or in the room in which the apparatus was brought to the prescribed temperature, after the reassembly of those parts which may have been removed. 在将可能已被拆除的那些零部件重新装好后，在湿热箱内，或在能使设备达到规定温度的房间内，进行绝缘电阻测量和抗电强度试验。

The apparatus is deemed to comply with the requirement, if the insulation resistance measured after 1 min is not less than the values given in table 3 and no flash-over or breakdown occurs during the dielectric strength test.

如果在1 min后测得的绝缘电阻不小于表3的规定值，而且在抗电强度试验期间，没有出现飞弧或击穿，则认为该设备符合要求。

When testing enclosures of insulating material, a metal foil is pressed tightly against ACCESSIBLE parts.

当对绝缘材料外壳进行试验时，应将金属箔紧贴在可触及零部件上。

For apparatus incorporating both REINFORCED INSULATION and lower grades of insulation, care shall be taken that the voltage applied to the REINFORCED INSULATION does not overstress BASIC or SUPPLEMENTARY INSULATION. 对包含既有加强绝缘又有较低等级绝缘的设备，应注意施加到加强绝缘的电压不应使基本绝缘和附加绝缘承受过电压。

NOTE 2 – ACCESSIBLE conductive parts may be connected together during the dielectric strength test.

NOTE 3 – An instrument to carry out the dielectric strength test on thin sheets of insulating material is described in figure 6.

注2：在进行抗电强度试验时，可以将可触及导电零部件连接在一起。

注3：图6为对薄层绝缘材料进行抗电强度试验的装置。

NOTE 4 – The test is not made on insulation the short-circuiting of which does not cause any electric shock hazard, for

example in the case where one end of a secondary winding of an ISOLATING TRANSFORMER is connected to an ACCESSIBLE conductive part, the other end need not meet any insulation requirement with regard to the same

ACCESSIBLE conductive part. 注4：对其短路不引起任何触电危险的绝缘不进行试验。例如，在隔离变压器次级绕组的一端与可触及导电零部件相连的情况下，另一端对该同一个可触及的导电零部件不必满足任何绝缘要求。



Resistors, capacitors and RC-units complying with 14.1, 14.2.1 and 14.2.2 respectively, connected in parallel with the insulations to be tested, are disconnected. Inductors and windings which otherwise would prevent the test from being made, are also disconnected. 与受试绝缘并联的分别符合14.1、14.2.1和14.2.2要求的电阻器、电容器和阻容单元应予以断开。另外，会妨碍试验进行的电感器和绕组也应予以断开。

Table 3 – Test voltages for dielectric strength test and values for insulation resistance

表3 抗电强度试验电压和绝缘电阻值

Insulation 绝缘	Insulation resistance 绝缘电阻	AC test voltage (peak) or d.c. test voltage 交流试验电压（峰值）或直流试验电压
1 Between parts of different polarity DIRECTLY CONNECTED TO THE MAINS. 与电网电源直接连接的不同极性的零部件之间	2 MΩ	For rated MAINS voltages 对额定电源电压 ≤150 V (r.m.s.) 1 410 V For rated MAINS voltages 对额定电源电压 >150 V (r.m.s.) 2 120 V
2 Between parts separated by BASIC INSULATION or by SUPPLEMENTARY INSULATION. 基本绝缘或附加绝缘隔离的零部件之间	2 MΩ	Curve A of figure 7 图7曲线A
3 Between parts separated by REINFORCED INSULATION. 加强绝缘隔离的零部件之间	4 MΩ	Curve B of figure 7 图7曲线B

NOTE – Curves A and B of figure 7 are defined by the following points:

注：图7的曲线A和B由下列各点确定

OPERATING VOLTAGE U (peak) 工作电压U（峰值）	Test voltage (peak) 试验电压（峰值）	
	Curve A 曲线A	Curve B 曲线B
35 V	707 V	1 410 V
354 V		4 240 V
1 410 V	980 V	
10 kV	15 kV	15 kV
>10 kV	1.5U V	1.5U V

11 Fault conditions 故障条件

NOTE – To check compliance with the requirements of this clause, it may be necessary to repeat the dielectric strength tests. However, it is advisable to identify beforehand all the insulations to be tested with a higher test voltage in order to avoid more than one humidity treatment. 注：为了检验是否符合本章的要求，可能需要重复抗电强度试验。但是为了避免多于一次的湿热处理，合理的做法是预先挑选出用较高电压来试验的所有受试绝缘。

11.1 Electric shock hazard 触电危险

Protection against electric shock shall still exist when the apparatus is operated under fault conditions.

当设备在故障条件下工作时，仍应提供防触电保护。

Compliance is checked by the tests described in clause 9, modified as specified below and under fault conditions.

在故障条件下，按下面修改的第9章试验规定的试验来检验是否合格

For contacts of TERMINALS 假设天线插头和地线插头不能插入被试端子，对连接端子接触件

– the permissible values of 9.1.1 a) are increased to 70 V (peak) a.c. and 120 V d.c., and

9.1.1 a)的允许值增加到交流70V（峰值）和直流120V；以及

– the permissible values of 9.1.1 b) are increased to $U_1 = 70 \text{ V (peak)}$ and $U_2 = 1,4 \text{ V (peak)}$ for a.c. and to $U_1 =$

4 V for d.c., 9.1.1 b)的允许值增加到交流 $U_1=70\text{V}$ （峰值）和 $U_2=1.4\text{V}$ （峰值），对直流增加到 $U_1=4\text{V}$

provided that the plugs for antenna and for earth cannot be inserted into the TERMINAL under test.

NOTE – It is recommended that for apparatus intended to be used in tropical climates, the values given above be halved.

注：建议对预定要在热带使用的设备，上述给定的数值减半。

If short-circuiting or disconnecting a resistor, a capacitor, an RC-unit, an optocoupler or an inductor causes an infringement of the requirements, the apparatus is still deemed to be satisfactory if the component complies with the relevant requirements of clause 14 (see 4.3.4). 如果开路或断开某个电阻器、电容器、阻容单元、光电耦合器或电感器造成设备不满足要求，只要该元器件满足第14章的相关要求（见4.3.4），则仍然认为设备满足要求。

If, during the tests, an insulation mentioned in table 3 is subjected to a voltage exceeding the voltage occurring under normal operating conditions, and if this increase involves a higher test voltage according to 10.3, this insulation shall withstand a test for dielectric strength at the higher test voltage, unless the higher voltage is due to the short-circuiting or disconnection of a resistor, a capacitor, an RC-unit, an optocoupler or an inductor complying with the relevant requirements of clause 14. 如果试验期间，表3所列的某一绝缘承受的电压超过正常



工作条件下的电压,且该增加值按10.3要求有较高试验电压,则该绝缘应承受该较高试验电压的抗电强度试验,除非该较高电压是由于符合14章相关要求的某个电阻器,电容器,阻容单元,光电耦合器或电感器的开路或开路引起的。

11.2 Heating 发热

When the apparatus is operated under fault conditions, no part shall reach such a temperature that:

当设备在故障条件下工作时,不允许任何零部件的温度达到产生下列情况的程度:

- there is a danger of fire to the surroundings of the apparatus; 使设备周围存在着火危险;
- safety is impaired by abnormal heat developed in the apparatus. 设备内产生的异常热损害安全。

Compliance is checked by the tests of 11.2.1. 通过11.2.1的试验来检验是否合格。

During the tests any flame inside the apparatus shall extinguish within a period of 10 s.

试验期间,设备内的任何火焰应在10 s内(自然)熄灭

During the test, solder may soften or become fluid as long as the apparatus does not become unsafe within the sense of this standard. 试验期间,焊锡可以软化或变成液体,只要设备不出现本标准意义上的不安全即可。

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.

另外,焊锡端接点不应作为保护机构来使用,但预定要熔化的焊锡除外,例如热熔断体的焊锡。

11.2.1 Measurement of temperature rises 温升测量

The apparatus is operated under fault conditions and the temperature rises are measured after a steady 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 up to and including 11.2.6.

In the case where an applied fault condition results in the interruption of the current before steady state has been reached, the temperature rises are measured immediately after the interruption.

设备在故障条件下工作,温升在达到稳态后测量,但不晚于设备工作4 h以后。

在本试验期间,设备应满足11.2.2至(最高)11.2.6(含)的要求。

若设备的故障在达到稳态之前就引起电流中断,则应在电流中断后立即测量温升。

If the temperature is limited by fuses, the following additional test is carried out if necessary in relation to the characteristic of the fuse. 如果温度受熔断器的限制,如有必要,进行下列与该熔断器特性有关的附加试验。

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.

试验时将熔断器短路,然后在有关故障条件下测量既通过熔断体又通过短路线的电流:

- if this current remains less than 2,1 times the rated current of the fuse-link, the temperatures are measured after a steady state has been attained;

如果该电流维持在小于该熔断体额定电流的2,1倍时,在达到稳定后测量温度。

- if this current is either immediately 2,1 times the rated current of the fuse-link or more, or reaches this value after a period of time, equal to the maximum pre-arcing time for the relevant current through the fuse-link under consideration, both the fuse-link and the shortcircuit link are removed after an additional time corresponding to the maximum pre-arcing time of the fuse-link under consideration and the temperatures are measured immediately. 当测得的电流立即等于或大于熔断体额定电流的2,1倍,或者在一段等于相应电流通过该熔断体时的最大预飞弧时间后达到该电流值,则在一段等于被考虑的该熔断体的最大预飞弧时间后,同时断开熔断体和短路线并立即测量温度。

If the fuse resistance influences the current of the relevant circuit, the maximum resistance value of the fuse-link shall be taken into account when establishing the value of the current.

如果熔断器的电阻值影响相关电路的电流,在确定电流值时应考虑熔断器的最大电阻值。

NOTE - The above test is based on the fusing characteristics specified in IEC 60127, which also gives the information necessary to calculate the maximum resistance value.

注:上述试验是以IEC 60127(GB9364)规定的熔断特性为依据,该标准也给出了计算最大电阻值所需要的资料。

In determining the current through the fuse, consideration should be given to the fact that this current may vary as a function of time. It should therefore be measured as soon as possible after switching on, taking into account any delay time for full operation of the circuit under consideration. 在测定通过熔断器的电流时,应考虑电流会作为时间函数变化这一事实,因此在合上开关后应尽快测量电流并考虑电路完全工作所需的延时时间。

If a temperature rise exceeding the value given in table 2 is due to short-circuiting an insulation, the apparatus is not deemed to be unsatisfactory, but this insulation shall withstand a dielectric strength test as described in 10.3.

If a temperature rise exceeding the value given in table 2 is due to short-circuiting or disconnecting a resistor, a capacitor, an RC-unit, an optocoupler or an inductor, the apparatus is deemed to be satisfactory if the component complies with the relevant requirements of clause 14 (see 4.3.4).

如果温升超过表2的规定值是由于短路某一绝缘而引起的,则不认为设备不满足要求,但该绝缘应能承受10.3规定的抗电强度试验。



如果温升超过表2的规定值是由于短路或断开某个电阻器、电容器、阻容单元、光电耦合器或电感器引起的，只要该元器件满足第14章的相关要求，则认为该设备满足要求。

If a temperature rise exceeding the value given in table 2 is due to the disconnection of a resistor, the overload test specified in 14.1 b) is repeated on the resistor mounted in the apparatus, including the connections made by the manufacturer. 如果温升超过表2的规定值是由于断开某个电阻器而引起的，则应重新对安装在设备内的该电阻器和制造厂商所做的该处连接进行14.1 b)规定的过载试验。

During this test, the connections shall not fail. 在本试验期间，该处连接不应失效。

11.2.2 ACCESSIBLE parts 可触零部件

The temperature rise of ACCESSIBLE parts shall not exceed the values given in table 2, item a), "fault conditions". 可触及零部件的温升不应超过表2的a项“故障条件”的规定值。

11.2.3 Parts, other than windings, providing electrical insulation 除绕组外提供电气绝缘的零部件

The temperature rise of insulating parts, other than windings, the failure of which would cause an infringement of the requirements of 11.1, 11.2.2, 11.2.4 and 11.2.6, shall not exceed the values given in table 2, item b) "fault conditions", with the following exceptions: 除绕组外的绝缘零部件失效会导致不能满足11.1, 11.2.2, 11.2.4和11.2.6的要求时，其温升不应超过表2的b项“故障条件”的规定值，但下列情况例外：

- For PRINTED BOARDS, the temperature rise may exceed, for a maximum period of 5 min, the values given in table 2, item b) "fault conditions", by not more than 100 K.
对印制板，其温升可以超过表2的b项“故障条件”的规定值，但超出值不大于100K，持续时间最长为5 min。
- For PRINTED BOARDS withstanding the flame test described in 20.1.3, the temperature rise may exceed:
对能承受20.1.3规定的火焰试验的印制板，其温升可以：
 - a) the values given in table 2, item b) "fault conditions", by not more than 100 K on one or more small areas providing that the total area does not exceed 2 cm² for each fault condition and no electric shock hazard is involved, or 在一处或多处小面积上超过表2的b项“故障条件”的规定值，但超出值不大于100K，只要对每一个故障条件，其总面积不超过2 cm²，并且不涉及触电危险即可；或者
 - b) for a maximum period of 5 min, the values given in table 2, item b) "fault conditions", up to the temperature rise value given for "other parts" in table 2, item e) "fault conditions", on one or more small areas, providing that the total area does not exceed 2 cm² for each fault condition and no electric shock hazard is involved. 在一处或多处小面积上超过表2的b项到e项的“故障条件”规定的温升值，最长不超过5 min，只要对每一个故障条件，其总面积不超过2 cm²，并且不涉及触电危险即可。

If a temperature rise value is exceeded and if there is doubt as to whether or not an electric shock hazard exists, a short-circuit is applied between the conductive parts concerned and the tests of 11.1 are repeated. 如果超过温升值，且对是否存在触电危险有怀疑，则在有关的导电零部件之间进行短路，并重复进行11.1规定的试验。

If conductors on PRINTED BOARDS are interrupted, peeled or loosened during the test, the apparatus is still deemed to be satisfactory if all of the following conditions are met:

如果在试验期间印制板上的导体断开、剥离或松脱，只要满足下列全部条件，则仍认为设备符合要求：

- the PRINTED BOARD complies with 20.1.3; 印制板符合20.1.3的要求；
- the interruption is not a POTENTIAL IGNITION SOURCE; 断开处不是潜在引燃源；
- the apparatus complies with the requirements of this subclause with the interrupted conductors bridged; 在接通断开的导体后，设备符合本条的要求；
- any peeled or loosened conductor does not reduce the CLEARANCES and CREEPAGE DISTANCES between HAZARDOUS LIVE parts and ACCESSIBLE parts below the values specified in clause 13; 任何剥离或松脱的导体不会使危险带电零部件与可触及零部件之间的电气间隙和爬电距离减小到小于第13章的规定值；
- for CLASS I apparatus the continuity of any protective earth connection is maintained; loosening of such a conductor is not allowed. 对I类设备，任何保护接地连接的连续性保持良好，不允许这种导体松动。

11.2.4 Parts acting as a support or a mechanical barrier. 用作支架和机械隔板的零部件

The temperature rise of parts whose mechanical failure may cause an infringement of the requirements of 9.1.1 shall not exceed the values given in table 2, item c) "fault conditions".

对其机械失效会导致不符合9.1.1要求的零部件，其温升不应超过表2的c)项“故障条件”的规定值。

11.2.5 Windings 绕组

The temperature rise of windings shall not exceed the values given in table 2, items b) and d) "fault conditions", with the following exceptions: 绕组温升不应超过表2的b)项和d)项“故障条件”的规定值，但下列情况除外：

- If the temperature is limited due to the operation of replaceable or resettable protective devices, the temperature rises may be exceeded until 2 min after the operation of the device. 如果由于可更换或可复位保护装置的动作限制了绕组温度，则在保护装置动作后2 min内，绕组温升可以超过规定值。

In the case of windings providing protection against electric shock or where a fault could result in a fire



hazard, the test is carried out three times and the winding is then subjected to the dielectric strength test of 10.3 without the humidity treatment of 10.2, starting within 1 min after the temperature rise measurement. 对提供防触电保护或某一故障可能导致着火危险的绕组, 试验要进行三次, 在测量绕组温升后1 min内绕组要承受10.3的抗电强度试验, 但不承受10.2的湿热处理。

No failure is allowed. 不允许失效

- If the temperature is limited due to the operation of an integral non-resettable or a nonreplaceable protective device or due to the open circuiting of a winding, the temperature rises may be exceeded but the test shall be carried out three times using new components. 如果由于形成一体的不可复位或不可更换保护装置的动作或由于绕组开路而限制了温度, 则绕组温升可以超过规定值, 但试验应用新的元件进行三次。

In the case of windings providing protection against electric shock or where a fault could result in a fire hazard, the winding is then in each case subjected to the dielectric strength test of 10.3 without the humidity treatment of 10.2, starting within 1 min after the temperature rise measurement. 对具有防触电保护或某一故障可能导致着火危险的绕组, 在每种情况下, 在测量绕组温升后1 min内绕组要承受10.3的抗电强度试验, 但不承受10.2的湿热处理。

No failure is allowed. 不允许失效

- Higher temperature rises are allowed for windings, provided a failure of their insulation cannot cause an electric shock hazard or a fire hazard and that they are not connected to sources capable of supplying power in excess of 5 W under normal operating conditions. 如果绕组绝缘的故障不会引起触电危险或着火危险, 而且在正常工作条件下不与能够提供功率超过5W的电源连接, 则允许绕组有较高温升。
- If a temperature rise value is exceeded and if there is doubt as to whether or not a hazard exists, the insulation concerned is short-circuited and the tests of 11.1 and 11.2.2 are repeated. 如果超过了规定温升值, 而且怀疑是否存在危险, 则短路有并绝缘, 并重新进行11.1和11.2.2的试验。

NOTE - If the insulation is incorporated in a winding in such a way that its temperature rise cannot be measured directly, the temperature is assumed to be the same as that of the winding wire.

注: 如果包含在绕组内的绝缘体, 其温升不能直接测量, 则认为绝缘体的温度与绕组线的温度相同。

11.2.6 Parts not subject to a limit under 11.2.1 to 11.2.5 inclusive 不受11.2.1至11.2.5限制的零部件

According to the nature of the material, the temperature rise of the part shall not exceed the values given in table 2, item e) "fault conditions". 零部件的温升按材料的特性不应超过表2的e)项“故障条件”的规定值。

12 Mechanical strength 机械强度

12.1 Complete apparatus 完整设备

The apparatus shall have adequate mechanical strength and be so constructed as to withstand such handling as may be expected during intended use.

设备应具有足够的机械强度, 而且其结构应能经受住在预期使用时可能遇到操作和搬运的考验。

The apparatus shall be so constructed that short-circuiting of insulations between HAZARDOUS LIVE parts and ACCESSIBLE conductive parts or parts conductively connected to those, for example by unintended loosening of screws, is prevented. 设备的结构应能防止诸如螺钉无意间的松动而使危险带电零部件与可触及导电零部件, 或者与可触及导电零部件导电连接的零部件之间的绝缘发生短路。

Compliance, except for devices forming a part of the MAINS plug, is checked by the tests of 12.1.1, 12.1.2 and 12.1.3. 通过12.1.1, 12.1.2和12.1.3的试验来检验是否合格, 但直插式设备除外。

NOTE - Devices forming a part of the MAINS plug are subjected to the tests as described in 15.4.

注: 直插式设备应承受15.4规定的试验。

12.1.1 Bump test 撞击试验

Apparatus with a mass exceeding 7 kg are subjected to the following test: 质量超过7 kg的设备要承受下列试验:

The apparatus is placed on a horizontal support of wood which is allowed to fall 50 times from a height of 5 cm onto a wooden table. 设备放置在水平的木支承板上, 从5 cm高处跌落到木质台上, 跌落50次。

After the test, the apparatus shall show no damage in the sense of this standard.

试验后, 设备不应出现本标准意义上的损伤。

12.1.2 Vibration test 振动试验

TRANSPORTABLE APPARATUS intended to be used for audio amplification of musical instruments, PORTABLE APPARATUS and apparatus having a metal enclosure, are subjected to a vibration endurance conditioning by sweeping, as specified in IEC 60068-2-6. 预定要作为乐器的音频放大器的可运输设备、便携式设备以及有金属外壳的设备应承受IEC 60068-2-6 (GB/T2423.10) 规定的扫频振动耐久性处理。

The apparatus is fastened in its intended positions of use to the vibration-generator by means of straps round the enclosure. The direction of vibration is vertical, and the severity is:

将设备按其预定使用位置用捆绑带将其固定在振动台上, 振动方向为垂直方向, 振动严酷度为:



Duration 30 min 持续时间: 30 min

Amplitude 0,35 mm 振幅: 0,35 mm

Frequency range 10 Hz ... 55 Hz ... 10 Hz 频率范围: 10 Hz~55 Hz ~10 Hz

Sweep rate approximately 1 octave/min. 扫描速率: 约1 octave/min

After the test, the apparatus shall show no damage in the sense of this standard, in particular, no connection or part the loosening of which might impair safety shall have loosened. 试验后, 设备不应出现本标准意义上的损伤, 特别是其松动可能会危害安全的连接处或零部件不应发生松动。

12.1.3 Impact test 冲击试验

The apparatus is held firmly against a rigid support and is subjected to three blows from a spring-operated impact hammer according to IEC 60068-2-75, applied with a kinetic energy just before impact of 0,5 J to every point of the exterior that protects HAZARDOUS LIVE parts and is likely to be weak, including drawers in the pulled-out position, handles, levers, switch knobs and the like, by pressing the release cone perpendicularly to the surface. 设备紧靠在刚性支架上, 用事先加有0,5 J的动能、符合IEC 60068-2-75要求的弹簧冲击锤对保护危险带电零部件外部和可能是薄弱的地方(包括处于拉开状态的抽屉、把手、操纵杆、开关旋钮等)的每一点垂直受试表面释放锥体三次。

This test is also made on windows, lenses, signal lamps and their covers, etc., but only if they protrude from the enclosure by more than 5 mm or if the individual projected surface area exceeds 1 cm². 如果窗口、透镜片、信号灯及其外罩突出外壳5 mm以上, 或者单件投影面积超过1 cm², 则也要对它们进行本试验。

After the test, the apparatus shall withstand the dielectric strength test as specified in 10.3 and shall show no damage in the sense of this standard; in particular, HAZARDOUS LIVE parts shall not have become ACCESSIBLE, enclosures shall show no visible cracks and insulating barriers shall not have been damaged.

试验后, 设备应承受10.3规定的抗电强度试验, 而且不应出现本标准意义上的损伤, 特别是危险带电零部件不应变成可触及, 外壳不应出现可见裂纹, 绝缘隔板不应损坏。

NOTE – Damage to the finish, small dents which do not reduce CLEARANCES or CREEPAGE DISTANCES below the specified values, cracks which are not visible to the naked eye, surface cracks in fibre-reinforced mouldings and the like are ignored. 注: 不会使电气间隙和爬电距离减小到小于规定值的饰面损伤、小凹痕、肉眼看不到的裂纹、增强纤维模压件上的表面裂纹等忽略不计。

13.2 Fixing of actuating elements 驱动件的固定

Actuating elements, for instance knobs, push-buttons, keys and levers, shall be so constructed and fastened that their use will not impair the protection against electric shock.

驱动件, 诸如旋钮、按钮、键钮的操纵杆, 其结构及其固定应能保证它们的使用不损害防触电保护。

Compliance is checked by the following tests. 通过下列试验来检验是否合格。

Fixing screws, if any, are loosened and then tightened with 2/3 of the torque given in table 12 and finally loosened for 1/4 turn. 紧固螺钉, 如果有的话, 将其松开, 然后用表12规定力矩的2/3拧紧, 最后松开1/4圈。

The actuating elements are then subjected for 1 min to a torque corresponding to a force of 100 N applied at the periphery, but not more than 1 Nm and, for 1 min, to an axial pull of 100 N. If the mass of the apparatus is less than 10 kg, the pulling force is limited to the value corresponding to the mass of the apparatus but not less than 25 N. 然后, 驱动件要承受相当于沿周边方向施加100N的力的力矩1 min, 但力矩不大于1 Nm, 然后再承受100N的轴向拉力。如果设备的质量小于10 kg, 则拉力限制在相当于设备的质量, 但不应小于25N。

For actuating elements such as push-buttons, keys and the like, on which only a pressure is exerted during intended use and which do not protrude more than 15 mm from the surface of the apparatus, the pulling force is limited to 50 N.

对在预期使用时仅承受压力, 而且突出设备表面不大于15 mm的诸如按钮、键钮等驱动件, 拉力限制在50N。

After these tests, the apparatus shall show no damage in the sense of this standard.

试验后, 设备不应出现本标准意义上的损伤。

13.3 REMOTE CONTROL devices held in hand 手持遥控装置

Parts of REMOTE CONTROL devices intended to be held in hand and containing HAZARDOUS LIVE parts, shall have adequate mechanical strength and be so constructed as to withstand such handling as may be expected.

预定要手持的而且含有危险带电零部件的遥控装置的零部件应具有足够的机械强度, 且其结构应能经受在预期使用时可能遇到的考验。

Compliance is checked by the following test: 通过下列试验来检验是否合格

The REMOTE CONTROL device, with its flexible cord, if any, shortened to 10 cm, is tested according to IEC 60068-2-32, procedure 2. 遥控装置, 以及其软电线(如果有的话)截短到10 cm, 按IEC 60068-2-32

(GB/T2423.8-1995)的程序2规定进行试验。

The barrel is rotated 50 times if the mass of the control device is up to 250 g and 25 times if the mass is greater



than 250 g. 如果遥控装置的质量小于等于250 g, 则滚桶转动50次; 如果质量大于250 g, 则转动25次。

After the test, the device shall show no damage in the sense of this standard.

试验后, 遥控装置不应出现本标准意义上的损伤。

Parts of cable-connected REMOTE CONTROL devices, not intended to be held in hand, are tested as a part of the attended apparatus.

预定无需手持的有电缆连接的遥控装置的零部件按有人看管的设备的一个零部件来进行试验。

13.4 Drawers 抽屉

Drawers which are intended to be partially pulled out from the apparatus shall have a stop of adequate mechanical strength in order to prevent HAZARDOUS LIVE parts becoming ACCESSIBLE.

预定要从设备中局部拉出的抽屉应有一个具有足够机械强度的止挡, 以防危险带电零部件变成可触及。

Compliance is checked by the following test: 通过下列试验来检验是否合格

The drawer is pulled out in the intended manner until the stop prevents further movement. A force of 50 N is then applied for 10 s in the most unfavourable direction.

抽屉以预定的方式拉出, 直到止挡阻止抽屉进一步移动。然后, 沿最不利的方向施加50 N的力持续10 s。

After the test, the apparatus shall show no damage in the sense of this standard; in particular no HAZARDOUS LIVE parts shall become ACCESSIBLE.

试验后, 设备不应出现本标准意义上的损伤, 特别是危险带电零部件不应变成可触及。

13.5 Antenna coaxial sockets mounted on the apparatus 安装在设备上的天线同轴插座

Antenna coaxial sockets mounted on the apparatus and incorporating parts or components which isolate HAZARDOUS LIVE parts from ACCESSIBLE parts, shall be so constructed as to withstand such mechanical stresses as may be expected in the intended use. 安装在设备上而且装有将危险带电件与可触及零部件隔离的零部件或元器件的天线同轴插座, 其结构应能承受在预期使用时可能会遇到的机械应力。

Compliance is checked by the following tests, which are made in the order given.

通过下列给定顺序的试验来检验是否合格

After these tests, the apparatus shall show no damage in the sense of this standard.

在这些试验后, 设备不应出现本标准意义上的损伤。

Endurance test 耐久性试验

A test plug as shown in figure 8 is inserted and withdrawn from the socket 100 times. Care is to be taken not to damage the socket intentionally during insertion and withdrawal of the test plug.

图8所示的试验插头对插座进行插拔100次, 应注意在插拔试验插头时不要故意去损伤插座。

Impact test 冲击试验

A test plug as shown in figure 8 is inserted into the socket and three successive blows from the spring-operated hammer according to IEC 60068-2-75 are applied with a kinetic energy just before impact of 0,5 J to the same point on the plug in the most unfavourable direction.

图8所示的试验插头插入插座, 然后用符合IEC 60068-2-75的弹簧冲击锤连续冲击三次, 冲击锤事先加有动能, 以最不利的方向对插头的同一点, 施加0,5 J的冲击能量。

Torque test 力矩试验

A test plug as shown in figure 8 is inserted into the socket and a force of 50 N is applied for 10 s, without jerks, at right angles to the axis of the plug, the radial direction of the force being so as to stress those parts of the socket which are likely to be weak. The force is determined by using, for example, a spring balance attached by means of the hole in the test plug.

图8所示的试验插头插入插座, 然后沿垂直于插头轴线方向平稳地施加50 N的力持续10 s, 该径向力的施加应能使插座上可能是薄弱的那些部位承受应力。作用力的大小可由连到试验插头的弹簧秤来读出。

This test is made 10 times. 本试验进行10次。

NOTE – When antenna coaxial sockets different from IEC 60169-2 [3] are tested, a corresponding test plug of the same length is used for the tests.

注: 当对不同于IEC 60169-2 [3]的天线同轴插座进行试验时, 应采用同样长度的相应试验插头来进行试验。

13 CLEARANCES and CREEPAGE DISTANCES 电气间隙和爬电距离

13.1 General 一般要求

13.1.1 CLEARANCES and CREEPAGE DISTANCES shall be dimensioned in accordance with 13.2.

电气间隙和爬电距离应符合13.2规定的尺寸。

The values are the minimum values which shall be applied, except that they may be reduced by 1 mm for BASIC and SUPPLEMENTARY INSULATION and 2 mm for REINFORCED INSULATION if all the following three conditions are met: 这些数值是应采用的最小值, 但如果全部满足下列三个条件, 则对基本绝缘和附加绝缘, 这些数值可以减小1 mm, 对加强绝缘可以减小到 mm:



注：对于海拔2000米以上地区使用的设备，其基本绝缘和附加绝缘的减小值正在考虑中。

- they are not between ACCESSIBLE conductive parts of an enclosure and HAZARDOUS LIVE parts, if they can be reduced by external forces, as specified in 9.1.7; 如果这些电气间隙和爬电距离会因受9.1.7规定的外力而减小，但它们不处在外壳的可触及导电零部件与危险带电零部件之间；
- they are maintained by rigid construction; 它们靠刚性结构保持不变；
- their insulation properties are not likely to be significantly affected by any deposition of conductive dust produced inside the apparatus, for example by the carbon brushes of commutator motors.

它们的绝缘特性不会因设备内部（例如整流子电动机碳刷）产生的导电灰尘而受到严重影响。

However, the minimum CLEARANCES and CREEPAGE DISTANCES shall not be reduced below two-thirds of the values given by the curves of figure 9, taking into account any reduction allowed for wire enamel according to note 6 of figure 9, with a minimum of 0,5 mm for BASIC INSULATION or SUPPLEMENTARY INSULATION, and with a minimum of 1 mm for REINFORCED INSULATION.

然而，在按图9注6考虑了导线漆膜的允许减小值后，最小电气间隙和爬电距离不应减小到小于图9曲线给定值的三分之二。但对基本绝缘或附加绝缘，最小值为0,5 mm，而对加强绝缘，最小值为1 mm。

Except for insulation between parts of different polarity DIRECTLY CONNECTED TO THE MAINS, CLEARANCES and CREEPAGE DISTANCES smaller than those specified are allowed but are subject to the requirements of 4.3.1, 4.3.2 and 11.2. 除了直接与电网电源连接的不同极性的零部件之间的绝缘外，电气间隙和爬电距离允许小于规定值，但要满足4.3.1、4.3.2和11.2的要求。

The following conditions shall be applied during the assessment for compliance in accordance with 13.2.

在按13.2评价合格性时，应采用下列条件

Movable parts shall be placed in the most unfavourable position. 可移动零部件应置于最不利的位置。

In the determination of CLEARANCES and CREEPAGE DISTANCES between ACCESSIBLE parts and HAZARDOUS LIVE parts, when using the standard test finger, any ACCESSIBLE area of a nonconductive part is considered as being covered with a conductive layer (see figure 3 as an example). 当使用标准试验指确定可触及零部件与危险带电零部件之间的电气间隙和爬电距离时，认为非导电零部件的任何可触及区域上覆盖有一层导电层（见图3的例子）。

13.1.2 Jointed insulation 有接缝的绝缘

Distances between conductive parts along uncemented joints shall be considered as CLEARANCES and CREEPAGE DISTANCES for which the values of figure 9 apply. 导电零部件与未粘合接缝之间的距离应按图9的电气间隙和爬电距离的数值考虑。

For reliably cemented joints, complying with the following tests, CLEARANCES and CREEPAGE DISTANCES do not exist. In this case only 8.8 applies. 对满足下列试验的可靠粘合的接缝，电气间隙和爬电距离不存在。在这种情况下，仅8.8的要求适用。

Compliance is checked by inspection, measurement and test. 通过检查，测量和试验来检验是否合格。

For this test, enamelled winding wires, if any, are replaced by uninsulated wires.

就本试验而言，漆包绕组线被认为是无绝缘导线。

The materials are considered to be cemented together, if they withstand the following test:

如果材料能承受下列试验，则该材料被认为是已粘合在一起的材料。

Three apparatus, components or subassemblies are subjected 10 times to the following temperature cycle:

3台设备、元件或部件，应承受10次下列的温度循环：

- 68 h at $(X \pm 2)$ °C,
- 1 h at (25 ± 2) °C,
- 2 h at (0 ± 2) °C,
- 1 h at (25 ± 2) °C,

whereby X is the highest temperature measured under normal operating conditions on the apparatus, component or subassembly under consideration plus 10 K with a minimum of 85 °C.

其中X是指被考虑的设备、元件或组件在正常工作条件下测得的最高温度加10K，但至少取85 °C。

Two of the above apparatus, components or subassemblies are then subjected to the relevant dielectric strength test of 10.3, however, the test voltages are multiplied by 1,6. 然后，上述设备、元件或组件其中的二个要承受10.3有关的抗电强度试验，但试验电压值应为10.3规定电压值的1,6倍。

The remaining apparatus, component or subassembly is subjected to the relevant dielectric strength test of 10.3, without the humidity treatment of 10.2, however, the test voltage is multiplied by 1,6. 剩下的设备、元件或组件应承受10.3有关的抗电强度试验，但不承受的湿热处理，但试验电压值应为10.3规定电压值的1,6倍。

The test is performed immediately at the end of the last period at highest temperature during the thermal cycling test. 试验在温度循环的最高温度的最后一段时间结束时立即进行。

NOTE - The test voltage is higher than the normal test voltage in order to ensure that, if the surfaces are not cemented



together, a breakdown occurs. 注：试验电压高于正常试验电压是为了一旦表面未粘合在一起而能使其发生击穿。

13.2 CLEARANCES and CREEPAGE DISTANCES: dimensions 电气间隙和爬电距离：尺寸

CLEARANCES and CREEPAGE DISTANCES shall be dimensioned in accordance with figure 9 taking into account the relevant conditions specified in the notes under the figure.

电气间隙和爬电距离，应符合图9规定的尺寸，并考虑图9下面的注所规定的有关条件。

The specified CLEARANCES are not applicable to air gaps between the contacts of protective devices, switches of microgap construction and similar components where the CLEARANCE varies with the movement of the contacts. 所规定的电气间隙不适用于保护装置、微隙结构的开头和其间隙随触点运动而改变的类似元件的触点之间的空气间隙。

CLEARANCES and CREEPAGE DISTANCES between parts of different polarity DIRECTLY CONNECTED TO THE MAINS shall have the values given in figure 9, curve A, taking into account the reduction allowed in 13.1.1 and/or note 6 of figure 9. 直接与电网电源连接的不同极性的零部件之间的电气间隙和爬电距离应具有图9曲线A给出的值，并考虑13.1.1和/或图9注6的允许的减小值。

The minimum CLEARANCES and CREEPAGE DISTANCES between conductors, one of which may be CONDUCTIVELY CONNECTED TO THE MAINS, on PRINTED BOARDS complying with the pull-off and peel strength requirements of IEC 60249-2, are given in figure 10, and for which the following applies:

符合IEC60249-2 (GB/T4723) 的拉脱和剥离强度要求的印制板上的导体（其中之一可以与电网电源导电连接）之间的最小电气间隙和爬电距离在图10中给出，对这些距离还要采用下列要求：

- these distances only apply as far as overheating is concerned (see 11.2) to the conductors themselves, but not to mounted components or associated soldered connections; 这些距离仅在考虑过热要求（见11.2）时才适用于导体本身，但不适用于安装的元器件或所涉及的焊接连接点；
- coatings of lacquer or the like, except coatings according to IEC 60664-3, are ignored when measuring these distances. 在测量这些距离时，除符合IEC 60664-3要求的涂敷层外，漆涂层或类似涂层忽略不计。

Compliance is checked by measurement taking into account the figures of annex E, subject to conditions detailed in 13.1.1. 考虑附录E的图例，按照13.1.1规定的条件，通过测量来检验是否合格。

If necessary, forces shall be applied simultaneously to any point on internal parts and to the outside of conductive enclosures, in an endeavour to reduce the CLEARANCE while taking measurements. The forces shall have a value of: 在测量时，如有必要，对内部零部件的任何一点和导电外壳的外侧，沿试图减小电气间隙的方向同时施加作用力。该作用力应为下列数值：

- 2 N for internal parts; 对内部零部件为2 N
- 30 N for enclosures. 对外壳为30 N

The force shall be applied to the enclosure by means of the rigid test finger according to IEC 61032, test probe 11. 作用力应通过符合IEC 61032 (GB/T16842-1997) 的试具11要求的刚性试验指施加到外壳上。

If a CLEARANCE consists of two or more airgaps in series separated by conductive parts, any gap of less than 0,2 mm width is ignored in computing the total distance. 如果电气间隙是由被导电零部件分隔而成的两个或两个以上串联的空气间隙组成，则在计算总的距离时，宽度小于0,2 mm的任何空气间隙忽略不计。

13.3 For apparatus, subassemblies or components, not CONDUCTIVELY CONNECTED TO THE MAINS and which are enclosed, enveloped or hermetically sealed against ingress of dirt and moisture, the minimum internal CLEARANCES and CREEPAGE DISTANCES may be reduced to the values as given in table 4.

对不与电网电源导电连接的，且经过防灰尘和潮气侵入的封闭、包封或气密密封的设备、组件或元器件，其最小内部电气间隙和爬电距离可以减小到表4规定的数值。

NOTE 1 - Examples of such constructions include hermetically sealed metal boxes, adhesive sealed plastic boxes, parts enveloped in a dip coat or by type A coatings according to IEC 60664-3 of PRINTED BOARDS.

NOTE 2 - This reduction is only permitted as far as protection against electric shock as well as overheating is concerned.

注1：这种结构的例子包括气密密封的金属盒、胶粘密封的塑料盒，用浸涂层包封的零部件或用符合IEC 60664-3要求的A型涂层包封的零部件。

注2：这种减小仅在考虑防触电保护和防过热要求后才能允许。

Table 4 - Minimum CLEARANCES and CREEPAGE DISTANCES (enclosed, enveloped or hermetically sealed constructions) 表4 最小电气间隙和爬电距离（封闭、包封或气密密封结构）	
OPERATING VOLTAGE up to and including V (peak) a.c. or V d.c. 工作电压小于或等于 交流V(峰值)或直流V	Minimum CLEARANCES and CREEPAGE DISTANCES (mm) 最小电气间隙和爬电距离
35	0,2
45	0,2
56	0,3
70	0,3
90	0,4



110	0,4
140	0,5
180	0,7
225	0,8
280	1,0
360	1,1
450	1,3
560	1,6
700	1,9
900	2,3
1 120	2,6
1 400	3,2
1 800	4,2
2 250	5,6
2 800	7,5
3 600	10,0
4 500	12,5
5 600	16,0
7 000	20,0
9 000	25,0
11 200	32,0
14 000	40,0

NOTE 1 – The values are applicable to both BASIC and SUPPLEMENTARY INSULATION.
 NOTE 2 – The values for REINFORCED INSULATION shall be twice the values in the table.
 NOTE 3 – A minimum CTI (comparative tracking index) of 100 is required for the insulating materials used. The CTI rating refers to the value obtained in accordance with IEC 60112, solution A.
 NOTE 4 – Linear interpolation between the nearest two points is allowed, the calculated spacing being rounded to the next higher 0,1 mm increment.

注1: 表中的数值适用于基本绝缘和附加绝缘。
 2: 加强绝缘的数值为表中数值的两倍。
 3: 对所使用的绝缘材料, 要求CTI (相比漏电起痕指数) 至少为100, CTI额定值是指按IEC 60112 (GB/T4207) 方案A获得的数值。
 4: 在两个最近的点之间允许使用线性内插法, 计算所得的间隙值进位到小数点后一位。

Compliance is checked by inspection, measurement and by subjecting the apparatus, subassembly or component 10 times to the following temperature cycle:

通过检查, 测量以及使设备、部件和元件承受10次下列温度循环来检验是否合格

- 68 h at $(Y \pm 2) \text{ }^\circ\text{C}$,
- 1 h at $(25 \pm 2) \text{ }^\circ\text{C}$,
- 2 h at $(0 \pm 2) \text{ }^\circ\text{C}$,
- 1 h at $(25 \pm 2) \text{ }^\circ\text{C}$,

whereby Y is the highest temperature measured under normal operating conditions of the apparatus, subassembly or component under consideration, with a minimum of 85 °C. In case of transformers, Y is the highest winding temperature measured under normal operating conditions, plus 10 K, with a minimum of 85 °C. The apparatus, subassembly or component is then subjected to the dielectric strength test of 10.3.

Y是指所考虑的设备、组件或元件在正常工作条件测得的最高温度, 但至少取85 °C。对变压器, 是指在正常工作条件下测得的绕组最高温度再加10K, 但至少取85 °C。

然后设备、组件或元件应承受10.3的抗电强度试验。

The tests are carried out on three samples. 试验在三个样品上进行。

No failure is allowed. 不允许失效。

13.4 The distances between conductive parts internal to apparatus, subassemblies or components which are treated with insulating compound filling all voids, so that CLEARANCES and CREEPAGE DISTANCES do not exist, shall be subject only to the requirements of 8.8. 对用绝缘化合物填满所有空隙来处理的, 以致不存在电气间隙和爬电距离的设备、组件或元件, 其内部导电零部件之间的距离, 仅需满足8.8的要求。

NOTE – Examples of such treatment include potting, encapsulation and vacuum impregnation.

注: 这种绝缘处理的例子包括灌封、封装和真空浸渍。

Compliance is checked in accordance with 13.3, taking into account 8.8 together with the following:

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按13.3的规定，并将8.8和下列情况一并考虑来检验是否合格

A visual inspection shall show that there are no cracks in the encapsulating, impregnating or other material, that coatings have not loosened or shrunk, and after sectioning the sample, that there are no significant voids in the material.

外观检查封装材料、浸渍材料或其他材料应无裂缝，涂层应无疏松或皱缩，切开样品后，材料上无明显的空隙。

13.5 For type B coated PRINTED BOARDS, insulation between conductors shall comply with the requirements of IEC 60664-3. This applies only to BASIC INSULATION.

对B型涂覆印制板，导体之间的绝缘应符合IEC 60664-3的要求，本要求仅适用于基本绝缘。

NOTE – For such PRINTED BOARDS, CLEARANCES and CREEPAGE DISTANCES under the coating do not exist.

注：对这样的印制板，涂覆层下不存在电气间隙和爬电距离。

14 Components 元器件

NOTE 1 – Where components are part of a range of values it is usually not necessary to test every value within that range. If this range of values consists of several technologically homogeneous subranges, the samples should be representative of each of these subranges. Moreover, it is recommended, where possible, to make use of the concept of structurally similar components.

NOTE 2 – When a certain flammability category according to IEC 60707 is required, reference is made to annex G with respect to alternative test methods.

NOTE 3 – When no flammability requirements are specified in this clause, reference is made to 20.1.1.

注1：当元器件是属于一个范围中的一部分时，通常不必对此范围中的每个值进行试验。如果这个范围是由几个技术上类似的分范围组成，则样品应代表各分范围的特征。然而，建议在可能的情况下要采用结构相似元器件的概念。

2：当要求符合IEC 60707（GB/T11020）的某一可燃性等级时，按照附录G有关替代的试验方法。

3：当在本章中对可燃性要求未作规定时，按照20.1.1。

14.1 Resistors 电阻器

Resistors the short-circuiting or disconnecting of which would cause an infringement of the requirements for operation under fault conditions (see clause 11) and resistors bridging contact gaps of MAINS switches, shall have an adequate stable resistance value under overload. 当电阻器的短路或断路可能会不满足故障条件（见第11章）

下工作的要求时，以及当电阻器跨接在电源开关触点间隙上时，这些电阻器在过载情况下应有足够稳定的电阻值。Such resistors shall be positioned inside the enclosure of the apparatus. 这些电阻器应安装在设备外壳的内部。

Compliance is checked by test a) or test b), carried out on a sample of 10 specimens.

取10个样品，通过进行a)项或b)项试验来检验是否合格。

Before test a) or b), the resistance of each specimen is measured and the sample is then subjected to the damp heat test according to IEC 60068-2-3, severity 21 days. 在进行a)项或b)项试验前，应测量每个样品的电阻值，然后样品按IEC 60068-2-3（GB/T2423.3）的规定承受湿热试验，严酷度21天。

a) For resistors connected between HAZARDOUS LIVE parts and ACCESSIBLE conductive parts and for resistors bridging contact gaps of MAINS switches, the 10 specimens are each subjected to 50 discharges at a maximum rate of 12/min, from a 1 nF capacitor charged to 10 kV in a test circuit as shown in figure 5a. After this test, the value of resistance shall not differ more than 20 % from the value measured before the damp heat test.

对连接在危险带电零部件和可触及导电零部件之间的电阻器，以及对跨接在电源开关触点间隙上的电阻器，10个样品均承受如图5a所示试验电路中充电到10 kV的1 nF电容器，以12次/分的最大速率，进行50次的放电。试验后，其电阻值与湿热试验前所测得的电阻值相比，其变化应不大于20%。

No failure is allowed. 不允许有损坏。

b) For other resistors, the 10 specimens are each subjected to a voltage of such a value that the current through it is 1,5 times the value measured through a resistor, having a resistance equal to the specified rated value, which is fitted to the apparatus, when operated under fault conditions. During the test the voltage is kept constant. 其他电阻器，10个样品均承受规定的电压，该电压值为：在设备内接一个电阻器，其电阻值等于受试样品的标称电阻值，当设备在故障条件下工作时，测量该电阻器上流过的电流值。把通过受试电阻器的电流加到所测得的电流值的1,5倍。试验中使该电压保持不变。

The value of resistance is measured when steady state is attained and shall not differ more than 20 % from the value measured before the damp heat test.

当达到稳态时测量其电阻值，该电阻值与湿热试验前所测得的电阻值相比，其变化应不大于20%。

No failure is allowed. 不允许有损坏。

For resistors connected between HAZARDOUS LIVE parts and ACCESSIBLE conductive parts, the CLEARANCES and CREEPAGE DISTANCES between the terminations shall comply with the requirements of clause 13 for REINFORCED INSULATION. 对连接在危险带电零部件和可触及导电零部件之间的电阻器，其端接点间的电气间隙和爬电距离应符合第13章对加强绝缘的要求。



Resistors with internal end-lead terminations are allowed only if the internal spacings are clearly and precisely defined. 对具有内部端接点的电阻器，只有清楚而精确地限定了该内部端接点间距的情况下才允许使用。

Compliance is checked by measurement and inspection. 通过测量和检查来检验是否合格。

14.2 Capacitors and RC-units 电容器和阻容单元

Where reference is made to the tests specified in IEC 60384-14, table II, these tests are supplemented as follows: 对要按照IEC 60384-14 (GB/T14472-1998) 表2规定试验的情况下，需对这些试验作下列补充

The duration of the damp heat steady-state test as specified in IEC 60384-14, subclause 4.12, shall be 21 days. IEC 60384-14 (GB/T14472-1998) 的4.12款规定的恒定湿热试验的持续时间应为21天。

NOTE – Reference is made to IEC 60384-14:1993, including amendment 1 (1995), irrespective of whether the capacitor or RC-unit is used for electromagnetic interference suppression purposes or not.

注：无论电容器或阻容单元是否被用作抑制电磁干扰，均要按照IEC 60384-14 (GB/T14472-1998)。

14.2.1 Capacitors or RC-units, the short-circuiting or disconnecting of which would cause an infringement of the requirements under fault conditions with regard to electric shock hazard shall:

当电容器或阻容单元短路或断路可能会不满足故障条件下关于触电危险的要求时，这些电容器或阻容单元应

a) withstand the tests for subclass Y2 or Y4 capacitors or RC-units as specified in IEC 60384-14, table II.

Subclass Y2 capacitors or RC-units shall be applied for apparatus with rated MAINS voltages $>150\text{ V}$ and $\leq 250\text{ V}$ with respect to earth or neutral respectively.

Subclass Y4 capacitors or RC-units may be applied only for apparatus with rated MAINS voltages $\leq 150\text{ V}$ with respect to earth or neutral respectively.

承受IEC 60384-14 (GB/T14472-1998) 表2中规定的Y2或Y4小类电容器或阻容单元的试验。

对额定电源电压分别相对于地或中线为大于150V，但小于或等于250V的设备应采用Y2小类电容器或阻容单元。

只有对额定电源电压分别相对于地或中线为小于或等于150V的设备才可以采用Y4小类电容器或阻容单元。

b) withstand the tests for subclass Y1 or Y2 capacitors or RC-units as specified in IEC 60384-14, table II.

Subclass Y1 capacitors or RC-units shall be applied for apparatus with rated MAINS voltages $>150\text{ V}$ and $\leq 250\text{ V}$ with respect to earth or neutral respectively.

Subclass Y2 capacitors or RC-units may be applied only for apparatus with rated MAINS voltages $\leq 150\text{ V}$ with respect to earth or neutral respectively.

承受IEC 60384-14 (GB/T14472-1998) 表2中规定的Y1或Y2小类电容器或阻容单元的试验。

对额定电源电压分别相对于地或中线为大于150V，但小于或等于250V的设备应采用Y1小类电容器或阻容单元。

只有对额定电源电压分别相对于地或中线为小于或等于150V的设备才可以采用Y2小类电容器或阻容单元。

NOTE – For the application of a) and b), reference is made to 8.5 and 8.6. 注：在采用a)项和b)项时，按照8.5和8.6。

Such capacitors or RC-units shall be positioned inside the enclosure of the apparatus.

这类电容器或阻容单元应安装在设备外壳的内部。

14.2.2 Capacitors or RC-units having their terminations DIRECTLY CONNECTED TO THE MAINS, shall withstand the tests for subclass X1 or X2 capacitors or RC-units as specified in IEC 60384-14, table II. 其端子与电网电源直接连接的电容器或阻容单元应承受IEC 60384-14表2中规定的X1或X2小类电容器或阻容单元的试验。

Subclass X1 capacitors or RC-units shall be applied for PERMANENTLY CONNECTED APPARATUS intended for connection to a MAINS with a nominal voltage $>150\text{ V}$ and $\leq 250\text{ V}$ with respect to earth or neutral respectively.

Subclass X2 capacitors or RC-units may be used for all other applications.

对预定要与标称电压分别相对于地或中线大于150V，但小于或等于250V的电网电源连接的永久连接式设备应采用X1小类电容器或阻容单元。

X2小类电容器或阻容单元可用于所有其他应用场合。

NOTE 1 – Y2 capacitors or RC-units may be used instead of X1 or X2 capacitors or RC-units.

NOTE 2 – Y4 capacitors or RC-units may be used instead of X2 capacitors or RC-units in applications $\leq 150\text{ V}$.

注1：Y2小类电容器或阻容单元可以用来代替X1或X2小类电容器或阻容单元。

2：在应用场合电压小于或等于150V时，Y4小类电容器或阻容单元可以用来代替X2小类电容器或阻容单元。

14.2.3 Capacitors or RC-units in a.c. circuits with MAINS frequency not CONDUCTIVELY CONNECTED TO THE MAINS, the short-circuiting of which would cause an infringement of the requirements with regard to overheating, shall withstand the tests for subclass X2 capacitors or RC-units as specified in IEC 60384-14, table II.

当在电网电源频率的交流电路中与电网电源非导电连接的电容器或阻容单元的短路可能会不满足关于过热的要求时，这些电容器或阻容单元应承受IEC 60384-14 (GB/T14472-1998) 表2规定的X2小类电容器或阻容单元的试验。

The characteristics of the capacitors or RC-units shall be appropriate for their function in the apparatus under normal operating conditions. 电容器或阻容单元的特性应与其在正常工作条件下设备中的功能相适应。

14.2.4 (Intentionally kept free for future requirements for capacitors or RC-units others than those mentioned in 14.2.1 to 14.2.3) (为电容器和阻容单元除14.2.1至14.2.3所规定的要求以外的进一步要求留空)



14.2.5 Capacitors or RC-units with a volume exceeding 1 750 mm³ used in circuits where, when the capacitor or RC-unit is short-circuited, the current through the short-circuit exceeds 0,2 A, shall comply with the passive flammability requirements according to IEC 60384-1, subclause 4.38, flammability category B or better.

Capacitors or RC-units with a volume less than 1 750 mm³ need not meet requirements for passive flammability. 对体积超过1 750 mm³的电容器或阻容单元，当用于在该电容器或阻容单元短路时流过短路处的电流会超过0,2 A的电路时，这些电容器或阻容单元应符合IEC 60384-1（GB/T2693-1990）的4.38款可燃性类别B或更优的类别。对体积小于1 750 mm³的电容器或阻容单元则不必满足可燃性要求。

When the distance between POTENTIAL IGNITION SOURCES and capacitors or RC-units with a volume exceeding 1 750 mm³ does not exceed the values specified in table 5, then these capacitors or RC-units shall comply with the relevant passive flammability requirements according to IEC 60384-1, subclause 4.38 as specified in table 5 or better. 当潜在引燃源与体积超过1 750 mm³的电容器或阻容单元之间的距离不超过表5的规定值时，这些电容器或阻容单元应符合表5规定的IEC 60384-1（GB/T2693-1990）的4.38款相关的可燃性要求B或更优的可燃性要求。

Where these capacitors or RC-units are shielded by a barrier meeting the flammability category FV 0 according to or a barrier made of metal, no requirements shall apply. The barrier shall have dimensions covering at least the areas specified in table 5 and shown in figure 13. 对使用了满足IEC 60707（GB/T11020）的可燃性等级FV 0级的隔板或金属材料的隔板来隔离这些电容器或阻容单元的情况下，可燃性要求不适用。隔板所具有的尺寸应至少覆盖表5和图13所规定的范围。

These requirements are not applicable to capacitors or RC-units having a metal case. Thin coatings on such a case are ignored. 这些要求不适用于带金属壳的电容器或阻容单元。在这种外壳上的薄覆涂层忽略不计。

Table 5 – Flammability category related to distance from POTENTIAL IGNITION SOURCES.

表5 与距潜在引燃源的距离有关的可燃性类别

Open circuit voltage of the POTENTIAL IGNITION SOURCE 潜在引燃源的开路电压 交流V（峰值）或直流V	Distance from POTENTIAL IGNITION SOURCES to the capacitor or RC-unit downwards or sideways less than 1) mm 从潜在引燃源向下或向侧面到电容器或阻容单元的距离（小于）	Distance from POTENTIAL IGNITION SOURCES to the capacitor or RC-unit upwards less than 1) mm 从潜在引燃源向上到电容器或阻容单元的距离（小于）	Passive flammability Category according to IEC 60384-1 GB/T26953的可燃性类别
>50 V to <4 000 V (peak) a.c. or d.c.	13	50	B
>4 kV (peak) a.c. or d.c.	D 2)	D 3)	B

1) See figure 13. 见图13

2) Where D is 13 mm or the open-circuit voltage of the POTENTIAL IGNITION SOURCE in kilovolts, whichever is larger.
D为13 mm或潜在引燃源的开路电压KV数，取其较大者

3) Where D is 50 mm or the open-circuit voltage of the POTENTIAL IGNITION SOURCE in kilovolts, whichever is larger.
D为50 mm或潜在引燃源的开路电压KV数，取其较大者

Compliance is checked according to IEC 60384-1, subclause 4.38. 按GB/T2693-1990的4.38款来检验是否合格。

14.2 Inductors and windings 电感器和绕组

14.3.1 Marking 标志

Inductors the failure of which can impair the safety of an apparatus, for example ISOLATING TRANSFORMERS, shall be marked with the manufacturer's name or trade mark and with a type or catalogue reference. The manufacturer's name and the type reference may be replaced by a code number. 其失效会损害设备的安全的电感器，例如隔离变压器，应标有制造厂名称或商标以及型号或产品分类号。制造厂名称和型号可以用代码来代替。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.3.2 General 总则

NOTE 1 – Depending on the application in the apparatus attention is drawn to the requirements of 10.1 for the insulation of windings. 注1：根据在设备中的应用情况，应注意10.1对绕组绝缘的要求。

ISOLATING TRANSFORMERS shall comply with: 隔离变压器应符合下列条款的要求

- 14.3.3 and
- 14.3.4.1 or 14.3.4.2 and
- 14.3.5.1 or 14.3.5.2.

SEPARATING TRANSFORMERS shall comply with: 分离变压器应符合下列条款的要求

- 14.3.3 and
- 14.3.4.3 and
- 14.3.5.1 or 14.3.5.2.

Other windings, for example induction motors where the power is supplied to the stator only, degaussing coils,



relay coils, autotransformers, shall comply with 14.3.3.1, 14.3.5.1 and 14.3.5.2 as far as applicable.

其他绕组,例如,电源仅加到其定子的感应电动机、消磁线圈、继电器线圈、自耦变压器应按适用情况符合14.3.3.1, 14.3.5.1以及14.3.5.2的要求。

Transformers for switch mode power supplies (SMPS) shall comply with the requirements as for ISOLATING TRANSFORMERS as far as applicable. 开关型电源SMPS用变压器应按适用情况符合有关隔离变压器的要求。

NOTE 2 –Special requirements for SMPS transformers are under consideration. 注2:SMPS用变压器的特殊要求正在考虑中。

Insulating material of inductors and windings, except in thin sheet form, shall comply with 20.1.4.

电感器和绕组的所用绝缘材料,除薄层形式外,应符合20.1.4的要求。

14.3.3 Constructional requirements 结构要求

14.3.3.1 All windings 所有的绕组

CLEARANCES and CREEPAGE DISTANCES shall comply with the requirements of clause 13.

电气间隙和爬电距离应符合第13章的要求。

14.3.3.2 Designs with more than one winding 带有一个以上绕组的设计

When an insulation barrier consisting of an uncemented pushed-on partition wall is used, CREEPAGE DISTANCES are measured through the joint. If the joint is covered by an adhesive bonding tape in accordance with IEC 60454, one layer of adhesive bonding tape is required on each side of the wall in order to reduce the risk of tape folding over during production.

当使用一种由推入式不胶合的隔板组成的绝缘档板时,应通过接缝处测量爬电距离。如果接缝处使用符合IEC 60454的胶带覆盖,则在隔板的每一侧都需要一层胶带,以便减少在生产过程中胶带发生折叠的危险。

The input and output windings shall be electrically separated from each other, and the construction shall be such that there is no possibility of any connection between these windings, either directly or indirectly through conductive parts. 输入绕组与输出绕组彼此应电气隔离,在结构上应使得这些绕组之间不存在直接或间接通过导电零部件发生任何连接的可能性。

In particular, precautions shall be taken to prevent: 特别应该采取预防措施,以便

– undue displacement of input or output windings, or the turns thereof;

防止输入绕组或输出绕组或者这些绕组中的线匝发生过分位移

– undue displacement of internal wiring, or wires for external connections;

防止内部连线或供外部连接的导线发生过分位移

– undue displacement of parts of windings, or of internal wiring, in the event of rupture of wires, or loosening of connections;

防止当万一导线断开或连接点松动时,绕组的一部分或内部连线的一部分发生过分位移

– wires, screws, washers and the like from bridging any part of the insulation between the input and output windings, including the connections of windings, should they loosen or become free.

防止一旦导线、螺钉、垫圈和类似零件发生松动或脱落而跨接在输入和输出绕组之间、包括绕组的连接点之间的任何绝缘上。

The last turn of each winding shall be retained in a reliable manner, for example by tape, suitable bonding agent, or retention shall be implied by process technology. 每个绕组的最后一匝应用可靠的方法固定,例如用胶带,用合适的胶粘剂,或者应采用含有固位工艺技术的加工工艺固定。

Where cheekless bobbins are used, the end turns of each layer shall be retained in a reliable manner. Each layer can, for example, be interleaved with adequate insulation material projecting beyond the end turns of each layer and, moreover, either 在使用无档板骨架的情况下,每层的端匝应用可靠的方法固定。例如每一层可以包上延伸至超出端匝的足够的绝缘材料,此外再采用如下方法:

– the windings shall be impregnated with hard-baking or cold-setting material, substantially filling the intervening spaces and effectively sealing-off the end turns, or

将绕组用热固性或凝固性材料浸渍,充分填满空隙并有效地封固端匝,或

– the windings shall be held together by means of insulating material, or 用绝缘材料把绕组固定在一起,或

– the windings shall, for example, be fixed by process technology. 诸如采用加工工艺将绕组固定。

NOTE – It is not expected that two independent fixings will become loose at the same time.

注:不考虑两种独立的固定同时发生松动。

Where serrated tape is used, the serrated part is disregarded as insulation.

在使用齿形胶带的情况下,齿形部分不作绝缘考虑。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.3.4 Separation between windings 绕组间的隔离

14.3.4.1 Windings of CLASS II construction II类结构的绕组

The separation between HAZARDOUS LIVE windings 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. 在带危险电压的绕组与预定要连接到可触导电零部件的绕组之间的隔离应由符合8.8的双重绝缘或加强绝缘组成，但对用作加强绝缘的线圈骨架和隔板，除其厚度至少为0,4 mm外，无需采用附加要求。

Where an intermediate conductive part, for example the iron core, not intended to be connected to ACCESSIBLE conductive parts is located between the relevant windings, the insulation between these windings via the intermediate conductive part shall consist of DOUBLE or REINFORCED INSULATION as mentioned above.

对预定不连接到可触导电零部件的中间导电零部件（如铁芯）位于相关绕组之间的情况下，这些绕组之间通过中间导电零部件的绝缘应由上述的双重绝缘或加强绝缘组成。

Compliance is checked by inspection and by measurement. 通过检查和测量来检验是否合格。

14.3.4.2 Windings of CLASS I construction I类结构的绕组

The separation between HAZARDOUS LIVE windings and windings intended to be connected to ACCESSIBLE parts may consist of BASIC INSULATION plus PROTECTIVE SCREENING only if all of the following conditions are complied with: 在危险带电绕组与预定要连接到可触及金属零部件的绕组之间的隔离可由基本绝缘加保护屏蔽层组成，只要满足下列全部条件即可

- the insulation between HAZARDOUS LIVE windings and the protective screen shall comply with the requirements for BASIC INSULATION according to 8.8 dimensioned for the HAZARDOUS LIVE voltage; 在危险带电绕组与保护屏蔽层之间的绝缘应符合8.8针对危险带电电压规定了基本绝缘的尺寸要求;
- the insulation between the protective screen and non-HAZARDOUS LIVE windings shall comply with the requirements for dielectric strength according to table 3, item 2; 在保护屏蔽层与非危险带电绕组之间的绝缘应符合表3第2项的抗电强度的要求;
- the protective screen intended to be connected to a PROTECTIVE EARTH TERMINAL or contact shall be positioned between the input and output windings in such a way that the screen effectively prevents the input voltage being applied to any output winding in case of an insulation fault; 预定要连接到保护接地端子或接触件的保护屏蔽层，在输入绕组与输出绕组之间的设置，应能保证万一绝缘失效时，该屏蔽层能有效防止输入电压被加到任何输出绕组;
- the protective screen shall consist of a metal foil or of a wire wound screen extending at least the full width of one of the windings adjacent to the screen. A wire wound screen shall be wound tight without space between the turns; 保护屏蔽层应由金属箔或线绕屏蔽构成，其宽度应至少延展至与该屏蔽层相邻的绕组中的一个绕组的整个宽度。线绕屏蔽应采用密绕方式，以使线匝之间无空隙;
- the protective screen shall be so arranged that its ends cannot touch each other nor touch simultaneously an iron core, in order to prevent losses due to creation of a shorted winding; 保护屏蔽层的配置应使其两端不会彼此触及，也不会同时触及铁芯，以防止由于形成短路绕组而引起损耗;
- the protective screen and its lead-out wire shall have a cross-sectional area sufficient to ensure that if a breakdown of insulation should occur, a fusing or interrupting device will open the circuit before the screen or the lead-out wire is destroyed; 保护屏蔽层及其引出线应具有足够的截面积，以保证在万一发生绝缘击穿时，熔断装置或断路装置在屏蔽层或引出线被烧毁前先行断开电路;
- the lead-out wire shall be connected to the protective screen in a reliable manner, for example by soldering, welding, riveting or crimping. 引出线应用可靠的方法连接到保护屏蔽层上，例如采用焊接、熔焊、铆接或压接。

Compliance is checked by inspection and by measurement. 通过检查和测量来检验是否合格。

14.3.4.3 Windings of separating construction 分离结构的绕组

The separation between HAZARDOUS LIVE windings and windings intended to be connected to parts separated from ACCESSIBLE parts by SUPPLEMENTARY INSULATION only shall consist of at least BASIC INSULATION according to 8.8. 危险带电绕组与预定与仅用附加绝缘和可触及零部件隔离的零部件连接的绕组之间的隔离，应由至少符合8.8的基本绝缘组成。

Compliance is checked by inspection and by measurement. 通过检查和测量来检验是否合格。

14.3.5 Insulation between HAZARDOUS LIVE parts and ACCESSIBLE parts 危险带电零部件与可触及零部件之间的绝缘

14.3.5.1 Windings of CLASS II construction II类结构的绕组

The insulation between HAZARDOUS LIVE windings and ACCESSIBLE parts or parts intended to be connected to ACCESSIBLE conductive parts, for example the iron core, and

the insulation between HAZARDOUS LIVE parts, for example the 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.



在危险带电绕组与可触及零部件之间，或者与预定要连接到可触及导电零部件上的零部件（例如铁芯）之间的绝缘，以及危险带电零部件（例如预定要连接到危险带电绕组的铁芯）与预定要连接到可触及导电零部件的绕组之间的绝缘，应由符合8.8的双重绝缘或加强绝缘组成，但对用作加强绝缘的线圈骨架和隔板，除其厚度至少为0,4 mm外，无需采用附加要求。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

14.3.5.2 Windings of CLASS I construction I类结构的绕组

The insulation between HAZARDOUS LIVE windings and ACCESSIBLE conductive parts or parts intended to be connected to ACCESSIBLE conductive parts connected to a PROTECTIVE EARTH TERMINAL or contact, for example the iron core,

and

the insulation between HAZARDOUS LIVE parts, for example the iron core connected to a HAZARDOUS LIVE winding, and winding wires or foils of protective screens intended to be connected to a PROTECTIVE EARTH TERMINAL or contact,

shall consist of BASIC INSULATION according to 8.8.

在危险带电绕组与可触及导电零部件之间，或者与预定要连接到和保护接地端子或接触件的可触及导电零部件（例如铁芯）之间的绝缘，以及在危险带电零部件（例如连接到危险带电绕组的铁芯）与预定要连接到保护接地端子或接触件的绕组线或保护屏蔽层的金属箔之间的绝缘应由符合8.8的基本绝缘组成。

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

预定要连接到保护接地端子或接触件的绕组线应具有足够的载流容量，以保证在万一发生绝缘击穿时，熔断装置或断路装置在绕组线被烧毁前先行断开电路。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

14.4 High voltage components and assemblies 高压元件及组件

NOTE – For high voltage cables reference is made to 20.1.2. 注：对高压电缆，按照20.1.2。

Components operating at voltages exceeding 4 kV (peak) and spark gaps provided to protect against overvoltages, if not otherwise covered by 20.1.3, shall not give rise to danger of fire to the surroundings of the apparatus, or to any other hazard within the sense of this standard. 对工作电压超过4KV（峰值）的元件和过压保护放电器，如果20.1.3无其他规定，则不应对设备的周围造成起火的危险或本标准意义范围内的任何其他危险。

Compliance is checked by meeting the requirement for category FV1 according to IEC 60707 or by the test of

14.4.1, in which no failure is allowed. 通过检查是否满足IEC 60707（GB/T11020-1998）规定的FV1级的要求或通过14.4.1的试验来检验是否合格，试验不允许失效。

14.4.1 High voltage transformers and multipliers 高压变压器和倍增器

Three specimens of the transformer with one or more high-voltage windings or of the high-voltage multipliers are subjected to the treatment specified under item a), followed by the test specified under item b).

三个带有一个或一个以上高压绕组的变压器或高压倍增器承受a)项规定的处理，然后承受b)项规定的试验。

a) Preconditioning 预处理

For transformers, a power of 10 W (d.c. or a.c. at MAINS frequency) is initially supplied to the high-voltage winding. This power is sustained for 2 min, after which it is increased by successive steps of 10 W at 2 min intervals to 40 W. 对变压器，开始先用10W（直流或电网电源频率的交流）功率加于高压绕组。在此功率上保持2 min，此后每隔2 min依次步进10W来增大功率，直至40W为止。

The treatment lasts 8 min or is terminated as soon as interruption of the winding or appreciable splitting of the protective covering occurs.

处理持续8 min，或者一旦出现绕组断线或保护覆盖层出现明显开裂，立即终止处理。

NOTE 1 – Certain transformers are so designed that this preconditioning cannot be carried out. In such cases, only the test of item b) below is applied. 注1：对某些变压器的设计不能进行此项预处理，在这种情况下仅进行下面b)项的试验。

For high-voltage multipliers, a voltage taken from an appropriate high-voltage transformer, is supplied to each specimen, its output circuit being short-circuited.

The input voltage is adjusted so that the short-circuit current is initially (25 ± 5) mA. This is maintained for 30 min or is terminated as soon as any interruption of the circuit or appreciable splitting of the protective covering occurs.

对于高压倍增器，从一个适当的高压变压器上取出电压加至每一个样品，将样品的输出电路短路调节输入电压使短路电流一开始为 (25 ± 5) mA，此处理保持30 min，或者一旦出现电路断开或防护覆盖层出现明显开裂，立即终止处理。

NOTE 2 – Where the design of a high-voltage multiplier is such that a short-circuit current of 25 mA cannot be obtained, a preconditioning current is used, which represents the maximum attainable current, determined either by the design of the



multiplier or by its conditions of use in a particular apparatus. 注2: 在高压倍增器的设计不能达到25 mA短路电流的情况下, 使用由高压倍增器设计确定的, 或由高压倍增器在特定设备的使用条件确定的、代表最大能达到的电流作为预处理电流。

b) Flame test 燃烧试验

The specimen is subjected to the flame test of clause G.1.2, annex G.

样品承受附录G的G.1.2规定的火焰试验。

14.5 Protective devices 保护装置

The application of protective devices shall be in accordance with their rated values.

External CLEARANCES and CREEPAGE DISTANCES of protective devices and their connections shall meet the requirements for BASIC INSULATION of clause 13 for the voltage across the device when opened.

保护装置的应用应与它们的额定值相一致。

保护装置的外部电气间隙和爬电距离以及它们的连接点应按其断开时跨接保护装置两端的电压, 符合第13章的基本绝缘的要求。

Compliance is checked by measurement or calculation. 通过测量或计算来检验是否合格。

14.5.1 THERMAL RELEASES 热释放

THERMAL RELEASES used in order to prevent the apparatus from becoming unsafe within the sense of this standard shall comply with 14.5.1.1, 14.5.1.2 or 14.5.1.3 respectively, whichever is applicable. 为了防止设备出现本标准范围内的危险而使用的热释放器, 应按适用情况, 分别符合14.5.1.1, 14.5.1.2或14.5.1.3的要求。

14.5.1.1 THERMAL CUT-OUTS shall meet one of the following requirements: 热断路器应满足下列要求之一

a) The THERMAL CUT-OUT when tested as a separate component, shall comply with the requirements and tests of IEC 60730 series as far as applicable.

当热断路器作为单独的元件进行试验时, 应按适用情况, 符合IEC 60730 (GB14536) 系列标准的要求和试验。

For the purpose of this standard the following applies: 就本标准而言, 采用下列要求和试验

– the THERMAL CUT-OUT shall be of type 2 action (see IEC 60730-1, subclause 6.4.2);

热断路器的动作特性应为2型动作; 见IEC 60730-1 (GB14536.1-1998) 中6.4.2;

– the THERMAL CUT-OUT shall have at least MICRO-DISCONNECTION (type 2B) (see IEC 60730-1, subclauses 6.4.3.2 and 6.9.2); 热断路器的操作特性至少应具有微断开 (2B型) (见GB14536.1-1998中6.4.3.2和6.9.2);

– the THERMAL CUT-OUT shall have a TRIP-FREE mechanism in which contacts cannot be prevented from opening against a continuation of a fault (type 2E) (see IEC 60730-1, subclause 6.4.3.5); 热断路器的结构特性应具有不会妨碍触头打开, 以防止故障持续的自动脱扣机构 (2E型) (见GB14536.1-1998中6.4.3.5);

– the number of cycles of automatic action shall be at least 自动动作循环次数应至少为

• 3 000 cycles for THERMAL CUT-OUTS with automatic reset used in circuits which are not switched-off when the apparatus is switched-off (see IEC 60730-1, subclause 6.11.8), 用于断开设备时不断开电路的自动复位热断路器, 3 000次循环 (见GB14536.1-1998中6.11.18)

• 300 cycles for THERMAL CUT-OUTS with automatic reset used in circuits which are switched-off together with the apparatus and for THERMAL CUT-OUTS with no automatic reset which can be reset BY HAND from the outside of the apparatus (see IEC 60730-1, subclause 6.11.10), 用于同时断开设备和电路的自动复位热断路器以及能从设备外面手动复位的非自动复位的热断路器, 300次循环 (见GB14536.1-1998中6.11.10)

• 30 cycles for THERMAL CUT-OUTS with no automatic reset and which cannot be reset BY HAND from the outside of the apparatus (see IEC 60730-1, subclause 6.11.11); 不能从设备外面手动复位的非自动复位的热断路器, 30次循环 (见GB14536.1-1998中6.11.11)

– the THERMAL CUT-OUT shall be tested as designed for a long period of electrical stress across insulating parts (see IEC 60730-1, subclause 6.14.2);

热断路器应按电气应力长期加在绝缘零部件上的设计来试验 (见GB14536.1-1998中6.14.2)

– the THERMAL CUT-OUT shall meet the ageing requirements for an intended use of at least 10 000 h (see IEC 60730-1, subclause 6.16.3); 热断路器应满足预定用途至少为10 000 h的老化要求 (见IEC 60730-1)

– with regard to the dielectric strength, the THERMAL CUT-OUT shall meet the requirements of 10.3 of this standard, except across the contact gap, and except between terminations and connecting leads of the contacts, for which IEC 60730-1, subclauses 13.2 to 13.2.4 applies.

关于抗电强度, 热断路器应满足本标准10.3的要求, 但对触头间隙的两端, 以及端头和触头的连接引线之间, 采用IEC 60730- (GB14536.1-1998) 中13.2至13.2.4的要求。

The characteristics of the THERMAL CUT-OUT with regard to:

下列的热断路器的特性应适合于在正常工作条件以及故障条件下在设备中的应用

– the ratings of the THERMAL CUT-OUT (see IEC 60730-1, clause 5); 热断路器的额定值 (见IEC 60730-1中第5章)

– the classification of the THERMAL CUT-OUT according to 按下列的特性划分的热断路器的类别



- nature of supply (see IEC 60730-1, subclause 6.1), 电源性质 (见GB14536.1-1998中6.1)
 - type of load to be controlled (see IEC 60730-1, subclause 6.2), 所控制的负载类型 (见60730-1中6.1)
 - degree of protection provided by enclosures against ingress of solid objects and dust (see IEC 60730-1, subclause 6.5.1), 由防止固体异物和灰尘进入的外壳提供保护的等级 (见GB14536.1-1998中6.5.1)
 - degree of protection provided by enclosures against harmful ingress of water (see IEC 60730-1, subclause 6.5.2), 外壳提供的防止水有害进入的防护等级 (见60730-1中6.5.2)
 - pollution situation for which the THERMAL CUT-OUT is suitable (see IEC 60730-1, subclause 6.5.3), 热断路器适应的污染环境 (见GB14536.1-1998中6.5.3)
 - maximum ambient temperature limit (see IEC 60730-1, subclause 6.7);最高环境温度极限(见60730-1中6.7)
- shall be appropriate for the application in the apparatus under normal operating conditions and under fault conditions.

Compliance is checked according to the test specifications of IEC 60730 series, by inspection and by measurement. 按GB14536系列标准的试验规范, 通过检查和测量来检验是否合格。

b) The THERMAL CUT-OUT when tested as a part of the apparatus shall:

当热断路器作为设备的部件进行试验时, 应符合下列要求

- have at least MICRO-DISCONNECTION according to IEC 60730-1 withstanding a test voltage according to subclause 13.2 of IEC 60730-1, and 至少具有符合IEC 60730-1 (GB14536.1) 的微断开, 能承受符合IEC 60730-1 (GB14536.1-1998) 中13.2的耐压试验; 以及
- have a TRIP-FREE mechanism in which contacts cannot be prevented from opening against a continuation of a fault, and 具有不会妨碍触头打开, 以防止故障持续的自动脱扣机构; 以及
- be aged for 300 h at a temperature corresponding to the ambient temperature of the THERMAL CUT-OUT when the apparatus is operated under normal operating conditions at an ambient temperature of 35 °C (45 °C for apparatus intended for use in tropical climates), and 应老化300 h, 老化温度等于设备在35 °C (预定要用于热带气候的设备为45 °C) 环境温度下、正常工作时的热断路器的环境温度; 以及
- be subjected to a number of cycles of automatic action as specified under a) for a THERMAL CUT-OUT tested as a separate component, by establishing the relevant fault conditions. 热断路器作为单独的元件按a)项进行试验的规定, 建立相关的故障条件, 承受一定数量的自动动作循环。

The test is made on three specimens. 用3个样品进行试验。

No sustained arcing shall occur during the test. 试验期间不应发生持续飞弧。

After the test, the THERMAL CUT-OUT shall show no damage in the sense of this standard. In particular, it shall show no deterioration of its enclosure, no reduction of CLEARANCES and CREEPAGE DISTANCES and no loosening of electrical connections or mechanical fixings. 试验后, 热断路器不应出现本标准意义上的损坏。特别是, 其外壳不应出现劣变, 电气间隙和爬电距离不应出现减小以及电气连接或机械固定不应出现松动。

Compliance is checked by inspection and by the specified tests in the given order.

通过检查和规定的试验, 按给定的顺序来检验是否合格。

14.5.1.2 THERMAL LINKS shall meet one of the following requirements: 热熔断体应符合下列要求之一

a) The THERMAL LINK when tested as a separate component, shall comply with the requirements and tests of IEC 60691. 当热熔断体作为单独的元件试验时, 应符合IEC 60691 (GB9816) 的要求和试验。

The characteristics of the THERMAL LINK with regard to

下列的热熔断体特性应适合于在正常工作条件和故障条件下在设备中的应用

- the ambient conditions (see IEC 60691, subclause 6.1), 环境条件 (见GB9816-1998中6.1)
- the circuit conditions (see IEC 60691, subclause 6.2), 电路条件 (见IEC 60691中6.1)
- the ratings of the THERMAL LINK (see IEC 60691, subclause 8 b)), 热熔断体的额定值(见GB9816-1998中8 b))
- the suitability for sealing in or use with impregnating fluids or cleaning solvents (see IEC 60691, subclause 8 c)); 放入浸渍液或清洗剂中, 或者与浸渍液或清洗剂一起使用的适用性 (见GB9816-1998中8 c))

shall be appropriate for the application in the apparatus under normal operating conditions and under fault conditions.

The dielectric strength of the THERMAL LINK shall meet the requirements of 10.3 of this standard except across the disconnection (contact parts) and except between terminations and connecting leads of the contacts, for which IEC 60691, subclause 11.3 applies. 热熔断体的抗电强度应符合本标准10.3的要求, 但断开点(触点部分)两端以及端接处和触点连接引线之间, 采用IEC 60691 (GB9816-1998) 中11.3的要求。

Compliance is checked according to the test specifications of IEC 60691, by inspection and measurement.

按IEC 60691 (GB9816) 的试验规范, 通过检查和测量来检验是否合格。

b) The THERMAL LINK when tested as a part of the apparatus shall be: 当热熔断体作为设备的一部分试验时

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- aged for 300 h at a temperature corresponding to the ambient temperature of the THERMAL LINK when the apparatus is operated under normal operating conditions at an ambient temperature of 35 °C (45 °C for apparatus intended for use in tropical climates), and 应老化300 h, 老化温度等于设备在35 °C (预定热带气候使用的设备为45 °C)、正常工作条件下工作时的热熔断体的环境温度; 以及
- subjected to such fault conditions of the apparatus which cause the THERMAL LINK to operate. During the test no sustained arcing and no damage in the sense of this standard shall occur, and 应承受能引起热熔断体动作的设备的故障条件。在试验期间不应发生持续飞弧和本标准范围内的损坏; 以及
- capable of withstanding two times the voltage across the disconnection and have an insulation resistance of at least 0,2 MΩ, when measured with a voltage equal to two times the voltage across the disconnection. 应能承受两倍断开点两端的电压, 并且当用等于断开点两端电压两倍的电压测量时, 绝缘电阻至少有0,2 MΩ。The test is made 10 times, no failure is allowed. 试验进行10次, 不允许失效。

The THERMAL LINK is replaced, partially or completely, after each test.

在每次试验后, 热熔断体部分更换或全部更换。

NOTE – When the THERMAL LINK cannot be replaced partially or completely, the complete component part comprising the THERMAL LINK, for example a transformer, should be replaced.

注: 当热熔断体不能部分或全部更换时, 应更换装有热熔断体的完整的元部件, 例如变压器。

Compliance is checked by inspection and by the specified tests in the given order.

通过检查和规定的试验, 按给定的顺序来检验是否合格。

14.5.1.3 Thermal interrupting devices which are intended to be reset by soldering shall be tested according to 14.5.1.2 b). 预定要用焊接复位的热断路器装置应按14.5.1.2 b)进行试验。

However, the interrupting element is not replaced after operation, but reset according to the instructions of the apparatus manufacturer or, in absence of instructions, soldered with standard 60/40 tin/lead solder.

但是, 在动作后不更换断路元件, 而是按照设备制造厂商的说明复位, 或在没有说明的情况下, 用含60%锡、40%铅的标准焊锡焊接。

NOTE – Examples of interrupting devices which are intended to be reset by soldering, are THERMAL RELEASES, integrated, on power resistors, for example externally.

注: 预定要用焊接复位的断路装置的例子是, 在功率电阻器上, 例如在其外部, 形成整体的热释放器。

14.5.2 Fuse-links and fuse holders 熔断体和熔断器座

14.5.2.1 Fuse-links, DIRECTLY CONNECTED TO THE MAINS, used in order to prevent the apparatus from becoming unsafe within the sense of this standard shall comply with the relevant part of IEC 60127, unless they have a rated current outside the range specified in that standard. 为防止设备发生本标准范围内的危险而选用的直接与电网电源连接的熔断体, 应符合IEC 60127的有关部分, 但熔断体额定电流超过该标准规定的范围者除外。

In the latter case, they shall comply with the relevant part of IEC 60127 as far as applicable.

后一种的情况, 应按适用的情况符合IEC 60127 (GB9364)的有关部分。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.5.2.2 For fuse-links according to IEC 60127, the following marking shall be located on each fuse-holder or close to the fuse-link, in the given order:

对符合IEC 60127 (GB9364)的熔断体, 下列的标志应按给定的顺序, 标在每个熔断器座上或熔断体就近处

- a symbol denoting the relative prearcing time/current characteristic; 表示有关的预飞弧时间/电流特性的符号 examples are: 例如

F, denoting quick acting; F表示快速动作

T, denoting time lag; T表示延时

- the rated current in milliamperes for rated currents below 1 A, and in amperes for rated currents of 1 A or more; 对额定电流小于1 A者以毫安值表示额定电流, 额定电流等于或大于1 A者以安培值表示额定电流

- a symbol denoting the breaking capacity of the assigned fuse-link; 表示给定的熔断体分断能力的符号 examples are: 例如

L, denoting low breaking capacity; L表示低分断能力 (防爆)

E, denoting enhanced breaking capacity; E表示增强分断能力

H, denoting high breaking capacity. H表示高分断能力

Examples of marking: 标记示例 T 315 L or T 315 mA L

F 1,25 H or F 1,25 A H

However, it is permissible to locate the marking elsewhere, in or on the apparatus, provided that it is obvious to which fuseholder the marking applies.

然而, 允许将标志标在设备内或设备上的其他地方, 只要能明显看出标志对应的是哪一个熔断器座即可。

The marking requirements apply also if the fuse-links have a rated current outside the range specified in IEC



60127. 熔断体的额定电流超出IEC 60127 (GB9364) 规定的范围时, 标志要求仍然适用。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.5.2.3 Fuse holders, so designed that fuse-links can be connected in parallel in the same circuit, shall not be used. 设计成能使熔断体在同一电路中并联连接的熔断器座不得使用。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.5.2.4 If HAZARDOUS LIVE parts are rendered ACCESSIBLE during replacement of fusing or interrupting devices, access to such parts shall not be possible BY HAND operation.

如果在更换熔断装置或断路装置期间会使危险带电零部件变成可触及, 则应不可能手动操作来触及这种装置。

Fuse-holders for miniature cartridge fuse-links of the screw-in or bayonet type shall, if removal of the fuse-carrier BY HAND is possible from the outside of the apparatus, be so constructed that HAZARDOUS LIVE parts do not become ACCESSIBLE, either during insertion or removal of the fuse-link, or after the fuse-link has been removed.

Fuse holders in compliance with IEC 60127-6 satisfy this requirement. 如果有可能从设备外面手动卸下熔断器载体, 则对螺口式或卡口式小型管状熔断体的熔断器座, 其结构应使得在装入或取出熔断体过程中, 或在熔断体取出之后, 危险带电零部件不会变成可触及。符合IEC 60127-6 (GB9364.6) 的熔断器座就能满足本要求。

When the fuse carrier is constructed to hold the fuse-link, the fuse-link is placed in the fusecarrier during the test. 当熔断器承载体的结构做成能夹持熔断体时, 则在试验期间熔断体装入熔断器载体。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.5.3 PTC-S THERMISTORS 阶跃型正温度系数热敏电阻器

PTC-S THERMISTORS used in order to prevent the apparatus from becoming unsafe within the sense of this standard shall comply with IEC 60738.

为了防止设备出现本标准意义范围内的不安全而选用的PTC-S热敏电阻器应符合IEC 60738的要求。

Compliance is checked by inspection and by the tests of 11.2 of this standard.

通过检查和本标准11.2的试验来检验是否合格。

For PTC -S THERMISTORS whose power dissipation exceeds 15 W for the rated zero-power resistance at an ambient temperature of 25 °C, the encapsulation or tubing shall comply with the flammability category FV 1 or better according to IEC 60707. 对于在环境温度为25 °C下额定零功率电阻的功率耗散超过15 W的PTC-S热敏电阻器, 其封闭盒或管体应符合IEC 60707 (GB/T11020) 的可燃性等级FV1级或更优等级。

Compliance is checked according to IEC 60707 or according to clause G.1.2 of annex G. 按IEC 60707或按附录G的G.1.2来检验是否合格。

14.5.4 Protective devices not mentioned in 14.5.1, 14.5.2 or 14.5.3 未在提到的保护装置

Such protective devices, for example fusing resistors, fuse-links not standardized in IEC 60127 or miniature circuit breakers, shall have adequate breaking capacity.

这些保护装置, 例如熔断电阻器, 非IEC 60127 (GB9364) 标准化的熔断体或小型断路器应有足够的分断能力。

For non-resettable protective devices, such as fuse-links, a marking shall be located close to the protective device, so that correct replacement is possible.

对于不可恢复的保护装置, 如熔断体, 其标志位置应靠近保护装置, 以便有可能正确的更换。

Compliance is checked by inspection and during the tests under fault conditions (see 11.2).

通过检查以及在故障条件 (见11.2) 下的试验来检验是否合格。

The test under fault condition is carried out three times. 在故障条件下的试验进行3次。

No failure is allowed. 不允许损坏。

14.6 Switches 开关

14.6.1 PERMANENTLY CONNECTED APPARATUS shall be provided with an ALL-POLE MAINS SWITCH, except when the requirement of 5.4.2 is met. 永久连接式设备应装有一个全极电源开关, 但当符合5.4.2的要求时除外。

The ALL-POLE MAINS SWITCH shall have a contact separation of at least 3 mm in each pole.

全极电源开关每个极的触点开距至少应有3 mm。

14.6.2 Apparatus, which under normal operating conditions has a power consumption exceeding 15 W and/or employs a peak voltage exceeding 4 kV, shall be provided with a MANUALLY OPERATED MECHANICAL SWITCH.

在正常工作条件下功率消耗超过15 W和/或采用超过4 kV的峰值电压的设备应装有一个手动机械化开关。

The switch shall be so connected that, when it is in the off-position, the power consumption of circuits remaining under voltage does not exceed 15 W and/or peak voltages do not exceed 4 kV under normal operating conditions and under fault conditions according to 4.3. 开关的连接方式应使得在正常工作条件和4.3规定的故障条件下, 当开关处在“断”位时, 正在保持通电的情况下保持的电路消耗功率不超过15 W和/或峰值电压不超过4 kV。

The switch shall be so placed that it is readily operable by the USER but shall not be fitted in the MAINS flexible cable or cord. 开关的安置应使用户能便于操作, 但不应安装在电源软电缆或软线上。

Irrespective of power consumption, no switch is required for apparatus or parts of apparatus having independent



functions and not employing voltages exceeding 4 kV (peak) under normal operating conditions, provided that for devices with independent functions and under normal working conditions do not exceed 4 kV (peak) voltage of the device or device parts, if it belongs to the following cases, then regardless of its power consumption how do not need to be switched on:

- they are capable of being switched-on or -off, or both, automatically and without human intervention at the time of switching, for example clock radios, video recorders, apparatus controlled by a data link, or can be automatically switched on or off, or both, automatically, and without human intervention, for example clock-controlled radios, video recorders, data-link controlled devices; or
- they are intended for continuous operation, for example antenna amplifiers, RF converters and modulators, devices forming a part of the MAINS plug. 预定要连续工作, 例如天线放大器、射频转换器和调制器、直插式设备。

Compliance is checked by inspection and by measurements. 通过检查和测量来检验是否合格。

The measurements under fault conditions, as specified in 4.3, are carried out 2 min after the application of a fault. 在4.3规定的故障条件下的测量应在设置一个故障后2 min进行。

14.6.3 On apparatus for which a MANUALLY OPERATED MECHANICAL SWITCH is required according to 14.6.2, the on-position of the switch shall be indicated.

按14.6.2需要有手动机械开关的设备, 其开关的“通”位在设备上应有指示。

NOTE – The indication of the on-position may be in the form of marking, illumination, audible indication or other suitable means. 注: “通”位的指示可以采用标志、光、声音指示的形式或其他适当的方法。

Where the indication is in the form of marking, the relevant requirements of clause 5 shall be complied with. 在采用标志进行指示的情况下, 应符合第5章的有关要求。

Marking of the off-position by the relevant symbol \bigcirc (60417-2-IEC-5008) is permitted only for ALL-POLE MAINS SWITCHES. 符号“ \bigcirc ”(GB/T5465.2-1996中编号5008)只能用于全极电源开关的“断”位标志。

Where marking, signal lamps or similar means might give the impression that the apparatus is completely switched-off from the MAINS, information which states clearly the correct situation shall be included in the instructions for use. If symbols are used, their meaning shall also be explained.

若采用标志、信号灯或类似方法会给出设备完全与电网电源断开的印象, 应在使用说明书中清楚地叙述设备正确状态的信息。如果使用符号, 则它们的含义也应给予说明。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.6.4 Apparatus, which can be brought into operation from a STAND-BY mode and where a MANUALLY OPERATED MECHANICAL SWITCH is required in accordance with 14.6.2, shall be provided with an indication to show the STAND-BY mode. 能从待机方式转入工作且按14.6.2需要有手动机械开关的设备应具有能显示待机状态的某种指示。

NOTE – The indication of the STAND-BY mode may be in the form of marking, illumination, audible indication or other suitable means. 注: 待机方式的指示可以采用标志、光、声音指示的形式或其他适当的方法。

No indication is required, if the current consumption of the apparatus in the STAND-BY mode does not exceed 0,7 mA (peak) a.c. or d.c.

如果处在待机状态的设备的消耗电流不超过交流0,7 mA (峰值)或直流0,7 mA, 则不需要指示。

Compliance is checked by inspection. 通过检查来检验是否合格。

14.6.5 Where resistors, capacitors or RC-units are used for bridging contact gaps of mechanical switches CONDUCTIVELY CONNECTED TO THE MAINS, the components shall comply with 14.1 a) or 14.2.2 respectively.

跨在与电源导电连接的机械开关的触点间隙上的电阻器、电容器或阻容单元应分别符合14.1 a)或14.2.2的要求。

14.6.6

NOTE – Switches controlling currents up to 0,2 A r.m.s. a.c. or d.c. need not meet any specification, provided that the voltage across the open switch contacts does not exceed 35 V (peak) a.c. or 24 V d.c. 注: 对所控制的电流小于等于交流0,2 A (有效值)或直流0,2 A的开关, 如果在其断开的开关触点上的电压不超过交流35 V (峰值)或直流24 V则不需要符合任何规定。

MANUALLY OPERATED MECHANICAL SWITCHES controlling currents exceeding 0,2 A r.m.s. a.c. or d.c. shall meet one of the following requirements if the voltage across the open switch contacts exceeds 35 V (peak) a.c. or 24 V d.c.: 对所控制的电流超过交流0,2 A (有效值)或直流0,2 A的手动机械开关, 如果在其断开的开关触点上的电压超过交流35 V (峰值)或直流24 V, 则应符合下列要求之一:

a) The switch tested as a separate component, shall comply with the requirements and tests of IEC 61058-1, whereby the following applies: 当开关作为单独的元件进行试验时, 应符合IEC 61058-1 (GB15092.1-1994)的要求和试验, 由此采用下列规定

- the number of operating cycles shall be 10 000; (see IEC 61058-1, subclause 7.1.4.4); 操作循环次数应为10 000次; (见GB15092.1-1994中7.1.4.4)
- the switch shall be suitable for use in a normal pollution situation (see IEC 61058-1, subclause 7.1.6.2); 开关应适合在正常污染环境中使用 (见IEC 61058-1中7.1.6.2);



- the switch shall be of level 3 regarding the resistance to heat and fire (see IEC 61058-1, subclause 7.1.9.3); 开关的耐热和耐燃应为3级（见GB15092.1-1994中7.1.9.3）；
- for MAINS switches the speed of contact making and breaking shall be independent of the speed of actuation (see IEC 61058-1, subclause 13.1). Moreover, MAINS switches shall comply with clause G.1.1 of annex G. 对电源开关，触点接通和断开的速度应与操作速度无关（见IEC 61058-1中13.1）。此外电源开关应符合附录G的G.1.1。

The characteristics of the switch with regard to: 下列的开关特性应适合在正常工作条件下开关的功能

- the ratings of the switch (see IEC 61058-1, clause 6); 开关额定值（见GB15092.1-1994中第6章）。
- the classification of the switch according to: 按下列特性划分的开关类别
 - nature of supply (see IEC 61058-1, subclause 7.1.1), 电源性质（见IEC 61058-1 中7.1.1）
 - type of load to be controlled by the switch (see IEC 61058-1, subclause 7.1.2), 开关所控制的负载类型（见GB15092.1-1994中7.1.2）
 - ambient air temperature (see IEC 61058-1, subclause 7.1.3); 环境空气温度（见IEC 61058-1 中7.1.3）

shall be appropriate for the function of the switch under normal operating conditions.

Compliance is checked according to test specifications of IEC 61058-1, by inspection and by measurements.

If the switch is a MAINS switch which controls MAINS socket-outlets, the total rated current and the peak surge current of the socket-outlets as specified in 14.6.10 shall be taken into account for the measurement.

按IEC 61058-1 (GB15092.1-1994) 的试验规定，通过检查和测量来检验是否合格。

如果开关是控制电源输出插座的电源开关，测量时应考虑14.6.10规定的输出插座的总额定电流和峰值电涌电流。

- b) The switch tested as part of the apparatus working under normal operating conditions, shall meet the requirements of 14.6.7, 14.6.10 and 20.1.4, and moreover: 当开关作为在正常工作条件下的设备的部件进行试验时，应满足14.6.7、14.6.10和20.1.4的要求，此外

- switches controlling currents exceeding 0,2 A r.m.s. a.c. or d.c. shall meet the requirements of 14.6.8 and 14.6.9 if the voltage across the open switch contacts exceeds 35 V (peak) a.c. or 24 V d.c.; 对所控制的电流超过交流0,2 A（有效值）或直流0,2 A的开关，如果在断开的开关触点上的电压超过交流35 V（峰值）或者直流24 V，则应满足14.6.8和14.6.9的要求；

- switches controlling currents exceeding 0,2 A r.m.s. a.c. or d.c. shall meet the requirements of 14.6.8 if the voltage across the open switch contacts does not exceed 35 V (peak) a.c. or 24 V d.c.; 对所控制的电流超过交流0,2 A（有效值）或直流0,2 A的开关，如果在断开的开关触点上的电压不超过交流35 V（峰值）或者直流24 V，则应满足14.6.8的要求；

- switches controlling currents up to 0,2 A r.m.s. a.c. or d.c. shall meet the requirements of 14.6.9. if the voltage across the open switch contacts exceeds 35 V (peak) a.c. or 24 V d.c.; 对所控制的电流小于或等于交流0,2 A（有效值）或直流0,2 A的开关，如果在断开的开关触点上的电压超过交流35 V（峰值）或者直流24 V，则应满足14.6.9的要求；

- MAINS switches shall comply with clause G.1.1 of annex G. 电源开关应符合附录G的G.1.1的要求。

14.6.7 A switch tested according to 14.6.6 b) shall withstand, without excessive wear or other harmful effects, the electrical, thermal and mechanical stresses that occur during intended use and shall have a mechanism complying with IEC 61058-1, subclause 13.1, for d.c. switches. Moreover, for MAINS switches the speed of contact making and breaking shall be independent of the speed of actuation.

按14.6.6 b)试验的开关应承受在预期使用中出现的电应力、热应力和机械应力而不会过度磨损或受到其他有害影响，并且对直流开关还应具有符合IEC 61058-1 (GB15092.1-1994) 的13.1规定的机构。此外，对电源开关，触点接通和断开的速度应与操作速度无关。

Compliance is checked according to IEC 61058-1, subclause 13.1, and by the following endurance test:

按IEC 61058-1 (GB15092.1-1994) 中13.1以及用下列的耐久性试验来检验是否合格

The switch is subjected to 10 000 cycles of operation with a sequence according to IEC 61058-1, subclause 17.1.2, excluding the increased-voltage test at accelerated speed specified in IEC 61058-1, subclause 17.2.4, and under electrical and thermal conditions given by the normal operating conditions of the apparatus.

开关按IEC 61058-1 (GB15092.1-1994) 中17.1.2规定的顺序，以及在由设备正常工作条件给出的电和热的条件下，承受10 000次操作循环，但（GB15092.1-1994）中17.2.4规定的在加快速度条件下的提高电压试验除外。

The test is made on three specimens, no failure is allowed. 用三个样品进行试验，不允许失效。

14.6.8 A switch tested according to 14.6.6 b) shall be so constructed that it does not attain excessive temperatures during intended use. The materials used shall be such that the performance of the switch is not adversely affected by the operation during intended use of the apparatus. In particular, the material and design of the contacts and terminations shall be such that the operation and performance of the switch is not adversely affected by their oxidation or other deterioration. 按14.6.6 b)试验的开关，其结构应使开关在预期使用中不产生过



高温度。所使用的材料应使开关的性能不会由于在设备预期使用中的操作而受到不利影响。特别是触点和端子的材料和设计应使开关的操作和性能不会由于它们的氧化或其他劣变而受到不利影响。

Compliance is checked in the on-position under normal operating conditions and according to IEC 61058-1, subclause 16.2.2 d), l) and m), taking into account the total rated current I of MAINS socket-outlets, if any, including the peak surge current according to 14.6.10. 在正常工作条件下, 以及按 (GB15092.1-1994) 中16.2.2的d)项、l)项和m)项的规定, 并考虑电源输出插座的总额定电流I (如果有), 包括14.6.10规定的峰值电涌电流, 在开关置于“通”位时来检验是否合格。

The temperature rise at the terminations shall not exceed 55 K during this test.

在本试验期间, 端子的温升不应超过55 K。

14.6.9 A switch tested according to 14.6.6 b) shall have adequate dielectric strength.

按14.6.6 b)试验的开关应具有足够的抗电强度。

Compliance is checked by the following tests: 通过下列试验来检验是否合格

The switch shall withstand a dielectric strength test as specified in 10.3, without being previously subjected to the humidity treatment, the test voltage being decreased to 75 % of the corresponding test voltage specified in 10.3, but not less than 500 V r.m.s. (700 V peak). 开关应按10.3的规定承受抗电强度试验, 但事先不承受湿热处理, 试验电压减至10.3规定的相应试验电压的75%, 但不少于500 V有效值 (700 V峰值)。

- The test voltage is applied in the on-position between HAZARDOUS LIVE parts and ACCESSIBLE conductive parts or parts, which are connected to ACCESSIBLE conductive parts, and in addition between the poles in case of a multipole switch. 开关置于“通”位, 试验电压施加在危险带电零部件与可触及导电零部件或与可触及导电零部件连接的零部件之间, 此外对于多极开关还要施加在各极之间;
- The test voltage is applied in the off-position across each contact gap. During the test, resistors, capacitors and RC-units in parallel to a contact gap may be disconnected. 开关置于“断”位, 试验电压施加在每个触点的间隙上。试验期间, 与触点间隙并联的电阻器、电容器和阻容单元应予以断开。

14.6.10 If the switch is a MAINS switch which controls MAINS socket-outlets, the endurance test is carried out with an additional load connected to the socket-outlets, consisting of the circuit shown in IEC 61058-1, figure 9, taking into account IEC 61058-1, figure 10. 如果开关是控制电源输出插座的电源开关, 则用一个附加负载接到输出插座上来进行耐久性试验。附加负载由 (GB15092.1-1994) 图9所示的电路组成, 并把IEC 61058-1图10考虑在内。

The total rated current of the additional load shall correspond to the marking of the socket-outlets, see 5.2 c). The peak surge current of the additional load shall have a value as shown in table 6.

附加负载的总额定电流应与输出插座的标志相一致, 见5.2 c)。附加负载的峰值电涌电流应为表6所示的数值。

Table 6 – Peak surge current 表6 峰值电涌电流

Total rated current of the switch controlled socket-outlets 控制输出插座的开关的总额定电流 (A)		Peak surge current 峰值电涌电流 (A)
Up to and including 0,5	≤0,5	20
Over 0,5 up to and including 1,0	>0,5 ~ ≤1,0	50
Over 1,0 up to and including 2,5	>1,0 ~ ≤2,5	100
Over 2,5	>2,5	150

If the socket-outlets are marked with the currents which may be drawn, these values are chosen for the total rated current of the socket-outlets.

如果输出插座标有可供的电流, 则选取这些电流值作为输出插座的总额定电流。

If the socket-outlets are marked with the powers which may be drawn, the total rated current of the socket-outlets is calculated from these values.

如果输出插座标有可供的功率, 则根据这些功率值计算出输出插座的总额定电流。

After the test, the switch shall show no damage in the sense of this standard. In particular, it shall show no deterioration of its enclosure, no reduction of CLEARANCES and CREEPAGE DISTANCES and no loosening of electrical connections or mechanical fixings. 试验后, 开关不应出现本标准意义范围内的损坏。特别是, 其外壳不应出现劣变, 电气间隙和爬电距离不应出现减小, 并且电气连接或机械固定不应出现松动。

Compliance is checked by inspection and by the tests specified in 14.6.8 and/or 14.6.9 in the given order.

通过检查和14.6.8和/或14.6.9规定的试验, 按规定的顺序来检验是否合格。

14.7 SAFETY INTERLOCKS 安全联锁装置

SAFETY INTERLOCKS shall be provided where access BY HAND is possible to areas presenting hazards in the sense of this standard. 当手可能会进入到存在有本标准意义范围内的危险的区域时, 应装有安全联锁装置。

For requirements and test specifications reference is made to IEC 60950, subclause 2.8.



对其要求和试验的规定，按照IEC 60950（GB4943-2001）中2.8。

14.8 Voltage setting devices and the like 电压设定装置等类似装置

The apparatus shall be so constructed that changing the setting from one voltage to another or from one nature of supply to another is unlikely to occur accidentally. 设备的结构应保证不可能发生偶然地将设定装置从一个电压改变到另一个电压或从一种电源性质改变到改变到另一种电源性质。

Compliance is checked by inspection and by manual test. 通过检查和手动试验来检验是否合格。

NOTE – Changing of the setting which necessitates consecutive movements BY HAND is deemed to comply with this requirement. 注：必须手动依次操作来改变设定装置被认为符合本要求。

14.9 Motors 电动机

14.9.1 Motors shall be so constructed as to prevent, in prolonged intended use, any electrical or mechanical failure impairing compliance with this standard. The insulation shall not be affected and contacts and connections shall be such that they do not work loose by heating, vibration, etc. 电动机的结构应保证在按预定用途长期使用时应防止出现会损害本标准安全要求的任何电气或机械故障。发热、振动等不应使绝缘受到影响，而且不应使接触件及连接件出现松动。

Compliance is checked by the following tests carried out on the apparatus under normal operating conditions.

在正常工作条件下对设备进行下列试验来检验是否合格

- a) *The apparatus is connected to 1,06 times the RATED SUPPLY VOLTAGE and to 0,9 times the RATED SUPPLY VOLTAGE, each time for 48 h. Motors for short-time or intermittent operation are connected for periods in accordance with the operating time if limited by the construction of the apparatus. 设备应连接到1,06倍（国标为1.1）的额定电源电压和0,9倍的额定电源电压上，各持续48 h。如果设备的结构限定了工作时间，则短时或间断工作的电动机应按工作时间加电。*

In case of short-time operation, suitable cooling intervals are inserted.

对短时工作的情况，应加进适当冷却的间歇时间。

NOTE 1 – It may be convenient to carry out this test immediately after the test of 7.1.

注1：在7.1的试验后，立即进行本试验会比较方便。

- b) *The motor is started 50 times while the apparatus is connected to 1,06 times the RATED SUPPLY VOLTAGE and 50 times while connected to 0,9 times the RATED SUPPLY VOLTAGE, each period of connection being at least 10 times the period from start to full speed, but not less than 10 s. 当设备连接到1,06倍（国标为1.1）额定电源电压时，使电动机启动50次，以及当设备连接到0,9倍额定电源电压时，使电动机启动50次。每一次接通的时间至少应为由启动到全速度所需时间的10倍，但不少于10 s。*

The intervals between starts shall be not less than three times the period of connection.

各次启动的时间间隔应不小于接通时间的3倍。

If the apparatus provides for more than one speed, the test is carried out at the most unfavourable speed.

如果设备具有多种速度，则应在最不利的速度上进行试验。

After these tests, the motor shall withstand the dielectric strength of 10.3, no connection shall have loosened and there shall be no deterioration impairing the safety.

在这些试验后，电动机应承受10.3规定的抗电强度试验，连接点应无松动，而且应无损害安全的损伤。

NOTE 2 – For induction motors with power supplied to the stator only, see also 14.3.2.

注2：仅对定子供电的感应电动机见14.3.2。

14.9.2 Motors shall be so constructed or mounted that wiring, windings, commutators, sliprings, insulations, etc., are not adversely affected by oil, grease or other substances to which they are exposed during intended use.

电动机的结构和安装应使导线、绕组、整流子、集流环、绝缘等在预期暴露使用时不会受油液、油脂或其他物质的有害影响。

Compliance is checked by inspection. 通过检查来检验是否合格。

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. 易造成人身伤害的运动部件的安置或封闭应对在预期使用中的这种人身伤害危险有足够的防护。防护罩、保护装置等应有足够的机械强度，而且它们应不能手动拆除。

Compliance is checked by inspection and by manual test. 通过检查和手动试验来检验是否合格。

14.9.4 For motors having phase-shifting capacitors, three-phase motors and series motors, IEC 60950, annex B, clauses B.8, B.9 and B.10, apply additionally. 对带有移相电容器的电动机、三相电动机和串激电动机，还应符合IEC 60950（GB4943-1995）附录B的第B.8章、第B.9章和第B.10章的要求。

14.10 Batteries 电池

14.10.1 Batteries shall be so mounted that there is no risk of the accumulation of flammable gases and that the



leakage of liquid cannot impair any insulation. 电池的安装应使可燃性气体无积存的危险，而且应使漏出的液体不能损坏任何绝缘。

Compliance is checked by inspection. 通过检查来检验是否合格。

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, 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.

如果用户有可能用不可充电电池来更换能在设备中充电的可充电电池，则应采用特殊措施，例如可充电的专用电池组上一种分离式充电接触件，以避免任何电流供给不可充电电池。

本要求不适用于预定不由用户更换的设备内部的电池，例如记忆用电池。

Compliance is checked by inspection. 通过检查来检验是否合格。

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

注：关于使用说明书的附加要求在5.4.1中给出。

14.10.3 Under normal operating conditions and under fault conditions, 在正常工作和故障条件下，下列指标均不应超过电池制造厂规定的允许值

- for rechargeable batteries neither the charging current nor the charging time,
可充电电池充电电流和充电时间；
- for lithium batteries neither the discharging current nor the reverse current,
锂电池放电电流和反向电流。

shall exceed the permissible values given by the battery manufacturer.

Compliance is checked by measurement. 通过测量来检验是否合格。

Lithium batteries shall be removed from the circuit and replaced by a short-circuit when measuring currents.

在测量电流时，应从电路中取出锂电池并通过短接电路来代替锂电池。

14.11 Optocouplers 光电耦合器

Optocouplers shall comply with the constructional requirements of clause 8. 光电耦合器应符合第8章的结构要求。

Internal and external CLEARANCES and CREEPAGE DISTANCES of optocouplers shall comply with 13.1.1.

光电耦合器内部和外部的电气间隙和爬电距离应符合13.1.1的规定。

NOTE – The internal boundaries are not considered to be reliable joints. 注：内部边缘不认为是可靠的接合点。

15 TERMINALS 端子

15.1 Plugs and sockets 插头和插座

15.3.1 Plugs and appliance couplers for the connection of the apparatus to the MAINS and socket-outlets and interconnection couplers for providing MAINS power to other apparatus shall comply with the relevant IEC standards for plugs and socket-outlets, appliance couplers or interconnection couplers.

Examples of the relevant IEC publications are: IEC 60083 [1], IEC 60320, IEC 60884 and IEC 60906.

设备与电网电源和输出插座连接的插头和器具耦合器以及向其他设备提供电网电源的互连耦合器应符合有关插头和输出插座、器具耦合器或互连耦合器的有关国家标准、行业标准或IEC标准。

有关的例子有：IEC 60083 [3]、IEC 60884、GB/T17465和IEC 60906。

NOTE 1 – In Australia, Denmark, Japan, New Zealand, South Africa, Switzerland and the United Kingdom, special national conditions are valid for plugs and socket-outlets.

NOTE 2 – In South Africa, where a cordset is used as the means of connection to the supply MAINS, this cordset may be provided with a rewirable plug, provided that the plug complies with the national regulations.

注1：在澳大利亚、丹麦、日本、新西兰、南非、瑞士和英国，插头和输出插座适用国家特殊条件。

2：在南非，用电线组件作为连接供电电源的装置时，电线组件可以配备可拆线插头、只要该插头符合国家法规即可。

MAINS socket-outlets and interconnection couplers mounted on CLASS II apparatus shall only permit connection of other CLASS II apparatus. 对安装在II类设备上的电网电源输出插座和互连耦合器，只允许与其他II类设备连接。

MAINS socket-outlets and interconnection couplers mounted on CLASS I apparatus shall either allow connection of CLASS II apparatus only or shall be provided with protective earth contacts which are reliably connected to the PROTECTIVE EARTH TERMINAL or contact of the apparatus. 对安装在I类设备上的电网电源输出插座和互连耦合器或者仅允许连接II类设备，或者应具备有可靠连接到保护接地端子或接地接触件上的保护接地连接件，安全接地点用也应提供连接到保护接地端子或接地接触件上的保护接地连接件。

NOTE 3 – For CLASS I apparatus, provision for both kinds of socket-outlets and interconnection couplers is allowed on the same apparatus. 注3：对I类设备，允许在同一设备上既有输出插座又有互连耦合器这两种装置。

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 IEC 60320-2-2, standard sheets D or H. 注4：可以设计只允许连接II类设备的输出插座，例如：类似于IEC 60906-1，标准规格单3-1或符合GB/T17465-2，标准规格单D或H的输出插座。



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.

对装有向其他设备提供电网电源的输出插座的设备，如果其插头或器具连接器的额定电流小于16 A，则应采用措施，以确保将设备连接到电网电源的插头或器具输入插座不会过载。

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

注：输出插座的标志不认为是防止过载的合适措施。

Internal wiring of socket-outlets providing MAINS power to other apparatus shall have a nominal cross-sectional area as specified in 16.2 for external flexible cords.

向其他设备提供电网电源的输出插座的内部连线应具有16.2针对外接软线规定的标称横截面积。

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

按有关标准，通过检查以及按16.2的规定来检验是否合格。

15.3.2 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. 不与电网电源连接的其他连接器应设计成使其插头具有一定形状，以保证插头不可能插入电网电源插座或器件耦合器中。

NOTE – Examples of connectors meeting this requirement are those constructed according to IEC 60130-2, IEC 60130-8, 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 subclause is the so-called "Banana" plug.

注：满足本要求的连接器的例子是其结构符合IEC 60130-2、IEC 60130-8、IEC 60130-9 [2]、IEC 60169-2或IEC 60169-3 [3]，并按规定使用的连接器。不满足本条要求的连接器的一个例子是通常所称的香蕉插头。

Sockets for audio and video circuits 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 circuits of LOAD TRANSDUCERS and SOURCE TRANSDUCERS and for data and similar circuits which are not indicated with the symbol of 5.2 b), cannot be inserted into them.

标有5.2 b)规定符号的负载换能器的音频和视频电路的插座应设计成使天线和地线的插头、负载换能器和源换能器的音频和视频电路插头，以及未标有5.2 b)规定符号的数字电路和类似电路的插头不能插入这些插座。

Compliance is checked by inspection. 通过检查来检验是否合格。

15.3.3 TERMINALS and connectors used in output circuits of SUPPLY APPARATUS, whose output voltage is not a standard nominal MAINS voltage according to IEC 60038, table 1, shall not be compatible with those specified for household and similar general purposes, for example those described in IEC 60083 [1], IEC 60320, IEC 60884, IEC 60906. 对输出电压为非GB156-1993表1规定的标准的标称电网电源电压的电源设备，其输出电路端子和连接器不应与针对家用和类似一般用途的那些端子和连接器，例如IEC 60083 [1]、GB/T17465、IEC 60884、IEC 60906规定的那些插头、插座和器具耦合器相互兼容。

Compliance is checked by inspection and by manual tests. 通过检查和手动试验来检验是否合格。

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

端子和连接器应根据在正常工作条件下和在预期使用中可能会出现负载进行设计。

Compliance is checked according to IEC 60320 as far as safety is concerned, for instance with regard to shock hazard and heating. 按GB/T17465就所涉及的安全（例如有关触电和发热）来检验是否合格。

15.2 Provisions for protective earthing 保护接地措施

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 earth contacts of socket-outlets shall be reliably connected to a PROTECTIVE EARTH TERMINAL within the apparatus. 在基本绝缘发生单一绝缘故障时会呈现危险电压的I类设备可触及导电零部件以及输出插座的保护接地应可靠地与设备中的保护接地端子连接。

Protective earth circuits shall not contain switches or fuses. 保护接地电路不应装有开关或熔断器。

In SUPPLY APPARATUS of CLASS I with non-HAZARDOUS LIVE output voltage, output circuits shall not be connected to the protective earth conductor. 在具有非危险带电输出电压的I类电源设备中，输出电路不应与保护接地导体连接。

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

保护接地导体可以是裸露的也可以是绝缘的。如果是绝缘的，则绝缘应是绿/黄色，但下列两种情况除外：

a) for earthing braids, the insulation shall be either green/yellow or transparent;

对接地编织导体，其绝缘应是绿/黄色或透明的；

b) for internal protective conductors in assemblies such as ribbon cables, busbars, flexible printed wiring, etc., any colour may be used provided that no misinterpretation of the use of the conductor is likely to arise.

对诸如带状电缆、汇流条、软印制线缆等组件中的内部保护导体可以使用任何颜色，只要不可能发生对该导体的误用即可。



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

For PERMANENTLY CONNECTED APPARATUS and for apparatus provided with a non-detachable flexible cord or cable, a separate PROTECTIVE EARTH 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 earth 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 earth connection is interrupted when removing the part.

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

The PROTECTIVE EARTH TERMINAL shall be resistant to significant corrosion.

用绿/黄双色标识的电线只能用于保护接地连接。

对永久连接的设备和带有不可拆卸的软线或电缆的设备, 应使用单独的保护接地端子, 该端子应放在靠近电源端子的位置, 并且应符合15.3的要求, 此外该端子不得用来固定任何其他元件。

如果能手动拆除的零部件具有保护接地连接, 则当将该零部件安置在位时, 保护连接应在载流连接接通前先行接通, 当将该零部件拆除时, 载流连接应在保护接地连接断开前先行断开。

与保护接地连接件接触的导电零部件不应由于电化学反应而遭受到严重腐蚀。应避免附录F中分界线以上的组合。保护接地端子应耐明显腐蚀。

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

注1: 耐腐蚀可以采用适当的电镀或涂覆处理来实现。

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

通过检查和按照附录F电化学电位表来检验是否合格。

The resistance of the connection between the PROTECTIVE EARTH TERMINAL or contact, and parts required to be connected thereto, shall not exceed 0,1 Ω .

保护接地端子或接触件和需要与其连接的零部件之间的连接电阻不应超过0,1 Ω 。

Compliance is checked by the following test: 通过下列试验来检验是否合格

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. 试验应进行1 min, 试验电流为交流25 A或直流25 A, 试验电压不应超过12 V。

NOTE 2 – In Canada, a 30 A test current is used. 注2: 在加拿大, 试验电流采用30 A。

The voltage drop between the PROTECTIVE EARTH 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 earth conductor of the power supply cord shall not be included in the resistance measurement.

应测量保护接地端子或接触件与要与其连接的零部件之间的电压降, 并且根据试验电流和该电压降计算电阻值。电源线的保护接地导线的电阻值不应包括在此电阻测量值内。

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. 注3: 应注意测量探头的顶端与被试金属零部件的接触电阻不要影响试验结果。

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

外接软线的端子和与电网电源永久连接的端子

15.3.1 PERMANENTLY CONNECTED APPARATUS shall be provided with TERMINALS in which connection is made by means of screws, nuts or equally effective devices, for example screwless type clamping units according to IEC 60998-2-2 or TERMINALS according to IEC 60999. 永久连接式设备应装有用螺钉、螺母或等效装置(例如符合GB 13140.3的无螺纹类型夹紧单元或符合IEC 60999的端子)进行连接的端子。

Compliance is checked by inspection. 通过检查来检验是否合格。

For inlet openings, reference is made to IEC 60335-1. 对进线孔, 按照GB4706.1。

15.3.2 For apparatus with non-detachable MAINS supply cords, the connection of the individual conductors to the internal wiring of the apparatus shall be accomplished by any means that will provide a reliable electrical and mechanical connection, except that the supply conductors and the protective earthing conductor of a non-detachable MAINS cord or cable shall not be soldered directly to the conductors of a PRINTED BOARD.

Soldered, crimped and similar connections may be used for the connection of external conductors. For soldered or crimped connections, barriers shall be provided so that CLEARANCES and CREEPAGE DISTANCES cannot be reduced to less than the values specified in clause 13 should the conductor break away at a soldered joint or slip out of a crimped connection. Alternatively, the conductors shall be positioned or fixed in such a way that reliance is not placed upon the connection alone to maintain the conductors in position.

对带有不可拆卸的电源线的设备, 应采用能提供可靠的电气和机械连接的任何方法来完成每一导线与设备内部配线的连接, 但不可拆卸的电源线或电缆的供电导线和保护接地导线不应直接焊接在印制板的导体上。

对外部导线的连接可以用钎焊、压接或类似的连接。对钎焊或压接连接应有隔板, 以便万一导线在焊接点处断开或从压接处滑脱也不会使电气间隙和爬电距离减小到小于第13章规定的数值。另外应对导线加以定位或固定, 其采



用的方法不应仅是依靠将导线保持在位的那种连接。

Compliance is checked by inspection, and, in case of doubt, by applying a pull of 5 N in any direction to the connection. 通过检查来检验是否合格。在有疑问的情况下，对连接处以任何方向施加的5 N拉力。

15.3.3 Screws and nuts which clamp external MAINS supply conductors shall have a thread conforming with ISO 261 or ISO 262, or a thread comparable in pitch and mechanical strength. They shall not serve to fix any other component, except that they may also clamp internal conductors if these are so arranged that they are unlikely to be displaced when fitting the MAINS supply conductors. 夹持外部电网电源导线的螺钉和螺母应具有符合ISO 261或ISO 262的螺纹或螺距以及机械强度相当的螺纹。它们不应用于固定任何其他元件，但如果内部导线的安置不可能在安装电源导线时被移动，则它们也可以夹持这些内部导线。

NOTE – The terminations of a component (for example a switch) built into the apparatus may be used as TERMINALS for the supply of MAINS power to the apparatus, provided that they comply with the requirements of 15.3.1.

注：对装入设备的元件（例如开关）的端子，如果它们符合15.3.1的要求，则可以用来作为设备连接电网电源的端子。

Compliance is checked by inspection. 通过检查来检验是否合格。

15.3.4 For the purpose of applying the requirements for MAINS supply cords: 在采用电源软线的要求时

- it is assumed that two independent fixings will not become loose at the same time; 假定两个独立的固定点不会同时出现松动；
- conductors connected by soldering are not considered to be adequately fixed unless they are held in place near to the termination, independently of the solder. However "hooking-in" before the soldering is, in general, considered to be a suitable means for maintaining the conductors of a MAINS supply cord in position, provided that the hole through which the conductor is passed is not unduly large; 导线用钎焊连接不认为是满意的固定，除非用非钎焊的方法将导线固定在端接点附近的位置上。但是，通常先“钩住”再焊接被认为是将电源软线的导线保持在位的合适的方法，只要导线穿入的孔不过份大即可。
- conductors connected to TERMINALS or terminations by other means are not considered to be adequately fixed unless an additional fixing is provided near to the TERMINAL or termination; this additional fixing may clamp both the insulation and the conductor. 导线用其他方法与端子或端接件连接不认为是满意的固定，除非在端子或端接件的附近给予附加固定，这种附加固定可以既夹住绝缘以夹住导线。

15.3.5 TERMINALS for external flexible cords shall allow the connection of conductors having nominal cross-sectional areas as shown in table 7. 外部软线用端子应允许连接具有表7所示的标称横截面积的导线。

For rated currents exceeding 16 A, reference is made to IEC 60950, table 13.

对额定电流超过16 A时，按照GB4943-2001中表3D。

Compliance is checked by inspection, by measurement and by fitting cords of the smallest and largest cross-sectional areas of the appropriate range shown in table 7.

通过检查、测量和安装表7所示相应范围的最小和最大横截面积的软线来检验是否合格。

Table 7 – Nominal cross-sectional area to be accepted by TERMINALS

表7 端子能连接的导线的标称横截面积

RATED CURRENT CONSUMPTION of the apparatus * 设备的额定消耗电流 小于或等于 (A)	Nominal cross-sectional area 标称横截面积 (mm ²)
Up to and including 3	0,5 to 0,75
Over 3 up to and including 6	0,75 to 1
Over 6 up to and including 10	1 to 1,5
Over 10 up to and including 16	1,5 to 2,5

* The RATED CURRENT CONSUMPTION includes currents which can be drawn from socket outlets providing MAINS power for other apparatus. 额定消耗电流包括能对其他设备提供电源的输出插座所输出的电流。

15.3.6 TERMINALS according to 15.3.3 shall have minimum sizes as shown in table 8.

符合15.3.3要求的端子应具有表8中所示的最小尺寸。

Stud TERMINALS shall be provided with washers. 螺栓端子应带有垫圈。

For rated currents over 16 A, reference is made to IEC 60950, table 14.

对额定电流超过16 A时，按照GB4943-2001中表3E。

Compliance is checked by measurement and inspection. 通过测量和检查来检验是否合格。

Table 8 – Minimum nominal thread diameter 表8 最小标称螺纹直径

RATED CURRENT CONSUMPTION of the apparatus* 设备的额定消耗电流 小于或等于 (A)	Minimum nominal thread diameter 最小标称螺纹直径 (mm)	
	Pillar type or stud type 柱状类型或螺栓类型	Screw type 螺钉类型



Up to and including 10	3	3,5
Over 10 up to and including 16	3,5	4
* The RATED CURRENT CONSUMPTION includes currents which can be drawn from socket-outlets providing MAINS power for other apparatus. 额定消耗电流包括能对其他设备提供电源的输出插座所输出的电流。		

15.3.7 TERMINALS shall be so designed that they clamp the conductor between metal surfaces with sufficient contact pressure and without damage to the conductor.

端子的设计应保证其能以足够的接触压力将导线夹紧在金属表面之间而不损坏导线。

TERMINALS shall be so designed or located that the conductor cannot slip out when the clamping screws or nuts are tightened. 端子的设计或安装位置应保证在拧紧夹紧螺钉或螺母时不会使导线滑脱。

TERMINALS shall be so fixed that, when the means of clamping the conductor is tightened or loosened:

端子的固定应使夹紧导线的装置在拧紧或拧松时

- the TERMINAL itself does not work loose; 端子本身不松动;
- internal wiring is not subjected to stress; 内部连线不承受应力;
- CLEARANCES and CREEPAGE DISTANCES are not reduced below the values specified in clause 13. 电气间隙和爬电距离不减小到小于第13章的规定值。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

15.3.8 TERMINALS in circuits carrying a current exceeding 0,2 A under normal operation conditions shall be so designed that contact pressure is not transmitted through insulating material other than ceramic, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage of the insulating material.

在正常工作条件下, 电路中承载电流超过0,2 A的端子应设计成不通过绝缘材料(除陶瓷外)传输接触压力, 除非金属零部件有足够的弹性来补偿绝缘材料任何可能的收缩。

Compliance is checked by inspection. 通过检查来检验是否合格。

15.3.9 For non-detachable MAINS supply cords, each TERMINAL shall be located in proximity to its corresponding TERMINALS of different potential and to the PROTECTIVE EARTH TERMINAL, if any. 对不可拆卸的电源软线, 每一线端应就近固定在其所对应的不同电位的端子上和保护接地端子上(如果有的话)。

Compliance is checked by inspection. 通过检查来检验是否合格。

TERMINALS shall be so located, guarded or insulated that, should a strand of a flexible conductor escape when the conductor is fitted, there is no risk of accidental contact between such a strand and:

端子的安装位置、隔离保护或绝缘应保证在安装导线时, 万一软导线中的一根导线脱离时, 也不会出现这根导线与下列零部件发生意外接触的危险

- ACCESSIBLE conductive parts or conductive parts connected to them; 可触及导电零部件或与它们连接的导电零部件;
- conductive parts not connected to the PROTECTIVE EARTH TERMINAL and separated from ACCESSIBLE conductive parts by SUPPLEMENTARY INSULATION only. 不与保护接地端子连接的导电零部件和仅用附加绝缘与可触及导电零部件隔离的导电零部件。

Compliance is checked by inspection and, unless a special cord is prepared in such a way as to prevent the escape of strands, by the following test.

通过检查, 以及如果不采用能防止绞合导线脱离的方法制备专用软线, 还要通过下列试验来检验是否合格。

An 8 mm length of insulation shall be removed from the end of a flexible conductor having the appropriate nominal cross-sectional area. One wire of the stranded conductor shall be left free and the other wires shall be fully inserted into, and clamped in the TERMINAL. 从具有相应标称横截面积的软导线的端部剥去8 mm长的绝缘层, 应使绞合导线中的一根导线自由脱离, 而将其他线束完全嵌入并夹紧在端子中。

Without tearing the insulation back, the free wire shall be bent in every possible direction, but without making sharp bends round a guard.

If the conductor is HAZARDOUS LIVE, the free wire shall not touch any conductive part which is ACCESSIBLE or is connected to an ACCESSIBLE conductive part or, in the case of apparatus with DOUBLE INSULATION, any conductive part which is separated from ACCESSIBLE conductive parts by SUPPLEMENTARY INSULATION only.

If the conductor is connected to an earthing TERMINAL, the free wire shall not touch any HAZARDOUS LIVE part.

在不向后撕裂绝缘层的情况下, 应将这根自由脱离的导线沿每一个可能的方向弯曲, 但不要围绕隔离保护物锐弯。如果导线是危险带电的, 则这根自由脱离的导线不应触及任何可触及导电零部件或与可触及导电零部件连接的导电零部件, 或者对具有双重绝缘的设备, 不应触及仅用附加绝缘隔离的任何可触及导电零部件。

如果导线与接地端子连接, 则这根自由脱离的导线不应触及任何危险带电零部件。

15.4 Devices forming a part of the MAINS plug 直插式设备

15.4.4 A device provided with pins intended to be introduced into fixed socket-outlets shall not impose undue strain on these socket-outlets.



预定要插入固定式输出插座的、装有插销的装置不应使这些输出插座承受过大的应力。

Compliance is checked by engaging the device, as during intended use, with the socket-outlet of a test apparatus as shown in figure 11. The balancing arm of the test apparatus pivots about a horizontal axis through the centre lines of the contact tubes of the socket-outlet at a distance of 8 mm behind the engagement face of the socket-outlet. 将该装置按预期使用状态与图11所示试验设备的输出插座插合来检验是否合格。试验设备的平衡平衡臂围绕距输出插座的插合面后8 mm处、通过输出插座插孔中心线的水平轴线旋转。

With the device not in engagement, the balancing arm is in equilibrium, the engagement face of the socket-outlet being in the vertical position. 在该装置未插合时，平衡臂处于平衡状态，输出插座的插合面处于垂直位置。

After the device has been engaged, the torque to be applied to the socket-outlet to maintain its engagement face in the vertical plane is determined by the position of a weight on the balancing arm. The torque shall not exceed 0,25 Nm. 在该装置插合后，为维持输出插座插合面处于垂直平面内而对输出插座施加的力矩通过平衡平衡臂上砝码的位置来确定。此力矩不应超过0,25 Nm。

NOTE – This test is compatible with the test described in the IEC 60884-1.

注：本试验与IEC 60884-1所规定的该项试验相一致。

15.4.2 The device shall comply with the standards for the dimensions of MAINS plugs.

该装置应符合电源插头尺寸标准。

Compliance is checked by measurement in accordance with the relevant standard.

按有关标准的规定测量来检验是否合格。

NOTE – The dimensions of some types of MAINS plugs are specified in IEC 60083.

注：IEC 60083中规定了电源插头一些类型的尺寸。

15.4.3 The device shall have adequate mechanical strength. 该装置应具有足够的机械强度。

Compliance is checked by inspection and by the following tests: 通过检查和下列试验来检验是否合格

a) *The device shall be subjected to a drop test. 该装置应承受跌落试验。*

A sample of the complete device shall be subjected to three impacts that result from being dropped 1 m onto a horizontal surface in positions likely to produce the most adverse results.

The horizontal surface shall consist of hardwood of at least 13 mm thick, mounted on two layers of plywood each 19 mm to 20 mm thick, all supported on a concrete or equivalent non-resilient floor.

该完整装置的一个样品以可能产生最不利结果的方式承受三次从1 m高度上跌落到水平面上的撞击。

水平面应由至少13 mm厚的硬木板组成，安装在每层厚19 mm~20 mm共二层的层压板上，所有板件支撑在混凝土或等效的无弹性地板上。

After the test, the specimen shall comply with the requirements of this standard, but it need not be operational. 试验后，样品应符合本标准的要求，但不要求仍可供使用。

NOTE 1 – Small pieces may be broken off, provided that the protection against electric shock is not affected.

NOTE 2 – Distortion of pins and damage to the finish and small dents which do not reduce the CLEARANCES or CREEPAGE DISTANCES below the values specified in clause 13, are neglected.

注1：允许小部分受到破坏，只要防触电保护不受影响即可。

2：不使电气间隙或爬电距离减小到小于第13章规定值的插销变形、饰面破坏以及小的凹陷可忽略不计。

b) *The pins shall not turn when a torque of 0,4 Nm is applied, first in one direction for 1 min and then in the opposite direction for 1 min. 当对插销施加0,4 Nm的力矩时，首先在一个方向上保持1 min，然后在反方向上保持1 min，插销不应转动。*

NOTE 3 – This test is not carried out if rotation of the pins does not impair safety in the sense of this standard.

注3：如果插销的旋转不损害本标准意义范围内的安全，则不进行本试验。

c) *A pull force as given in table 9 is applied, without jerks, for 1 min on each pin in turn, in the direction of the longitudinal axis of the pin. 轮流对每个插销沿插销的纵轴方向上施加表9规定的压力（但不能急拉）保持1 min The pull force is applied within a heating cabinet at a temperature of (70 ± 2) °C, 1 h after the device has been placed in the heating cabinet. 该装置放置在(70 ± 2) °C的高温箱中1 h后，在高温箱内施加压力。*

After the test, the device is allowed to cool down to ambient temperature, no pin shall have been displaced in the body of the device by more than 1 mm.

试验后，允许该装置冷却到环境温度，插销在该装置本体中的位移不应大于1 mm。

Table 9 – Pull force on pins 表9 插销上的拉力

Ratings of the equivalent plug type 等效插头型式的额定值	Number of poles 极数	Pull force 拉力 (N)
Up to and including 10 A 130/250 V	2	40
	3	50
Over 10 A up to and including 16 A	2	50



130/250 V	3	54
Over 10 A up to and including 16 A	3	54
440 V	More than 3	70

For the purpose of this test, protective earth contacts, irrespective of their number, are considered as one pole.
就本试验而言，保护接地接触件无论有多少均视为一极。

Tests b) and c) are made separately, each with new samples. 试验b)和c)单独进行，每项试验用新的样品。

16 External flexible cords 外接软线

16.1 MAINS supply flexible cords shall be of the sheathed type complying with IEC 60227 for PVC cords or according to IEC 60245 for synthetic rubber cords. 电源软线应是符合GB5023针对聚氯乙烯软线规定的护套型软线或GB5013针对合成橡胶软线规定的护套型软线。

NOTE 1 – In Australia and New Zealand special national conditions apply for external flexible cords.

注1：在澳大利亚和新西兰，外接软线适用国家特殊条件。

Compliance is checked by testing MAINS supply flexible cords in accordance with IEC 60227 or IEC 60245. 按GB5023或GB5013对电源软线进行试验来检验是否合格。

Non-detachable flexible cables and cords of CLASS I apparatus shall be provided with a green/yellow core connected to the PROTECTIVE EARTH TERMINAL of the apparatus and, if a plug is provided, to the protective earth contact of the plug. I类设备的不可拆卸的软电缆和软线应具有与设备保护接地端子连接的、以及与插头（如果有话）保护接地插销连接的黄/绿色芯线。

Compliance is checked by inspection. 通过检查来检验是否合格。

NOTE 2 – The colour code for cores of flexible MAINS cords is contained in IEC 60173 [4].

注2：IEC 60173 [4]规定了电源软线芯线的颜色。

16.2 Power supply cord conductors shall have a nominal cross-sectional area not less than those shown in table 10. 电源软线导线的标称横截面积应不小于表10的规定值。

RATED CURRENT CONSUMPTION of the apparatus 1) 设备的额定消耗电流，小于或等于 (A)	Nominal cross-sectional area 标称横截面积 (mm ²)
Up to and including 3	0,5 2)
Over 3 up to and including 6	0,75
Over 6 up to and including 10	1
Over 10 up to and including 16	1,5

1) The RATED CURRENT CONSUMPTION includes currents which can be drawn from the socket-outlets providing MAINS power for other apparatus. 额定消耗电流包括能对其他设备提供电网电源的输出插座所输出的电流
2) This nominal cross-sectional area is allowed only for CLASS II apparatus and provided that the length of the supply cord, measured between the point where the cord or the cord guard enters the apparatus, and the entry to the plug, does not exceed 2 m. 仅对II类设备以及电源线长度（在软线或软线护套进入设备处与进入插头的入口处之间测量）不超过2 m才允许此横截面积。

For higher currents, reference is made to IEC 60950, table 11. 对更大的电流，按照GB4943-2001中表3B。

Compliance is checked by measurement. 通过测量来检验是否合格。

NOTE – In the USA and Canada a minimum cross-sectional area of 0,81 mm² is required.

注：在美国和加拿大要求最小横截面积是0,81 mm²。

16.3

a) Flexible cords, not complying with 16.1, used as a connection between the apparatus and other apparatus used in combination with it, and comprising HAZARDOUS LIVE conductors, shall have adequate dielectric strength. 不符合16.1的、用来作为设备和与之联用的其他设备之间连接的、且包含有危险带电导线的软线，应具有足够的抗电强度。

Compliance is checked by applying the dielectric strength test using a sample of approximately 1 m length and by applying the relevant test voltage according to 10.3 for the grade of insulation under consideration as follows: 用大约1 m长的样品，按下列所考虑的绝缘等级，施加10.3规定的有关试验电压进行抗电强度试验检查是否合格

- for insulation of a conductor: by the voltage test method given in IEC 60885-1, subclauses 3.1 and 3.2;
- for SUPPLEMENTARY INSULATION, for example sleeving around a group of conductors: between a conductor inserted into the sleeve and metal foil wrapped tightly round the sleeve for a length of at least 100 mm.



对于导线的绝缘：用IEC 60885-1：1987的3.1和3.2规定的电压试验方法；

对于附加绝缘，例如套在一组导线上的套管：插入套管内的一根导体与在套管上紧密缠绕至少100 mm长的金属箔之间。

NOTE – Where a power supply cord, whose insulating properties comply with those of the cord types of 16.1, is used inside the equipment, either as an extension of the external power supply cord or as an independent cable, its sheath is considered to be adequate SUPPLEMENTARY INSULATION for the purposes of this subclause.

注：对绝缘特性符合16.1的那些软线类型的电源软线，在设备内用来作为外接电源软线的延伸部分或作为单独电缆的情况下，其护套就本条而言被认为是满足要求的附加绝缘。

b) Flexible cords not complying with 16.1, used as connection between the apparatus and other apparatus used in combination with it, and comprising HAZARDOUS LIVE conductors, shall withstand bending and other mechanical stresses occurring during intended use. 在不符合16.1的、用来作为设备和与之联用的其他设备之间连接的、且包含有危险带电导线的软线应承受在预期使用中发生的弯曲和其他机械应力。

Compliance is checked by the test of IEC 60227-2, subclause 3.1, except that the table 11 applies.

通过GB5023.2-1997的3.1规定的试验，但采用表11的规定来检验是否合格。

Table 11 – Mass and pulley diameter for stress test 表11 应力试验的质量和滑轮直径		
Overall diameter of the flexible cable or cord 软电缆或软线的外径 小于或等于 (mm)	Mass 质量 (kg)	Pulley diameter 滑轮直径 (mm)
Up to and including 6	1,0	60
Over 6 up to and including 12	1,5	120
Over 12 up to and including 20	2,0	180

The carrier moves to and fro 15 000 times (30 000 movements). 小车往复运动15 000次 (30000次单程运动)
The voltage U between the conductors is the test voltage according to 10.3.

导线之间的电压U为10.3规定的试验电压。

During and after the test, the specimen shall withstand the dielectric strength test specified in 10.3.

试验期间和试验后，样品应承受10.3规定的抗电强度试验。

16.4 Conductors of flexible cords used as a connection between the apparatus and other apparatus used in combination with it shall have a cross-sectional area such that the temperature rise of the insulation under normal operating conditions and under fault conditions is negligible. 用来作为设备和与之联用的其他设备之间连接的软线的导线应有足够的横截面积，以便在正常工作条件下和故障条件下，绝缘的温升可忽略不计。

Compliance is checked by inspection. In case of doubt, the temperature rises of the insulation are determined under normal operating conditions and under fault conditions. The temperature rises shall not exceed the values given in the appropriate columns of table 2. 通过检查来检验是否合格。在有疑问的情况下，在正常工作条件下和故障条件下测定绝缘的温升，温升不应超过表2相应栏中的规定。

16.5 The apparatus shall allow the external flexible cords, comprising one or more HAZARDOUS LIVE conductors, to be so connected that the connecting points of the conductors are relieved from strain, that the outer covering is protected from abrasion, and that the conductors are prevented from twisting. 设备应使含有一根或一根以上危险带电导线的外接软线的连接能消除导线连接点的应力，防止外皮磨损，以及防止导线扭曲。

Moreover, it shall not be possible to push an external cord back into the apparatus through its aperture if this can impair safety in the sense of this standard.

The method by which the relief from strain and the prevention of twisting is provided shall be clearly seen.

Makeshift methods, such as tying the cord into a knot or tying the cord with a string, are not permitted.

此外，如果反推会危害本标准意义范围内的安全，则应不可能将外接软线通过引线孔向设备内反推。

消除应力和防止扭曲的方法应是显而易见的。

不允许采用诸如将软线打个结或将软线用线绑上这样一些权宜办法。

The devices for strain and twist relief shall either be made of insulating material, or have a fixed covering of insulating material other than natural rubber, if an insulation fault of the cord may make ACCESSIBLE conductive parts HAZARDOUS LIVE. 如果软线的绝缘失效会使可触及导电零部件变成危险带电，则消除应力和消除扭曲的装置应由绝缘材料制成，或者应具有一个除天然橡胶的绝缘材料的固定保护套。

For CLASS I apparatus, the arrangement of the TERMINALS for the MAINS supply flexible cord, or the length of the conductors between the device for strain and twist relief and the TERMINALS, shall be such that the HAZARDOUS LIVE conductors become taut before the conductor connected to the PROTECTIVE EARTH TERMINAL, if the cord slips out of the device for strain and twist relief.

对于I类设备，其电网电源软线用端子的设置，或其应力和扭曲消除装置与端子之间导线的长度应保证万一软线从



应力和扭曲消除装置中滑出时，和保护接地端子连接的导线在被拉紧之前，危险带电导线先被拉紧。

Compliance is checked by inspection and by the following test. 通过检查和下列试验来检验是否合格。

The test is made with the type of flexible cord attached to the apparatus. 将该类型的软线装到其设备上上进行试验。

The apparatus is fitted with its flexible cord, the device for strain and twist relief being appropriately used. The conductors are introduced into the TERMINALS, and the TERMINAL screws, if any, are slightly tightened, so that the conductors cannot easily change their position. 设备装上其软电线，相应使用其应力和扭曲消除装置。导线引入端子，轻轻拧紧端子螺钉（如果有），以便使导线不能轻易改变位置。

After this preparation, pushing the cord further into the apparatus shall not be possible or shall cause no hazard in the sense of this standard. 在做了上述准备之后，应不可能再将软线推入设备或应不引起本标准意义上的危险。

A mark is made on the cord, under strain, near the aperture, and the flexible cord is subjected 100 times to a pull of 40 N for a duration of 1 s each. The pull shall not be applied in jerks. 拉紧软线，在靠近进线孔处的软线上做一标记，然后软线承受40 N的拉力100次，每次持续1 s。拉力不应加得过猛。

Immediately afterwards, the cord is subjected for a period of 1 min to a torque of 0,25 Nm.

此后，软线立即承受0,25 Nm的扭矩持续1 min。

During the test, the cord shall not be displaced by more than 2 mm, the measurement being made while the cord is still under strain. The ends of the conductors shall not be noticeably displaced in the TERMINALS and no damage to the flexible cord shall be caused by the device for strain and twist relief. 试验期间，软线位移不应大于2 mm，在软线仍然被拉紧时进行测量。导线的各端在其端子中不应明显发生位移，而且应力和扭曲消除装置不应应对软线造成损伤。

16.6 Apertures for external flexible cords mentioned in 16.5 shall be so constructed that there is no risk of damage to the cord during its introduction or subsequent movement.

16.5规定的外接软线进线孔的结构应使软线在穿入或以后移动期间不会有损伤的危险。

NOTE – This can be done, for example, by rounding the edges of the aperture or by using an appropriate bushing of insulating material. 注：例如，将进线孔的边缘倒圆，或使用适用的绝缘材料套管就可达到此目的。

Compliance is checked by inspection and by fitting flexible cords. 通过检查和装配软线来检验是否合格。

16.7 TRANSPORTABLE APPARATUS, being musical instruments and their associated amplifiers, shall have an appliance inlet according to IEC 60320-1 for connection to the MAINS by detachable cord sets or shall have a means of stowage to protect the MAINS cord when not in use, for example a compartment, hooks or pegs.

凡属乐器及其附属放大器的可移动设备，应具有符合GB/T17465的通过可拆卸的电线组件与电网电源连接的器具插座，或应具有一个在不使用时能保护电源软线的存放装置，例如存放仓、盘线钩或盘线柱。

Compliance is checked by inspection. 通过检查来检验是否合格。

17 Electrical connections and mechanical fixings 电气连接和机械固定

17.1 Screw TERMINALS providing electrical contact and screw fixings which during the life of the apparatus will be loosened and tightened several times shall have adequate strength. 用作电气接触件的螺纹端子和在设备的寿命期间将会经受数次松开和拧紧的螺纹紧固件应具有足够的强度。

Screws exerting contact pressure and screws with a nominal diameter less than 3 mm which form part of the above-mentioned screw fixings shall screw into a metal nut or a metal insert. 承受接触压力的螺钉和构成上述螺纹紧固件的一部分、标称直径小于3 mm的螺钉应拧入金属螺母或金属嵌件中。

However, screws having a nominal diameter less than 3 mm, which do not exert contact pressure, need not be screwed into metal, provided that the screw fixing withstands the torque specified in table 12 for screws of 3 mm diameter. 但是，标称直径小于3 mm、不承受接触压力的螺钉不需要拧入金属，只要该螺纹紧固件能承受表12对3 mm直径螺钉规定的力矩即可。

Screw fixings which during the life of the apparatus will be loosened and tightened several times include TERMINAL screws, screws for fixing covers (as far as they must be loosened to open the apparatus), screws for fixing handles, knobs, legs, stands and the like. 在设备寿命期间，将会经受数次松开和拧紧的螺纹紧固件，包括端子螺钉、紧固盖板的螺钉（针对必须将其松开才能打开设备的螺钉）、紧固手把、旋钮、腿和支架等的螺钉。

Compliance is checked by the following test. 通过下列试验来检验是否合格。

The screws are loosened and then tightened, with a torque according to table 12:

用表12规定的力矩松开和拧紧螺钉

– 5 times in the case of screws operating in a thread in metal; 如果螺钉是拧入金属螺纹，5次；

– 10 times in the case of screws operating in wood, WOOD-BASED MATERIAL or in a thread in insulating material. 如果螺钉是拧入木材、木质基材或绝缘材料，10次。

In the latter case, the screws are to be completely removed and reinserted each time.

对后者，每次应全部拧出和拧入。



The screws shall not be tightened in jerks. 不应过猛地拧紧螺钉。

After the test, there shall be no deterioration impairing safety in the sense of this standard.

试验后，不应有损害本标准意义上的安全的劣变。

The material in which the screws are inserted is verified by inspection.

通过检查来检验拧入螺钉的材料。

Nominal diameter of screw 螺钉的标称直径 (mm)	Torque 力矩 (Nm)		
	I	II	III
Up to and including 2,8	0,2	0,4	0,4
Over 2,8 up to and including 3,0	0,25	0,5	0,5
Over 3,0 up to and including 3,2	0,3	0,6	0,6
Over 3,2 up to and including 3,6	0,4	0,8	0,6
Over 3,6 up to and including 4,1	0,7	1,2	0,6
Over 4,1 up to and including 4,7	0,8	1,8	0,9
Over 4,7 up to and including 5,3	0,8	2,0	1,0
Over 5,3 up to and including 6,0	—	2,5	1,25

The test is made by means of a suitable test screwdriver, spanner or key, applying a torque as shown in table 12, the appropriate column being: 用合适的试验改锥、扳手或键，施加按如下规定的表12相应栏中的力矩进行试验

– for metal screws without heads, if the screw, when tightened, does not protrude from the hole:

对无头金属螺钉，如果螺钉拧紧时不从孔里伸出 I

– for other metal screws and for nuts: 对其他金属螺钉和对螺母 II

– for screws of insulating material: 对绝缘材料螺钉

• having a hexagonal head with the dimension across flats exceeding the overall thread diameter, or 带六角头，其横截面尺寸超过螺纹外廓直径，或；

• with a cylindrical head and a socket for a key, the socket having a dimension across flats not less than 0,83 times the overall thread diameter, or 带圆柱头和键用凹座，其凹座横截面尺寸不小于螺纹直径的0,83倍，或

• with a head having a slot or cross slots, the length of which exceeds 1,5 times the overall thread diameter. 带有一字或十字槽头，其长度超过螺纹外廓直径1,5倍: II

– for other screws of insulating material: 对绝缘材料的其他螺钉 III

17.2 Means shall be provided to ensure the correct introduction of screws into female threads in non-metallic material, if they will be loosened and tightened several times during the life of the apparatus and contribute to safety in the sense of this standard. 如果在设备寿命期间，螺钉将会经受数次松开和拧紧，而且会影响到本标准意义范围内的安全，则应采取采取措施来保证螺钉正确导入非金属材料的阴螺纹中。

Compliance is checked by inspection and by manual test. 通过检查和手动试验来检验是否合格。

NOTE – This requirement is deemed to be met if introduction in a slanting manner is prevented, for example by guiding the screw in the part to be fixed by a recess in the nut or a lead to the screw.

注：如果采取防偏斜导入的措施，例如利用螺母上的凹口或采用导向螺纹将螺钉导入待固定的零部件中，则认为符合本要求。

17.3 Screws or other fixing devices intended to fix back covers, bottom covers, legs, stands or the like, shall be captive in order to prevent replacement during servicing by screws or other fixing devices, which might cause a reduction of CLEARANCES or CREEPAGE DISTANCES between ACCESSIBLE conductive parts or parts connected to them and HAZARDOUS LIVE parts below the values given in clause 13. 预定用来固定后盖、底盖、腿和支架等的螺钉或其他紧固装置应是不脱落的，以防止在维修时因螺钉或其他紧固装置被替换而可能导致可触及导电零部件或与其连接的零部件与危险带电零部件之间的电气间隙和爬电距离减小到小于第13章的规定值。

Such screws need not be captive if, when replaced by screws having the same nominal diameter and a length of 10 times its nominal diameter, the distances are not less than those stated in clause 13. 如果用具有相同标称直径且长度为标称直径10倍的螺钉来替换时，爬电距离不小于第13章的规定值，则这样的螺钉无需是不脱落的。

Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

17.4 Conductive parts permanently fixed together and carrying a current exceeding 0,2 A across their interface under normal operating conditions shall be secured in such a way that loosening is prevented. 永久固定在一起，且在正常工作条件下其界面上承载的电流超过0,2 A的导电零部件应用防止松动的方法加以固定。

Compliance is checked by inspection and by manual test. 通过检查和手动试验来检验是否合格。

NOTE 1 – Sealing by compound or the like provides satisfactory locking only for screw connections not subject to torsion.

NOTE 2 – If the fixing consists of more than one screw or rivet, only one of them need be locked.

NOTE 3 – For rivets, a non-circular shank or an appropriate notch may be a sufficient guard against rotation.



注1: 对不受扭力的螺纹连接件, 采用化合物封固就能具有满意的锁定。

2: 如果该固定是由一个以上的螺钉或铆钉构成的, 则只需锁定其中的一个。

3: 就铆钉而言, 采用非圆形铆钉体或适当的凹槽就可以充分防止转动。

17.5 Electrical connections in circuits carrying a current exceeding 0,2 A under normal operation conditions shall be so designed that contact pressure is not transmitted through insulating material other than ceramic, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage of the insulating material. 在正常工作条件下, 电路中承载电流超过0,2 A的电气连接应设计成不通过绝缘材料(除陶瓷外)传递接触压力, 除非金属零部件有足够的弹性以补偿绝缘材料任何可能的收缩。

Compliance is checked by inspection. 通过检查来检验是否合格。

17.6 Stranded conductors of flexible supply cords carrying a current exceeding 0,2 A under normal operating conditions, which are connected to screw TERMINALS, shall not be consolidated by lead-tin soldering where they are subject to contact pressure, unless the clamping means is so designed that there is no risk of a bad contact due to cold flow of the solder. 在正常工作条件下, 电路中承载电流超过0,2 A的软电源线的绞合导线与螺纹端子连接时, 在承受接触压力的部位不应用锡铅焊料来固紧, 除非夹紧装置设计成不会因焊料冷变形而出现不良接触的危险。

Compliance is checked by inspection. 通过检查来检验是否合格。

17.7 Cover-fixing devices, which may be operated during the life of the apparatus, shall have adequate mechanical strength, if the failure of such devices would impair safety in the sense of this standard. 对在设备寿命期间可能操作的盖板固定装置, 如果这种装置失效会损害本标准意义范围内的安全, 则应具有足够的机械强度。The locked and unlocked positions of these devices shall not be ambiguous, and it shall not be possible to unlock the devices inadvertently. 这些装置的锁定和松开的位置不应模棱两可, 而且应不可能无意中使该装置松开。

Compliance is checked by inspection, by operating the device and by one of the following tests:

通过检查、操作固定装置和下列试验之一来检验是否合格。

– *In the case of devices the operation of which is effected by a combination of rotary and linear movements, the device is locked and unlocked and the torques or forces necessary for this operation are measured.*

While the device is in the locked position, a torque or force of twice the value necessary to lock the device, with a minimum of 1 Nm or 10 N is applied in the locking direction, unless it is unlocked by a smaller torque or force in the same direction. 对用旋转加直线运动来对其进行操作的固定装置, 将装置锁定和松开, 测量进行该操作所需的力矩和力。当固定装置处于锁定位置时, 在锁定方向上施加锁定该装置所需力矩或力的两倍, 但至少为1 Nm或10 N, 除非在相同方向上用较小的力矩或力, 固定装置被松开。

This operation is performed 10 times. 这种操作进行10次。

The torque or force necessary to unlock the device shall be at least 0,1 Nm or 1 N.

松开固定装置所需的力矩或力至少应为0,1 Nm或1 N。

– *In the case of covers fixed by means of snap fasteners, the cover is removed and replaced 10 times in the intended way. 对用按扣来固定的盖板, 用预期使用的方式将该盖板拆装10次。*

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). 在该试验后, 盖板仍应符合9.1.7a)项和b)项规定的用刚性试验指和试验钩的试验。

17.8 Detachable legs or stands supplied by the manufacturer of the apparatus shall be delivered with the relevant fixing means. 由设备厂商提供的可拆卸的腿或支架应与相应的固定装置一起交付。

Compliance is checked by inspection. 通过检查来检验是否合格。

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. 如果内部可插连接件的松动会损害本标准意义上的安全, 则应将其设计成不可能发生意外的松动。

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

通过检查来检验是否合格。以及在有疑问的情况下, 对连接件以任何方向施加2 N的拉力来检验其是否合格。

NOTE – For other internal connections, see 8.11. 注: 对其他内部连接件, 见8.11。

18 Mechanical strength of picture tubes and protection against the effects of implosion

显像管的机械强度和防爆炸影响

18.1 Picture tubes with a maximum face dimension exceeding 16 cm either shall be intrinsically protected with respect to effects of implosion and to mechanical impact, or the enclosure of the apparatus shall provide adequate protection against the effects of an implosion of the tube. 对屏面最大尺寸超过16 cm的显像管, 其自身应能防爆炸影响和防机械撞击, 或者设备的外壳应对显像管爆炸影响有足够的防护。

A non-intrinsically protected picture tube 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 tube.



自身不防爆的显像管应具有一个不能用手拆除的有效保护屏。如果采用分离的玻璃屏,则该玻璃屏不应与显像管的表面接触。

Compliance is checked by inspection, by measurement, and by the tests of:

通过检查、测量以及下列规定的试验来检验是否合格

– 18.2 for intrinsically protected tubes, including those having integral protective screens;

对自身防爆的显像管, 包括有整体保护屏的显像管采用18.2规定的试验;

– 18.3 for apparatus having non-intrinsically protected tubes. 对自身不防爆的显像管, 采用18.3规定的试验。

NOTE 1 – A picture tube is considered to be intrinsically protected with respect to the effects of implosion 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.

注1: 如果在显像管正确安装时无须附加保护, 则认为该显像管是自身防爆炸影响的显像管。

2: 为了简化试验, 显像管制造厂商可以指出被试显像管的最薄弱的部件。

18.2 Intrinsically protected picture tubes, including those having integral protective screens

自身防爆显像管, 包括有整体保护屏的显像管

Each of the tests of 18.2.2 and 18.2.3 is made on six tubes, three of which are tested as received and the others after having been subjected to the ageing process of 18.2.1.

18.2.2和18.2.3的每种试验应用6只显像管进行, 其中3只显像管收到后即可进行试验, 而其余的3只则在18.2.1老化处理后进行试验。

No failure is allowed. 不允许有损坏。

For the tests of 18.2.2 and 18.2.3, the tubes are mounted in a test cabinet, according to the instructions given by the manufacturer of the tube, the cabinet being placed on a horizontal support at a height of (75 ± 5) cm above the floor. 对18.2.2和18.2.3的试验, 按显像管制造厂商的说明书, 将显像管安装在试验箱上。试验箱应置于高出地面(75 ± 5) cm的水平支架上。

Care is taken that, during the tests, the cabinet does not slide on the support.

应注意, 试验期间, 试验箱不得在支架上滑动。

NOTE – The following description of a test cabinet is given as an example: 注: 下面作为一个示例, 给出试验箱的说明

– the cabinet is made of plywood, with a thickness of about 12 mm for tubes having a maximum face dimension not exceeding 50 cm and of about 19 mm for larger tubes; 箱子用胶合板制成, 对屏幕尺寸不超过50 cm的显像管, 胶合板厚度约为12 mm; 对超过50 cm的显像管, 胶合板的厚度约为19 mm;

– the outside dimensions of the cabinet are approximately 25 % larger than the overall dimensions of the tube; 箱子的外形尺寸比显像管的外形尺寸约大25 %;

– the front of the cabinet is provided with an opening closely surrounding the tube when mounted. The back of the cabinet is provided with an opening, 5 cm in diameter, and rests against a wooden bar, about 25 mm high, which is fixed to the support and prevents the cabinet from sliding. 箱子的正面有一个紧靠显像管四周的开孔, 箱子的背面有一个直径为5 cm的开孔, 箱子背靠在一个大约25 mm高的木条上, 木条固定在支架上, 防止箱子滑动。

18.2.1 Ageing process 老化处理

The ageing process is as follows: 老化处理如下

a) *Damp heat conditioning:* 湿热处理

24 h at (25 ± 2) °C and 90 % to 95 % relative humidity 温度(25 ± 2) °C, 相对湿度90 % ~95 %, 24 h;

24 h at (45 ± 2) °C and 75 % to 80 % relative humidity 温度(45 ± 2) °C, 相对湿度75 % ~80 %, 24 h;

24 h at (25 ± 2) °C and 90 % to 95 % relative humidity 温度(25 ± 2) °C, 相对湿度90 % ~95 %, 24 h;

b) *Change of temperature consisting of two cycles, each comprising:* 由二次循环组成的温度变化, 每一循环包括

1 h at (+20 ± 2) °C

1 h at (-25 ± 2) °C

1 h at (+20 ± 2) °C

1 h at (+50 ± 2) °C

NOTE – The change of temperature is not intended to cause severe thermal stress on the picture tube, and may be achieved using one or two chambers. 注: 此温度变化并不是打算对显像管造成严酷的热应力, 因而可以使用一个试验箱, 也可以使用两试验箱来完成。

c) *Damp heat conditioning as indicated under a).* 按a)项规定的湿热处理。

18.2.2 Implosion test 爆炸试验

Cracks are propagated in the envelope of each tube by the following method:

用下列方法使每只显像管的外壳上产生裂纹:

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.



用金刚钻划针在每只显像管的侧边部位或正面部位划痕(图12),并用液氮和类似物反复冷却该部位,直至出现破裂。为了防止冷却液流出该试验部位,应用泥塑不坝或使用类似物来阻流。

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 tube and no particles shall have passed a similar barrier at 200 cm. 试验后,应无任何大于2 g的碎片飞过放在地面上离管面投影处50 cm、高25 cm的挡板,而且应无任何碎片飞过放在200 cm处的同样挡板。

18.2.3 Mechanical strength test 机械强度试验

Each tube is subjected to one impact of a hardened steel ball having a Rockwell hardness of at least R62 and a diameter of 40_{+10} mm, and which is suspended from a fixed point by means of a string. 每只显像管应承受洛氏硬度HRC至少62、直径为 40_{+10} mm的淬硬钢球撞击一次,钢球用绳子悬挂在一固定点上。

Keeping the string straight, the ball is raised and then allowed to fall onto any place on the face of the tube from a height such that the vertical distance between the ball and the point of impact is: 将绳子拉直提升钢球,使钢球与撞击点之间的垂直距离为下列高度,然后让钢球从该高度下落,击在管面的任何部位

– 210 cm for tubes having a maximum face dimension exceeding 40 cm;

对屏面最大尺寸超过40 cm的显像管为210 cm;

– 170 cm for other tubes. 对其他显像管为 170 cm。

The point of impact on the face of the tube shall be at least 20 mm from the border of its useful area.

After this test, no particles having a mass exceeding 10 g shall have passed a 25 cm high barrier, placed on the floor, 150 cm from the projection of the front of the tube.

显像管屏面的撞击点距显像管有用区的边缘至少为20 mm。

试验后,应无任何大于10 g的碎片飞过放在地面上离管面投影处150 cm、高25 cm的挡板。

18.3 Non-intrinsically protected picture tubes 自身不防爆的显像管

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. 将安装有显像管及保护屏的设备置于高出地面 (75 ± 5) cm的水平支架上,或者如果设备是落地式设备,则直接放置在地面上。

The tube is made to implode inside the enclosure of the apparatus by the method described in 18.2.2.

按18.2.2规定的试验方法,使显像管在设备外壳内部爆炸。

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. 试验后,应无大于2 g的碎片飞过放在地面上离管面投影处50 cm、高25 cm的挡板,而且应无任何碎片飞过放在200 cm处的同样挡板。

19 Stability and mechanical hazards 稳定性和机械危险

Apparatus having a mass exceeding 18 kg shall have adequate stability.

质量超过18 kg的设备应有足够的稳定性。

In addition, the stability shall be ensured when legs or stands supplied by the manufacturer are fitted.

此外,当安装由制造厂商提供的腿或支架时应保证设备的稳定性。

Compliance is checked by the tests of 19.1 and 19.2. 通过19.1和19.2的试验来检验是否合格。

During the tests, the apparatus shall not overbalance. 试验期间,设备不应倾倒。

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

将设备按正常使用状态置于与水平面成 10° 角的倾斜平面上,然后绕其法向垂直轴线慢慢转动 360° 。

If, however, the apparatus is such that, were it to be tilted through an angle of 10° when standing on a horizontal plane, a part of it not normally in contact with the supporting surface would touch the horizontal plane, the apparatus is placed on a horizontal support and tilted in the most unfavourable direction through an angle of 10° .

然而,如果将设备置于水平面上并使设备倾斜 10° 时,会使通常不与支承面相接触的设备的一部分接触到水平面,则将设备置于水平架上,并在最不利的方向上使设备倾斜 10° 。

NOTE – The test on the horizontal support may be necessary, for example, for apparatus provided with small feet, castors or the like. 注:对装有小脚、小脚轮和类似附件的设备,可能需要在水平支架上进行试验。

19.2 The apparatus is placed in its intended position of use on a non-skid surface that is at an angle not exceeding 1° to the horizontal with lids, flaps, drawers and doors in the most unfavourable position. 将设备按预期使用状态置于和水平面夹角不大于 1° 的防滑平面上,同时使其盖、铰链板、抽屉和门均处于最不利的位

置。A force of 100 N directed vertically downwards is applied in such a way as to produce the maximum overturning



moment, to any point of any horizontal surface, protrusion or recess, provided that the distance of that point to the non-skid surface does not exceed 75 cm. 在任一水平面，凸处或凹处的任何一点上，以能产生最大倾倒地矩的方式，施加100 N垂直向下的力，只要该受力点到防滑表面的距离不超过75 cm即可。

19.3 Edges or corners, except those required for proper apparatus functioning, shall be smoothed (no abrupt discontinuity) when they could otherwise be hazardous to the USER because of location or application in the apparatus. 当设备的边或角会因设备的放置或应用而在不同情况下对用户造成危险时，由这些边或角应做成圆滑形状（无陡然的中断点），但设备适当功能所需的边或角除外。

Compliance is checked by inspection. 通过检查来检验是否合格。

19.4 Glass, with the exception of picture tubes, with a surface area exceeding 0,1 m² or with a major dimension exceeding 450 mm, shall not be shattered in a manner likely to result in a skin lacerating injury. 表面积超过0,1 m²或主要尺寸超过450 mm的玻璃，不应被击碎到可能使皮肤造成划伤伤害，但显像管除外。

Compliance is checked by the test of 12.1.3. 通过12.1.3的试验来检验是否合格。

If thereby the glass breaks or cracks, an additional test according to 19.4.1 is made on a separate test sample.

如果玻璃因此破碎或开裂，则要用一个单独的试验样品按19.4.1的规定进行附加试验。

19.4.1 Fragmentation test 破碎试验

The test sample is supported over its whole area and precautions shall be taken to ensure that particles will not be scattered upon fragmentation. Then the test sample is shattered with a centre punch placed approximately 15 mm in from the midpoint of one of the longer edges of the test sample. Within 5 min of fracture, and without using any aid to vision, except spectacles if normally worn, the particles are counted in a square of 50 mm side located approximately at the centre of the area of coarsest fracture and excluding any area within 15 mm of any edge or hole. 将试验样品以其整个面积支撑好，并采取能确保使碎片不会从破碎处飞散开的措施。然后用一中心冲孔器，将其放置在距试验样品较长边缘之一的中点约15 mm处击碎试验样品。在破碎后5 min内，在不用任何助视装置（正常佩带的眼镜除外）的情况下，用边长50 mm的方格置于破碎面积（但不包括在15 mm范围内的任何边缘或孔洞的任何面积）的近似中心处数出方格内的碎片数。

The test sample shall fragment in such a way that the number of particles counted in a square of 50 mm side shall not be less than 45. 试验样品的破碎程度应达到在边长50 mm的方格内数出的碎片数不少于45片。

NOTE – A suitable method of counting the particles is to place a square of 50 mm side of transparent material over the test sample and mark a spot of ink as each particle within the square is counted. To count particles at the edges of the square, select any two adjacent sides of the square and count all the particles intersected by these, and exclude all other intersected particles. 注：数碎片的一种适用的方法是，将一个由透明材料制成的，边长50 mm的方格放在试验样品上，数出在方格范围内的每一碎片上点有一点墨水点的点数。为了数出位于方格压边的碎片数，选取方格任意相邻的两边，数出由这两边所压的所有碎片的片数，但不计入其他两边所压的碎片数。



20 Resistance to fire 防火

The apparatus shall be so designed that the start and spread of fire is prevented as far as possible, and shall not give rise to danger of fire to the surroundings of the apparatus.

设备的设计应最大限度的防止起火和火焰的蔓延，并且不应给设备的周围带来引燃的危险。

This is achieved as follows: 采取以下措施来满足此防火要求

- by using good engineering practice in design and production of the apparatus to avoid POTENTIAL IGNITION SOURCES, 在设备的设计和在生产上采用良好的工程措施，以避免产生潜在引燃源；

and 以及

- by using materials of low flammability for internal parts in the vicinity of POTENTIAL IGNITION SOURCES, 与潜在引燃源临近的内部零部件使用低可燃性的材料；

and 以及

- by using FIRE ENCLOSURES to limit the spread of fire. 采用防火防护外壳限制火焰蔓延。

The requirements are considered to be fulfilled, if the apparatus complies with the requirements of 20.1 and 20.2.

如果设备满足20.1和20.2的要求，则认为设备符合防火要求。

NOTE 1 – It is recommended that the quantity of environmentally unfriendly flame retardant materials should be kept as low as possible in order to minimize environmental pollution.

注1: 建议应尽可能减少对环保不利的阻燃材料的用量，以便减小环境污染。

NOTE 2 – In Australia and New Zealand special national conditions apply which include tests based on reconciliation with the philosophy of IEC 60695 [18] with respect to glow wire testing, needle flame testing, consequential testing and end product consequential testing. 注2: 在澳大利亚和新西兰，对包括基于和60695的原理相一致的试验在内的灼热丝试验、针焰、随后出现的试验和随后出现的产品试验采用国家特殊条件。

20.1 Electrical components and mechanical parts 电气元件和机械零件

Electrical components and mechanical parts with the exception of those in a) and b), shall comply with the requirements of 20.1.1, 20.1.2, 20.1.3 and 20.1.4.

除a)项和b)项规定以外的电气元件和机械零件应满足20.1.1、20.1.2、20.1.3和20.1.4的要求。

a) Components that are contained in an enclosure having a flammability category of FV 0 according to IEC 60707 and having openings only for the connecting wires filling the openings completely, and for ventilation not exceeding 1 mm in width regardless of length. 安装在符合GB/T11020的可燃性等级FV0级的、仅开有供连接导线填满的开孔、和开有宽度不超过1 mm、长度不限的通风孔的外壳内的元件。

b) The following parts which would contribute negligible fuel to a fire: 为火焰提供燃料可忽略不计的下列零件

- small mechanical parts, the mass of which does not exceed 4 g, such as mounting parts, gears, cams, belts and bearings; 质量不超过4 g的小机械零件，如：安装件、齿轮、凸轮、皮带和轴承；
- small electrical components, such as capacitors with a volume not exceeding 1 750 mm³, integrated circuits, transistors and optocoupler packages, if these components are mounted on material of flammability category FV 1 or better according to IEC 60707. 安装在符合GB/T11020的可燃性等级FV1级或更优等级材料上的小电气元件，如：体积不超过1 750 mm³电容器、集成电路、三极管和光电耦合器封装件。

NOTE – In considering how to minimize propagation of fire and what "small parts" are, account should be taken of the cumulative effect of small parts adjacent to each other for the possible effect of propagating fire from one part to another.

注：在考虑如何减少火焰蔓延和什么是“小零件”时，应针对火焰从一个零件蔓延到另一个零件的可能的影响，考虑相互邻近的小零件的累积效应。

20.1.1 Electrical components 电气元件

Electrical components shall comply with the relevant flammability requirement of clause 14.

Where there are no applicable flammability requirements in clause 14, the requirements of 20.1.4 apply.

元件应符合第14章相应的可燃性要求。

对第14章无相应的可燃性要求的情况下，采用20.1.4的要求。

Compliance is checked by appropriate tests of clause 14 or 20.1.4.

通过第14章或20.1.4的相应试验来检验是否合格。

20.1.2 Internal wiring 内部连线

Insulation on wiring shall not contribute to the spread of fire under following conditions:

在下列情况下，连线的绝缘不应有助于火焰的蔓延

- wiring working at voltages exceeding 4 kV (peak) a.c. or d.c., or 工作电压超过交流4 KV（峰值）或直流4 KV时，或者
- wiring leaving an internal FIRE ENCLOSURE with the exception of insulation consisting of PVC, TFE, PTFE, FEP or neoprene. 从内部防火外壳引出的连线，但由聚氯乙烯PVC、四氟乙烯TFE、聚四氟乙烯PTFE、氟化乙丙烯FEP或氯丁橡胶组成的绝缘除外。

NOTE – Reference is made to ISO 1043-1 [14] for the meaning of the abbreviations. 注：缩略语含义参见ISO 1043-1 [14]。



Compliance is checked by the tests of clause G.2, annex G. 通过附录G第G2章的试验来检验是否合格。

20.1.3 PRINTED BOARDS 印制板

Base material of PRINTED BOARDS, on which the AVAILABLE POWER at a connection exceeds 15 W operating at a voltage exceeding 50 V and equal or less than 400 V (peak) a.c. or d.c. under normal operating conditions, shall be of flammability category FV 1 or better according to IEC 60707, unless the PRINTED BOARDS are protected by an enclosure meeting the flammability category FV 0 according to IEC 60707, or be made of metal, having openings only for connecting wires which fill the openings completely. 在正常工作条件下, 印制板上的某个连接处, 工作电压超过交流50 V (峰值) 或直流50 V, 且小于或等于交流400V (峰值) 或直流400V时, 可得到的功率超过15 W, 则其基材的可燃性等级应达到GB/T11020规定的FV1级或更优等级, 除非该印制板由满足GB/T11020可燃性等级FV0级的外壳, 或由仅开有供连接导线填满的开孔的金属外壳来保护。

Base material of PRINTED BOARDS, on which the AVAILABLE POWER at a connection exceeds 15 W operating at a voltage exceeding 400 V (peak) a.c. or d.c. under normal operating conditions, and base material of PRINTED BOARDS supporting spark gaps which provide protection against overvoltages, shall be of flammability category FV 0 according to IEC 60707, unless the PRINTED BOARDS are contained in a metal enclosure, having openings only for connecting wires which fill the openings completely. 在正常工作条件下, 印制板上的某个连接处, 工作电压超过交流400V (峰值) 或直流400V时, 可得到的功率超过15 W, 以及印制板上支撑提供过压保护的放电器, 则其基材的可燃性等级应达到GB/T11020规定的FV 0级, 除非该印制板装在仅开有供连接导线填满的开孔的金属外壳内。

Compliance is checked for the smallest thickness of PRINTED BOARD used, in accordance with IEC 60707 or of clause G.1 of annex G, after a preconditioning of 24 h at a temperature of (125±2) °C in an air-circulating oven and a subsequent cooling period of 4 h at room temperature in a desiccator over anhydrous calcium chloride. 将实际使用的最小厚度的印制板放入温度为(125±2)°C空气循环的烘箱内预处理24 h后, 再放入放有无水氯化钙的干燥器, 在常温下冷却4 h, 然后按GB/T11020或附录G第G1章的规定来检验是否合格。

20.1.4 Components and parts not covered by 20.1.1, 20.1.2 and 20.1.3 except FIRE ENCLOSURES

除防火防护外壳外未包括在20.1.1、20.1.2和20.1.3中的元器件和零部件

When the distance between POTENTIAL IGNITION SOURCES and components or parts mentioned in the heading does not exceed the values specified in table 13, then these components and parts shall comply with the relevant flammability category according to IEC 60707 as specified in table 13, unless shielded from POTENTIAL IGNITION SOURCES by a barrier made of metal or meeting the flammability category FV 0 according to IEC 60707. The barrier shall have dimensions covering at least the areas specified in table 13 and shown in figure 13. A barrier shall have a distance to a POTENTIAL IGNITION SOURCE of at least 5 mm.

当潜在引燃源与本条标题规定的元器件或零部件之间的距离未超过表13的规定值, 则这些元器件或零部件应满足表13规定的GB/T11020相应的可燃性等级的要求, 除非这些元器件或零部件与引燃源之间用金属制成的隔板或符合GB/T11020的可燃性等级FV0级的隔板隔开。隔板的尺寸应至少覆盖表13规定的和图13所示的区域。

隔板到潜在引燃源的距离至少应有5 mm。

In case of openings in the barrier the requirements shown in figure 13 apply, unless it is not possible for the needle flame specified in IEC 60695-2-2 to penetrate the barrier.

如果隔板上有开孔, 则采用图13所示的要求, 除非GB/T5169.5规定的针焰不可能烧穿隔板。

PRINTED BOARDS carrying POTENTIAL IGNITION SOURCES are not considered to be a barrier for the purpose of this subclause. 就本条而言, 带有潜在引燃源的印制板不认为是隔板。

POTENTIAL IGNITION SOURCES inside electrical components are not included in this requirement.

本要求不包括在元器件内的潜在引燃源。

Table 13 – Distances to POTENTIAL IGNITION SOURCES 表13 距潜在引燃源的距离			
Open circuit voltage of the POTENTIAL IGNITION SOURCE 潜在引燃源的开路电压 交流V (峰值) 或直流V	Distance from POTENTIAL IGNITION SOURCES to the components or parts downwards or sideways less than (see figure 13) 从潜在引燃源向下或向侧面到 元器件或零部件的距离 (mm)	Distance from POTENTIAL IGNITION SOURCES to the components or parts upwards less than (see figure 13) 从潜在引燃源向上到元器 件或零部件的距离 (mm)	Flammability category according to IEC 60707 GB/T11020的可燃性等级
>50 to ≤400 (peak) a.c. or d.c.	13	50	FH 3-40 mm/min
>400 to ≤4 000 (peak) a.c. or d.c.	13	50	FV 2
>4 000 (peak) a.c. or	D 1)	D 2)	FV 1



d.c.		
1) where D is 13 mm or the open-circuit voltage of the POTENTIAL IGNITION SOURCE in kilovolts, whichever is larger D为13或潜在引燃源的电压KV数，取其较大者。 2) where D is 50 mm or the open-circuit voltage of the POTENTIAL IGNITION SOURCE in kilovolts, whichever is larger D为50或潜在引燃源的电压KV数，取其较大者。		

Wood and WOOD-BASED MATERIAL with a thickness of at least 6 mm is considered to fulfil the FV 1 requirement of this subclause. 厚度大于或等于6 mm的木材或木制基材被认为是符合本条要求的FV1级。

Compliance is checked in accordance with IEC 60707 or clause G.1 of annex G for the smallest thickness used, except for flammability category FH 3-40 mm/min, in which case the test is made on test specimens with a thickness of (3±0,2) mm, irrespective of the actual thickness in the apparatus.

将实际使用的最小厚度的样品按GB/T11020或附录G第G1章的规定来检验是否合格，但对可燃性等级FH 3-40 mm/min除外，在这种情况下，用厚度(3±0,2) mm的样品进行试验，不考虑其在设备中的实际厚度。

20.2 Fire enclosure 防火防护外壳

20.2.1 POTENTIAL IGNITION SOURCES with open circuit voltages exceeding 4 kV (peak) a.c. or d.c. under normal operating conditions shall be contained in a FIRE ENCLOSURE which shall comply with the flammability category FV 1 or better according to IEC 60707. 在正常工作条件下，开路电压超过交流4 kV（峰值）或直流4 kV 的潜在引燃源，应安装在符合GB/T11020的可燃性等级FV1或更优等级的防火防护外壳内。

Wood and WOOD-BASED MATERIAL with a thickness of at least 6 mm is considered to fulfil the FV 1 requirement of this subclause. 厚度大于或等于6 mm的木材或木制基材被认为是符合本条要求的FV1级。

Compliance is checked in accordance with IEC 60707 or clause G.1 of annex G for the smallest thickness used. 将实际使用的最小厚度的外壳按GB/T11020或附录G第G1章的规定来检验是否合格。

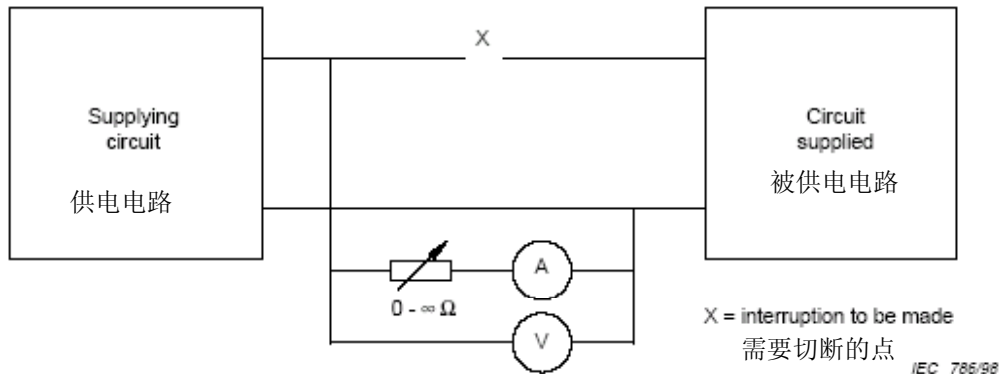
20.2.2 Internal FIRE ENCLOSURES shall not have openings for ventilation exceeding 1 mm in width regardless of length. 设备内部防火防护外壳不应有宽度超过1 mm的通风孔，但其长度不限。

Openings for connecting wires shall be filled completely by the wires. 供连接导线用的开孔应由这些导线完全填满。
Compliance is checked by inspection and measurement. 通过检查和测量来检验是否合格。

20.2.3 If the requirements of 20.2.1 and 20.2.2 are met by an internal FIRE ENCLOSURE no requirements apply to the outer enclosure of the apparatus or to components or parts adjacent to the internal FIRE ENCLOSURE.

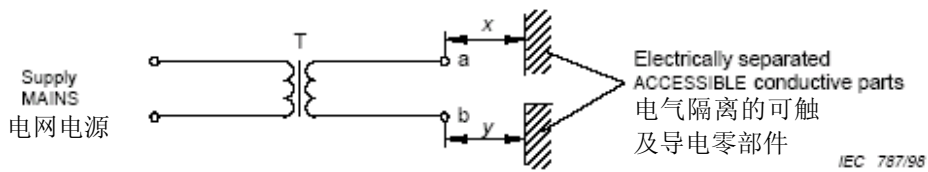
Insulation of internal wiring complying with 20.1.2 is considered to be an internal FIRE ENCLOSURE. 如果设备内部防火防护外壳满足20.2.1和20.2.2的要求，则这些要求不适用于设备的外部外壳，或与设备内部防火防护外壳相邻的元器件或零部件。满足20.1.2要求的内部连线的绝缘被认为是内部防火外壳。

Compliance is checked by inspection. 通过检查来检验是否合格。



NOTE – See 4.3.

Figure 1 – Test circuit for fault conditions 图1:故障条件用试验电路



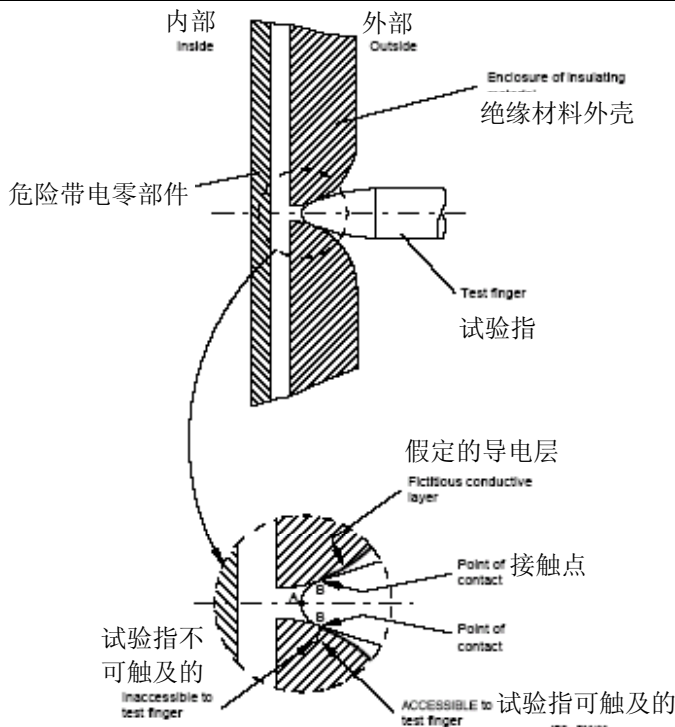
The diagram shows a SEPARATING TRANSFORMER T, where point a is HAZARDOUS LIVE relative to point b. If a and b are inside the apparatus, the sum of the distances x and y is taken into account for the purpose of checking compliance with 8.6. 该图表示的是一个分离变压器T，其中a点相对于b点是危险带电的。如果a和b位于设备内侧，在检查是否符合8.6要求时，要考虑距离x与距离y之和。

NOTE – See 8.6.

Figure 2 – Example of an assessment of REINFORCED INSULATION 图2 评价加强绝缘的示例



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Point A is used for determining accessibility (see 9.1.1)

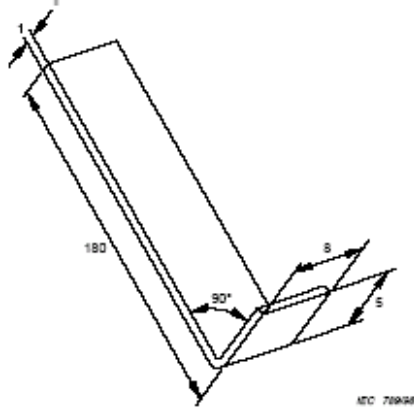
Point B is used for measurements of CLEARANCES and CREEPAGE DISTANCES (see clause 13)

A 点用于确定可触及性(见 9.1.1)

B 点用于测量电气间隙和爬电距离(见第 13 章)

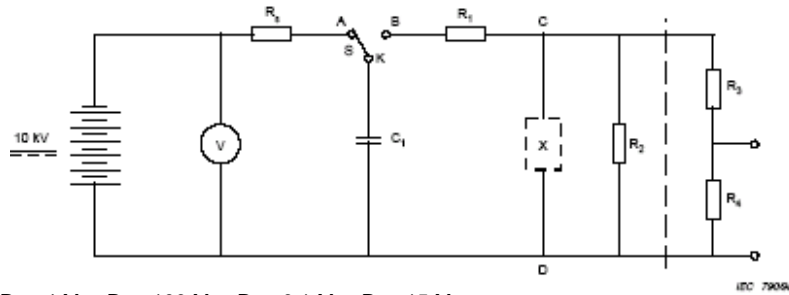
NOTE – See 9.1.1 and 13.1.1.

Figure 3 – Example of ACCESSIBLE parts 图 3 可触及零部件的示例



NOTE – See 9.1.7. Dimensions in millimeters 尺寸单位:毫米

Figure 4 – Test hook 图 4: 试验钩



$C_1 = 1 \text{ nF}$, $R_1 = 1 \text{ k}\Omega$, $R_2 = 4 \text{ M}\Omega$, $R_3 = 100 \text{ M}\Omega$, $R_4 = 0,1 \text{ M}\Omega$, $R_5 = 15 \text{ M}\Omega$

(R2 is used only when the tests of 14.2 are performed on a component comprising a capacitor only.)

(R2 仅是在对由一个电容器组成的元件进行 14.2 规定的试验时才使用)

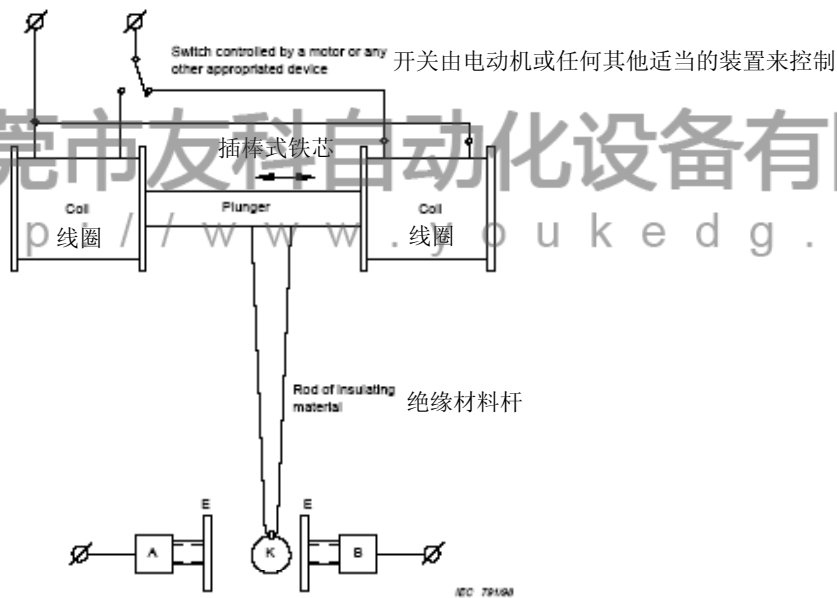
The switch S is a critical part of the circuit. It shall be so designed that as little as possible of the available energy is dissipated in arcing or inadequate insulation. An example of such a switch is given in figure 5b.

开关S是电路中的关键部件,其设计应确保消耗在飞弧或不完善绝缘上的有效能量尽可能小.图5b给出了这种开关的实例.

The component X under test is connected to the terminals C and D. Optionally the voltage divider R3, R4 may be provided so that an oscilloscope connected across R4 permits the observation of the voltage waveform across the component under test. This voltage divider is compensated so that the observed waveform corresponds with that across the component under test. 被试元件 X 连接到端子 C 和 D.分压器 R3 和 R4 可以任选,用来连接在 R4 两端的示波器能观测被试元件两端的电压波形.分压器的补偿要确保使观测到的波形与被试元件两端的波形一致.

NOTE – See 10.1 and 14.1.

Figure 5a – Surge test – Test circuit 图 5a 电涌试验: 试验电路



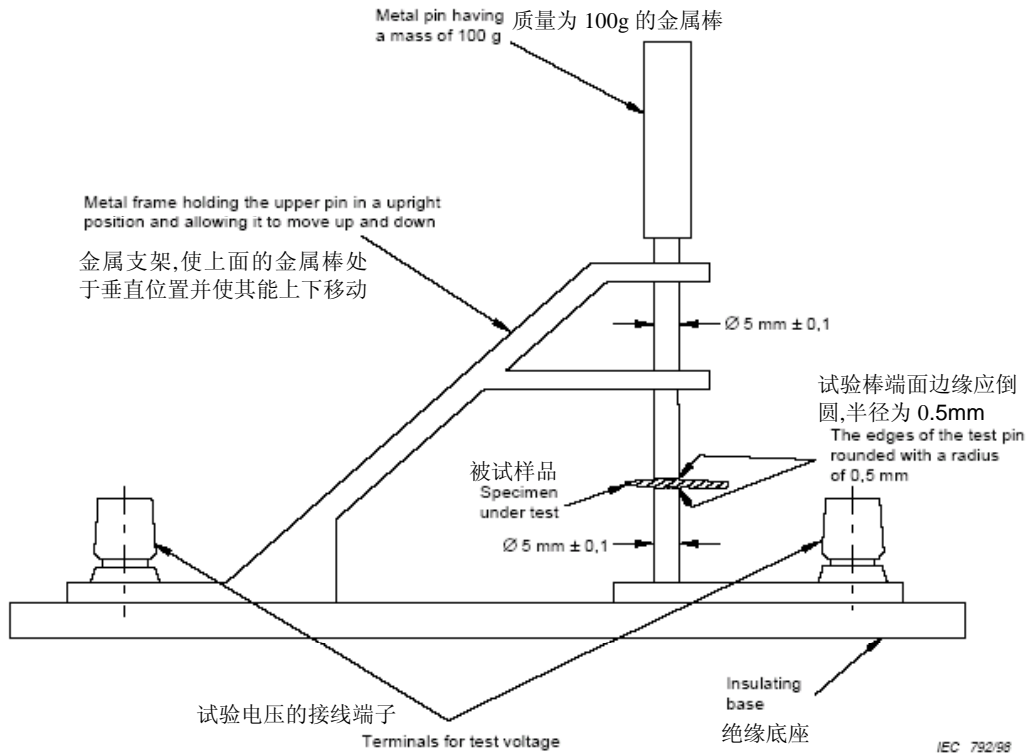
The switch (S in figure 5a) comprises the following parts: 开关(图5a中的S)由下列零部件组成

- the brass pillars A and B support circular electrodes E spaced at a distance of 15 mm;
铜柱A和B支承圆形电极E,两圆形电极相距15 mm;
- K is a brass sphere of 7 mm diameter and is supported on a rigid rod of insulating material approximately 150 mm long. K为直径7 mm的黄铜球,被支承在大约150 mm长的刚性绝缘材料杆上.

A, B and K are connected as shown in figure 5a, K by means of a flexible wire Care shall be taken to avoid bouncing of sphere K. A、B 和 K 按图 5a 所示连接,K 通过软电线连接.

Figure 5b – Surge test – Example of a switch to be used in the test circuit

图 5b 电涌试验: 用于试验电路的开关的实例



NOTE - See 10.3.2. 注: 见10.3.2

Figure 6 - Dielectric strength test instrument 图 6 抗电强度试验装置



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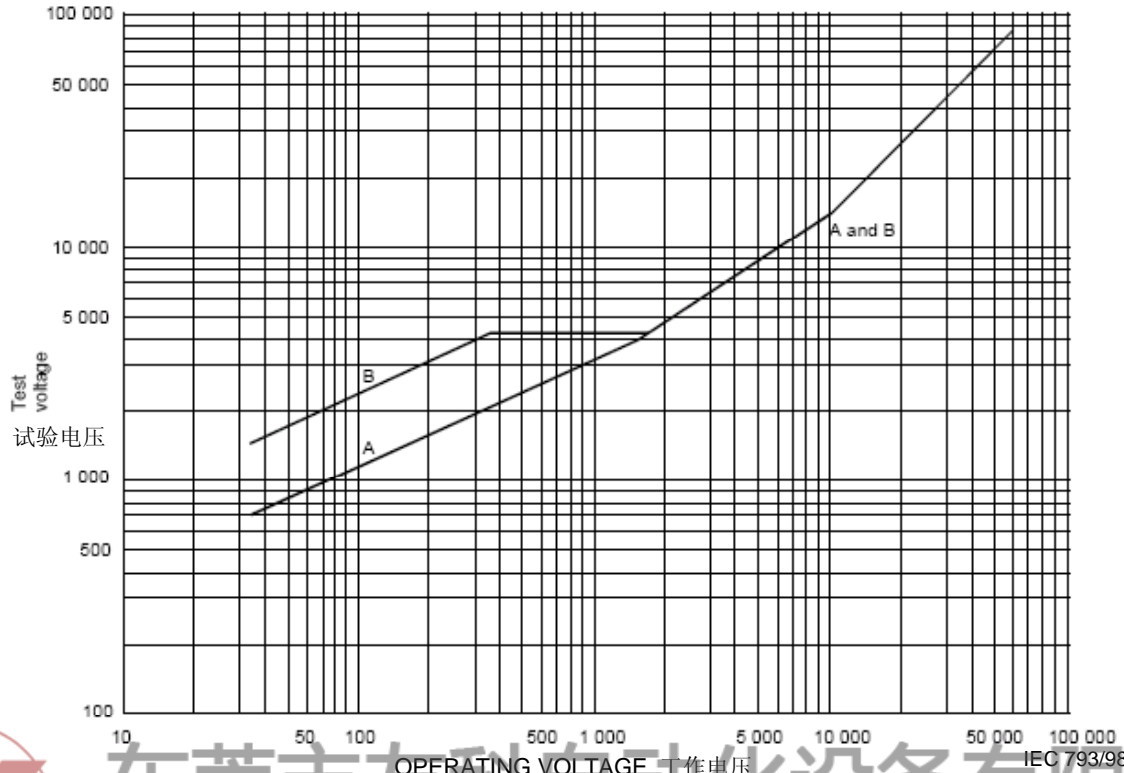
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Dimensions in V (peak) 单位:伏(峰值)



NOTE - See 10.3.2 + table 3. 注: 见10.3.2和表3.

Figure 7 - Test voltages 图7 试验电压

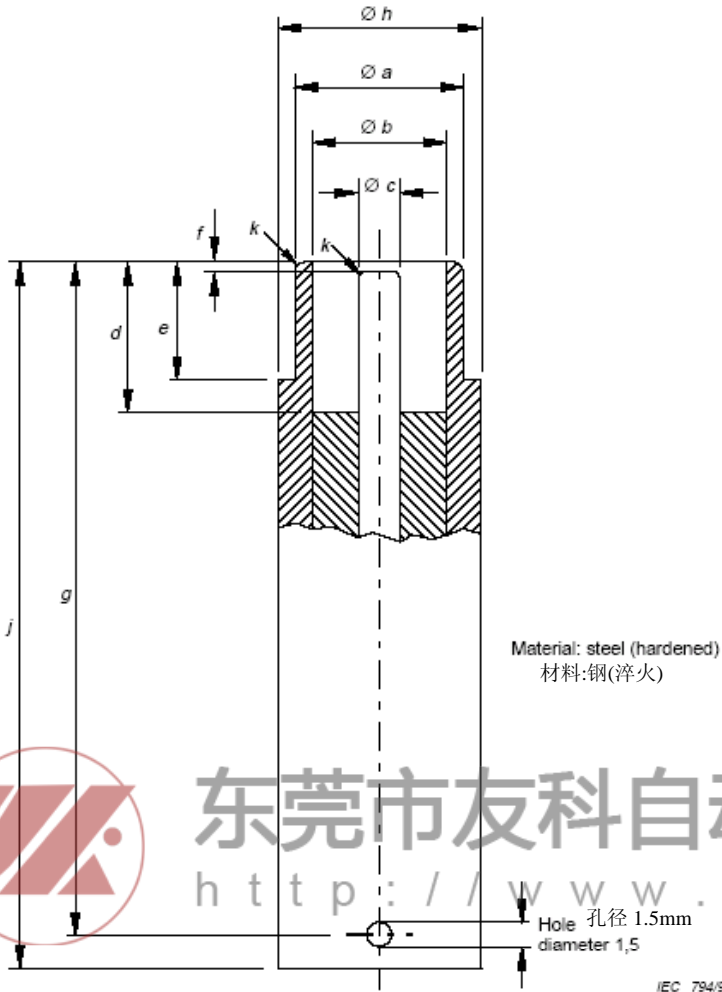
OPERATING VOLTAGE 工作电压

IEC 793/98



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Dimensions in millimeters 尺寸:毫米

a	b (min.)	c	d(min .)	e(min.)	f	g	h	j	k(min.)
9,576 ⁻¹ ₀	8,05	2,438 ⁻¹ ₀	9,1	7,112	0,8 ± 0,4	40 ± 0,4	12 ± 0,4	43 ± 0,4	0,3(radii 半径)

The mating section of the test plug is in accordance with IEC 60169-2 [3], figure 7.

试验插头的插合部分符合IEC 60169-2 [3], 图7

NOTE – See 12.5. 注:见12.5.

Figure 8 – Test plug for mechanical tests on antenna coaxial sockets

图 8 天线同轴插座机械试验用试验插头

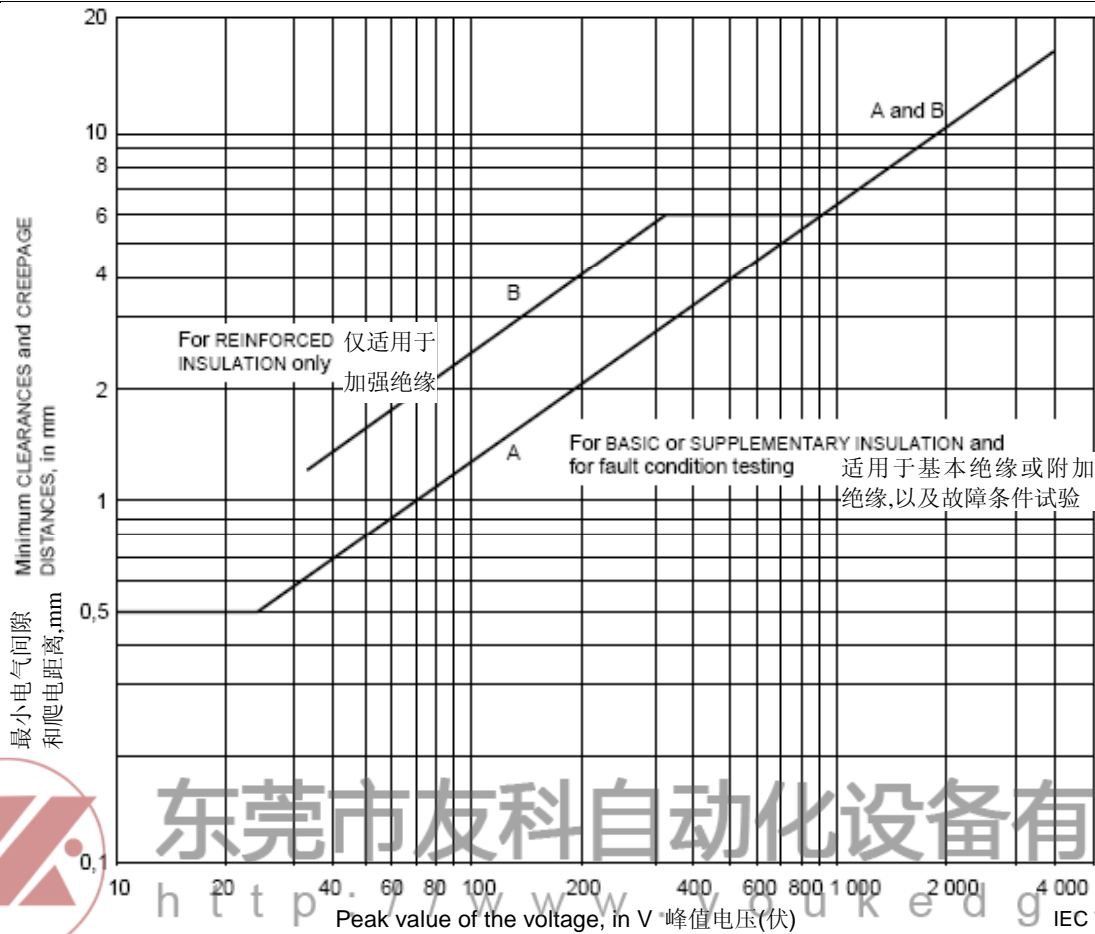


Figure 9 – CLEARANCES and CREEPAGE DISTANCES 图9 电气间隙和爬电距离

NOTE 1 – The given values are applicable to BASIC, SUPPLEMENTARY and REINFORCED INSULATION.

注1: 所给出的数值适用于基本绝缘、附加绝缘和加强绝缘。

NOTE 2 – For BASIC, SUPPLEMENTARY and REINFORCED INSULATION, all parts of the circuit CONDUCTIVELY CONNECTED TO THE MAINS are assumed to be at not less than the nominal MAINS voltage with respect to earth.

For parts CONDUCTIVELY CONNECTED TO THE MAINS with voltages in the range of 220 – 250 V (r.m.s.), the values are equal to those related to 354 V peak.

注2: 对基本绝缘、附加绝缘和加强绝缘而言, 与电网电源导电连接的电路的所有零部件均假定其对地有不小于电网电源的标称电压。

对和电压在220V~250V(有效值)范围内的电网电源导电连接的零部件, 这些数值等于354V峰值电压所对应的那些数值。

NOTE 3 – A voltage across the BASIC INSULATION is determined by short-circuiting the SUPPLEMENTARY INSULATION and vice versa. 注3: 基本绝缘上的电压由短路附加绝缘来确定, 反之亦然。

NOTE 4 – For voltages exceeding 4 000 V (peak) a.c. or d.c., the voltage test according to 10.3 is used to determine whether a CLEARANCE and CREEPAGE DISTANCE shall be short-circuited during the tests under fault condition. 注4: 当电压超过交流4000V(峰值)或直流4000V时, 用10.3的电压试验来确定在故障条件试验时是否短路电气间隙和爬电距离。

NOTE 5 – The graphs are defined by the following: 注5: 图中曲线由下列数值确定

- | | |
|-------------------------------------|-------------------|
| Curve A: 35 V corresponds to 0,6 mm | 曲线A: 35V对应于0,6 mm |
| 354 V corresponds to 3,0 mm | 354V对应于3,0 mm |
| Curve B: 35 V corresponds to 1,2 mm | 曲线B: 35V对应于1,2 mm |
| 354 V corresponds to 6,0 mm | 354V对应于6,0 mm |

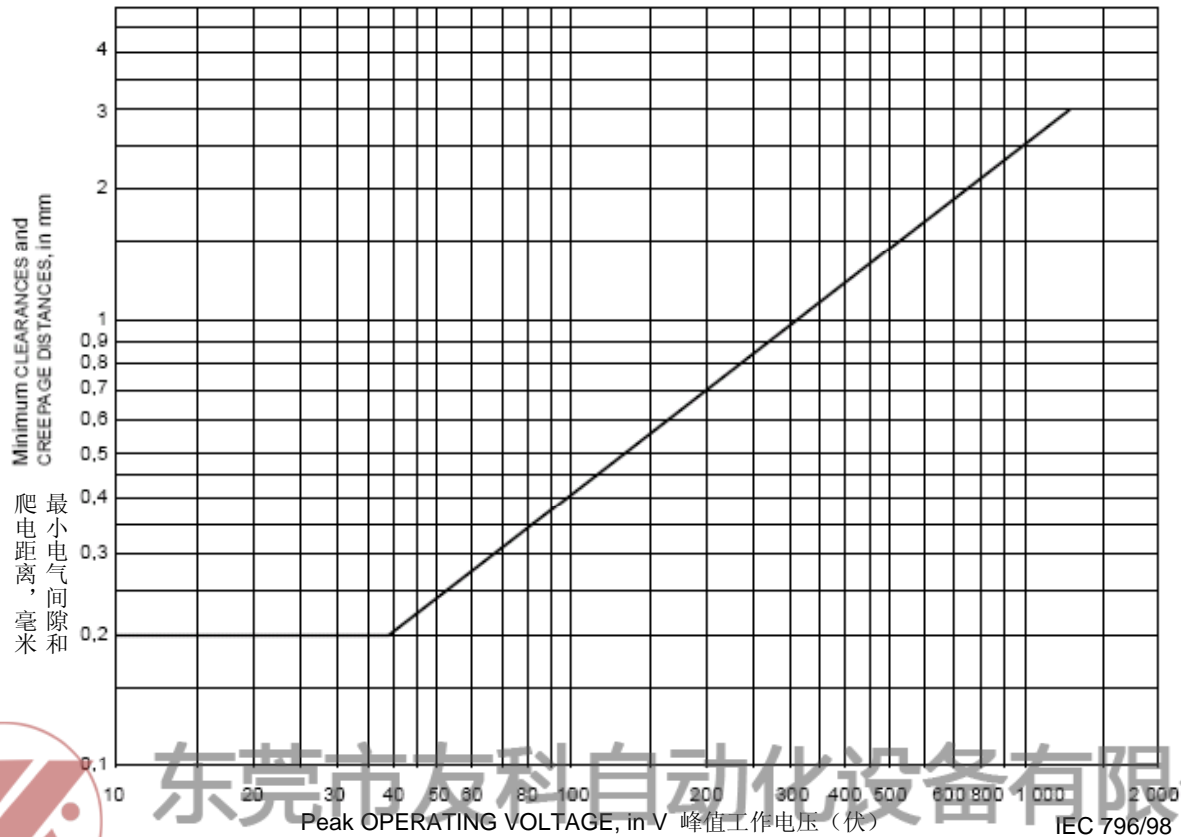
NOTE 6 – If enamel forms the insulation of a wire and withstands the voltage test prescribed for grade 2 or better of IEC 60317, it is considered to contribute 1 mm to the CLEARANCES and CREEPAGE DISTANCES, with a minimum as specified in 13.1.1. 注: 如果漆层构成导线的绝缘, 且能承受GB/T6109对2级或更优等级规定的电压试验, 则对13.1.1规定的最小值而言, 可认为漆层能提供1 mm的电气间隙和爬电距离。

NOTE 7 – The specified CLEARANCES and CREEPAGE DISTANCES are the minimum actual separations taking into account tolerances in assemblies and piece-parts.

注7: 所规定的电气间隙和爬电距离是在考虑了组件和零件的公差情况下的最小实际间隔距离。



NOTE 8 – See clause 13 注8: 见第13章



The curve is defined by the formula 曲线由下列公式确定: $\log d = 0,78 \log (V/300)$
 with a minimum of 0,2 mm 最小值0,2 mm

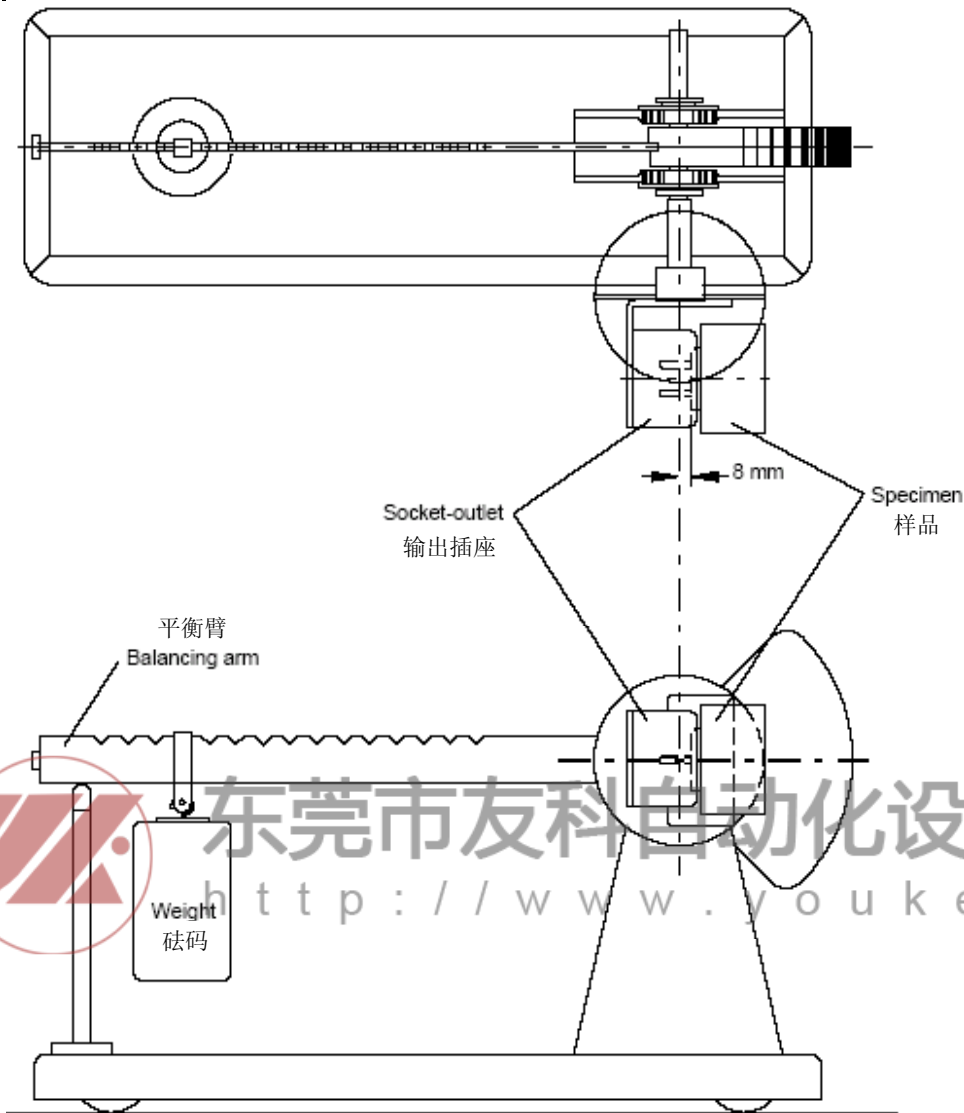
d = distance 距离

V = peak voltage (V) 峰值电压

NOTE – See 13.2. 注: 见13.2。

Figure 10 – Minimum CLEARANCES and CREEPAGE DISTANCES on PRINTED BOARDS

图 10 印制板上最小电气间隙和爬电距离

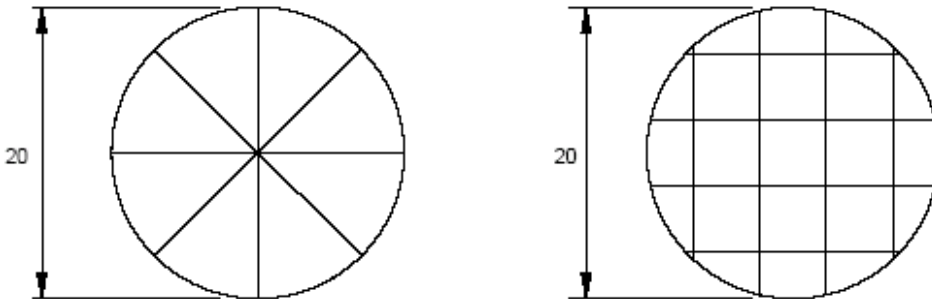


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NOTE – See 15.4.1. 注:见15.4.1.

Figure 11 – Test apparatus for devices forming a part of the MAINS plug

图 11 与电源插头形成一体的直插式设备用的试验装置



IEC 798/98

Dimensions in millimeters 单位: 毫米

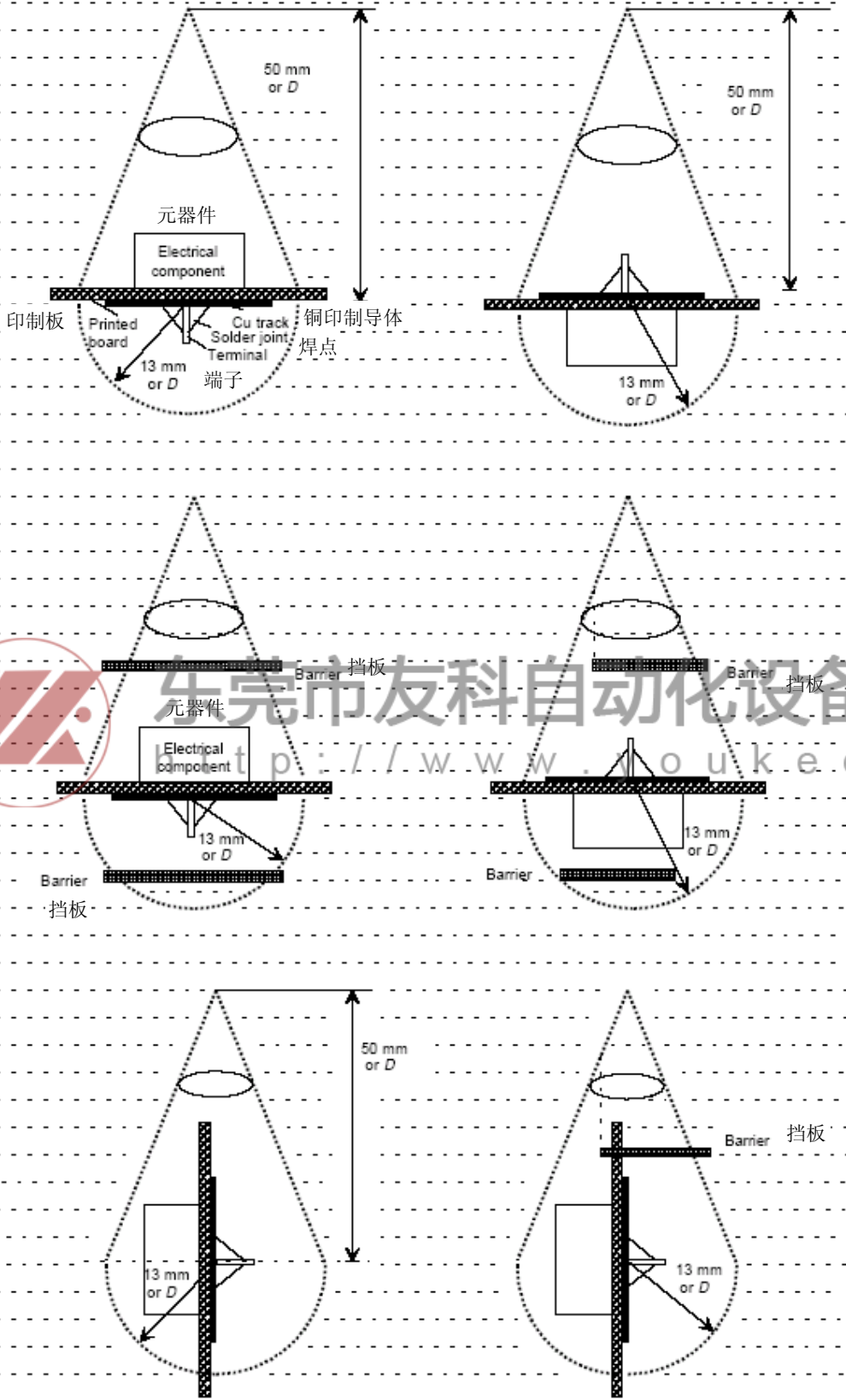
NOTE – See 18.2.2. 注: 见18.2.2

Figure 12 – Scratch patterns for implosion test 图12 爆炸试验的划痕图案



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NOTE – See 20.1.4. 注:见20.1.4

No requirements
无要求

IEC 759/98

Figure 13 Distances from POTENTIAL IGNITION SOURCES 图 13 距潜在引燃源的距离

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Annex A (normative) 附录A (标准的附录)

Additional requirements for apparatus with protection against splashing water

防水溅设备的附加要求

The requirements of this standard supplemented or replaced by those contained in this annex, apply to apparatus provided with protection against splashing water.

本标准中由本附录规定的补充要求或替代要求,适用于防水溅设备。

A.5 Marking and instructions 1) 标记和使用说明

Add the following item after 5.1 i): 在5.1 i)后增加下列条款

A.5.1 j) Protection against splashing water 防水溅

Apparatus provided with protection against splashing water shall be marked at least with the designation IPX4 in accordance with IEC 60529. 防水溅设备,至少应标有符合GB4208的代号“IPX4”。

Compliance is checked by inspection. 通过检查来检验是否合格。

A.5.4.1 a) Subclause 5.4.1 a) does not apply. 5.4.1 a)不适用。

A.10 Insulation requirements 绝缘要求

Modify 10.2 as follows: 10.2修改如下

A.10.2 Splash and humidity treatment 水溅和湿热处理

A.10.2.1 Splash treatment 水溅处理

The enclosure shall provide adequate protection against splashing water. 外壳应提供充分的水溅防护。

Compliance is checked by the treatment specified below, which is made on the apparatus fitted with external flexible cords in accordance with the requirements of clause 16.

The apparatus is subjected to the test described in IEC 60529, subclause 14.2.4, item a).

Immediately after this treatment, the apparatus shall comply with the tests of 10.3 and 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.

通过对装有符合第16章要求的外接软线的设备进行下列规定的处理来检验是否合格。

设备承受GB4208-1993的14.2.4 a)项规定的试验。

在该项处理后,设备应立即承受10.3的试验,而且检查结果应表明,可能进入设备内的水不会引起本标准含义范围内的任何损伤;特别是,在规定其爬电距离的绝缘件上应无水迹存在。

A.10.2.2 Humidity treatment 湿热处理

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

采用10.2,但试验持续时间为7d(168 h)。

1) The clause numbering of this annex refers to the clauses of this standard. 本附录的条款编号指的就是本标准的条款号。

Annex B (normative) 附录B

Apparatus to be connected to the TELECOMMUNICATION NETWORKS 与通信网络连接的设备

The requirements of this standard supplemented by those contained in this annex, apply to apparatus within the scope of this standard intended to be connected to TELECOMMUNICATION NETWORKS.

本附录规定的补充要求适用于本标准范围内要与通信网络连接的设备。

NOTE 1 – Attention is drawn to the fact that the telecommunication authorities may impose additional requirements on apparatus to be connected to TELECOMMUNICATION NETWORKS. Those requirements generally concern the protection of the networks as well as the USERS of the apparatus. 注1: 注意这样一个事实,通信当局可能对与通信网络连接的设备提出附加要求,这些要求一般涉及通信网络的保护以及设备的用户。

NOTE 2 – In Australia, the telecommunication network authorities require compliance to a national variation of IEC 60950 注2: 在澳大利亚,通信网络当局要求满足IEC 60950的国家偏离。

B.2 Definitions 1) 定义

Add the following two definitions to 2.5: 2.5增加下列两条定义

B.2.5.5 TELECOMMUNICATION SIGNAL 通信信号

A steady state, varying amplitude or intermittent voltage or current intended for use on a TELECOMMUNICATION NETWORK. 预定在通信网络上使用的一种稳态的、幅值变化的断续电压或电流。

NOTE – The limiting values are specified in IEC 60950, Subclause 6.2.1.1. 注: 通信信号的限值在GB4943-2001中作出规定。

B.2.5.6 TELECOMMUNICATION NETWORK VOLTAGE (TNV) CIRCUIT 通信网络电压(TNV)电路

A circuit that, under normal operating conditions, carries TELECOMMUNICATION SIGNALS.



在正常工作条件下，载有通信信号的电路。

B.5 Marking and instructions 标记和使用说明

Add the following item after 5.4.1 d): 在5.4.1 d)后增加下列项

B.5.4.1 e) Where the separation of TELECOMMUNICATION NETWORK VOLTAGE (TNV) CIRCUITS from other circuits relies on protective earthing of the apparatus, according to B.8.1 b), the apparatus installation instructions and other relevant literature shall state that the integrity of protective earthing shall be ensured.

对通信网络电压电路如与其他电路按B.8.1 b)规定依靠设备的保护接地来隔离，设备安装手册和其他有关资料应标明：应确保保护接地的完整性。

NOTE 1 – In Norway, if separation between the MAINS and a communication system/network, other than public TELECOMMUNICATION NETWORKS, relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed MAINS socket-outlet.

For requirements for apparatus to be connected to a public TELECOMMUNICATION NETWORK, see B.8.1.

NOTE 2 – In Sweden, if – for apparatus to be connected to the MAINS by means of a plug – the separation between the MAINS and a TELECOMMUNICATION NETWORK relies upon connection to protective earth, the apparatus shall have a marking stating that it must be connected to an earthed MAINS socket outlet.

注1：在挪威，如果电网电源与通信系统/网络的隔离（公共通信网络除外）依靠与安全地的连接，则设备必须有标记，说明设备必须连接到接地的电源输出插座。对与公共通信网络连接的设备的的要求，见see B.8.1。

2：在瑞典，对用插头与电网电源连接的设备，如果电网电源与通信网络的隔离依靠与保护地的连接则设备必须有标记，说明设备必须连接到接地的电源输出插座。

B.8 Constructional requirements with regard to protection against electric shock 关于防触电的结构要求

B.8.1 Add the following text to 8.1: 在8.1后增加下列条文

TELECOMMUNICATION NETWORK VOLTAGE (TNV) CIRCUITS shall be separated from circuits CONDUCTIVELY CONNECTED TO THE MAINS and from HAZARDOUS LIVE parts or circuits as determined in 9.1.1 by one or both of the following methods: 通信网络电压（TNV）电路与和电网电源导电连接的电路，以及与按9.1.1确定的危险带电零部件或电路，应采用下列一种或两种方法来隔离

a) by DOUBLE OR REINFORCED INSULATION as detailed in 8.6; 采用8.6规定的双重或加强绝缘；

b) by BASIC INSULATION together with PROTECTIVE SCREENING connected to the PROTECTIVE EARTH TERMINAL, as detailed in 8.5. 采用8.5规定的基本绝缘连同和保护接地端子连接的保护屏蔽层。

NOTE 1 – In Denmark method b) is permitted only for PERMANENTLY CONNECTED APPARATUS.

注1：在丹麦，只有对永久性连接式设备才允许用方法b)。

NOTE 2 – In Norway, method b) is not permitted. Insulation between parts CONDUCTIVELY CONNECTED TO THE MAINS and parts connected to a public TELECOMMUNICATION NETWORK shall comply with the requirements for DOUBLE or REINFORCED INSULATION. 注2：在挪威，不允许用方法b)。与电网电源的导电连接的零部件与和公共通信网络连接的零部件的绝缘应符合双重绝缘或加强绝缘的要求。

For the purpose of 8.5 and 8.6, the voltage is the sum of the MAINS voltage and the TNV voltage which is assumed to be 135 V (peak) a.c.

就8.5和8.6而言，电压是指电网电源电压与TNV电路的电压之和，TNV电压被假定为交流135V（峰值）。

NOTE 3 – In the USA and Canada, the TNV voltage is assumed to be 170 V (peak).

注3：在美国和加拿大，TNV电路电压被假定为交流170V（峰值）。

B.8.2 Add the following text to 8.2: 8.2增加下列条文

TNV CIRCUITS shall be separated from circuits other than mentioned in B.8.1 and from ACCESSIBLE conductive parts by BASIC INSULATION meeting the insulation requirements for CLEARANCES and CREEPAGE DISTANCES as specified in clause 13, for a voltage which is the sum of the voltage in the circuit and the TNV voltage which is assumed to be 135 V (peak) a.c. TNV电路与除B.8.1规定以外的电路以及可与触及导电零部件之间应用满足第13章规定的与其工作电压相对应的电气间隙和爬电距离绝缘要求的基本绝缘来隔离，其电压是指电路电压与TNV电压之和，TNV电压被假定为交流135V（峰值）。

NOTE – In the USA and Canada, the TNV voltage is assumed to be 170 V (peak).

注3：在美国和加拿大，TNV电压被假定为交流170V（峰值）。

B.9 Electric shock hazard under normal operating conditions

正常工作条件下的触电危险

B.9.1.1 Add the following text to 9.1.1: 9.1.1增加下列条文

Contacts of TERMINALS for TNV CIRCUITS which cannot be touched by the test probe figure B.1, are an additional exemption from the requirement for inaccessible TERMINAL contacts.

用图B1试验探头不能触及到的TNV电路的端子接触件可以免除不可触及端子接触件的要求。



B.9.1.4 Add the following text to 9.1.4: 9.1.4增加下列条文

The straight test probe according to IEC 61032, test probe D, is not applied to TNV CIRCUIT TERMINALS.
符合GB/T16842的试验探头D的直的试验指, 不适用于TNV电路的端子。

B.10 Insulation requirements 绝缘要求

B.10.1 Add the following text to 10.1: 10.1增加下列条文

The insulation between TNV CIRCUIT TERMINALS and

- TERMINALS for the connection of antenna, 连接天线的端子;
- any other TERMINAL in case of apparatus which may be interconnected to other apparatus with antenna TERMINALS 可以与其他带天线端子的设备互连的设备的任何其他端子。

is also subjected to the specified 50 discharges. TNV电路的端子与下列端子之间的绝缘承受规定的50次放电。

B.10.3 Add the following text to 10.3: 10.3增加下列条文

The test voltages between TNV CIRCUITS and other parts shall be determined according to the OPERATING VOLTAGES mentioned in B.8.1. TNV电路与其他零部件之间的试验电压应按B.8.1规定的工作电压来确定。

Surge suppressors shall be disconnected during the dielectric strength test.

在进行抗电强度试验时应断开电涌抑制器。

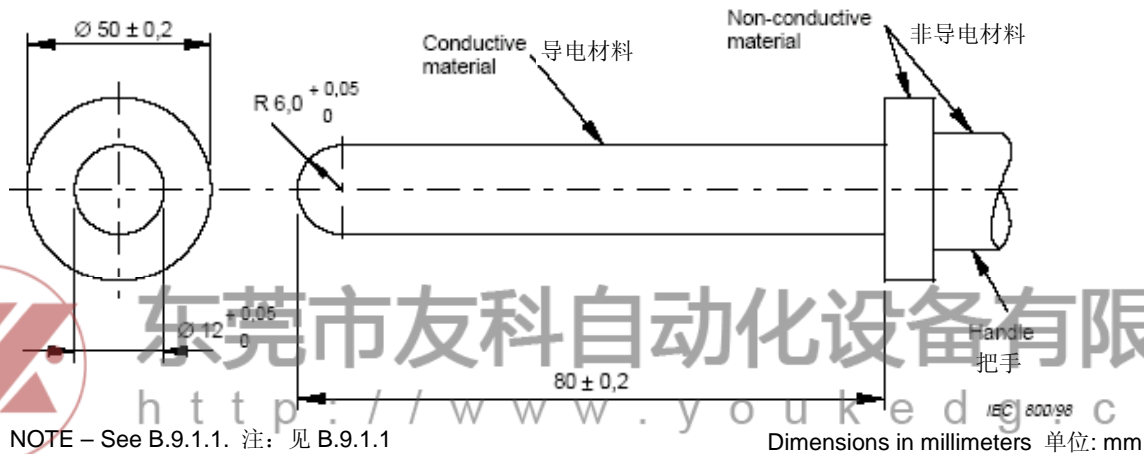


Figure B.1 – Test probe 图B.1 试验探头

B.14 Components 元器件

Add the following new subclause: 增加下列新的条款

B.14.12 Surge suppressors 电涌抑制器

If surge suppressors are connected between TNV CIRCUITS and other parts of the apparatus, the surge suppressors shall have a nominal d.c. spark-over voltage of at least 1,8 times the rated MAINS voltage of the apparatus. 如果在TNV电路与设备的其他零部件之间接有电涌抑制器, 则电涌抑制器的标称直流放电电压至少应为设备额定电源电压的1,8倍。

NOTE 1 – In Denmark the use of surge suppressors between the TELECOMMUNICATION NETWORK and conductive ACCESSIBLE parts or TERMINALS which are considered to be ACCESSIBLE, is allowed only for PERMANENTLY CONNECTED APPARATUS.

NOTE 2 – In Sweden and Norway, for CLASS I apparatus intended to be connected to the MAINS by means of a plug, surge suppressors may only be connected between TNV circuits and ACCESSIBLE parts if the apparatus has a marking stating that it must be connected to an earthed MAINS socket outlet

注1: 在丹麦, 对永久连接式设备只允许在通信网络与导电的可触及零部件或认为是可触及的端子之间使用电涌抑制器。

2: 在瑞典和挪威, 对预定用插头与电网电源连接的I类设备, 如果设备有标志, 说明设备必须与带接地的电源输出插座连接, 则只可以在TNV电路与可触及零部件之间接电涌抑制器。



Annex C (normative) 附录C

Band-pass filter for wide-band noise measurement (Extract of IEC 60268-1)

宽带噪声测量用带通滤波器 (摘自IEC 60268-1)

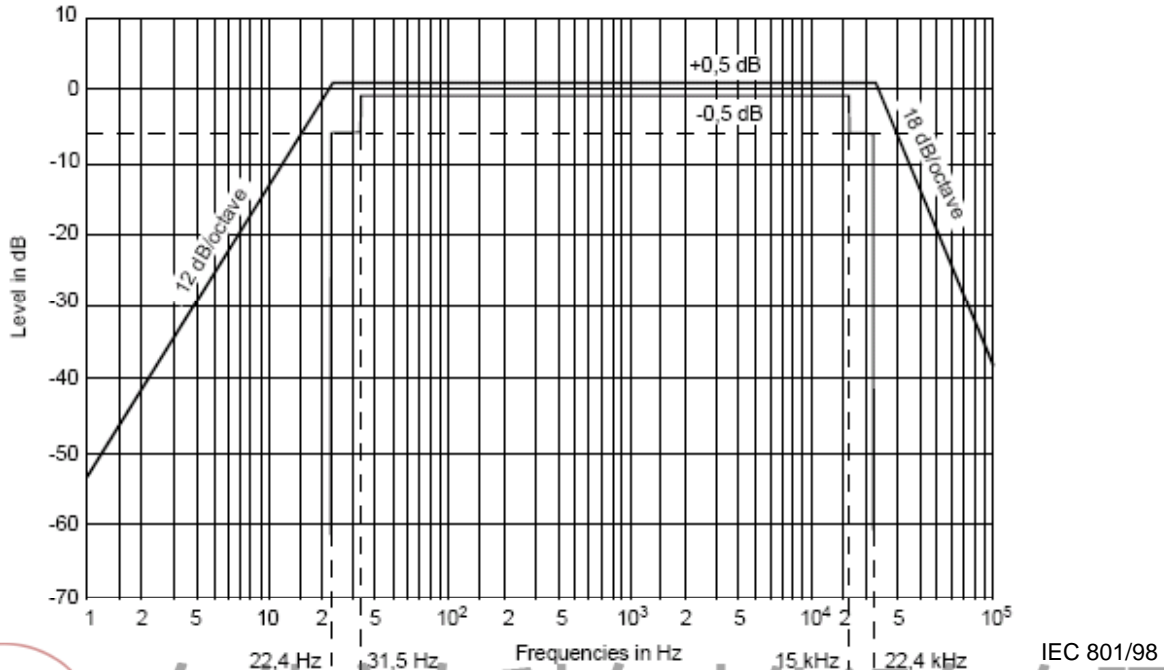


Figure C.1 – Band-pass filter for wide-band noise measurement (amplitude/frequency response limits, see below)

图 C.1 宽带噪声测量用带通滤波器 (幅度/频率响应限值, 见以下说明)

Wide-band measurement (see IEC 60268-1, subclause 6.1) 宽带测量 (见IEC 60268-1#6.1)

The filter shall be a band-pass filter having a frequency response within the limits shown in figure C.1.

A band-pass filter which has a substantially constant transmission factor between 22,4 Hz and 22,4 kHz, decreasing outside this frequency band at the rates specified for octave-band filters having mid-band frequencies of 31,5 Hz and 16 000 Hz specified in IEC 61260, has a response falling within the limits of this specification.

滤波器应是频率响应在图C1所示限值范围内的带通滤波器。

带通滤波器在22,4 Hz ~22,4 kHz之间具有大致不变的传输系数, 在该频带以外, 其衰减按GB/T3241规定的其中中心频率为31,5 Hz和16 000 Hz的倍频程带通滤波器所规定的衰减速率衰减, 其频率响应在本标准规定的限值范围内。

NOTE 1 – Care should be taken when there may be strong signals just above or below the band-limits since in this case the results will depend, to some degree, on the individual frequency response of the filter actually used.

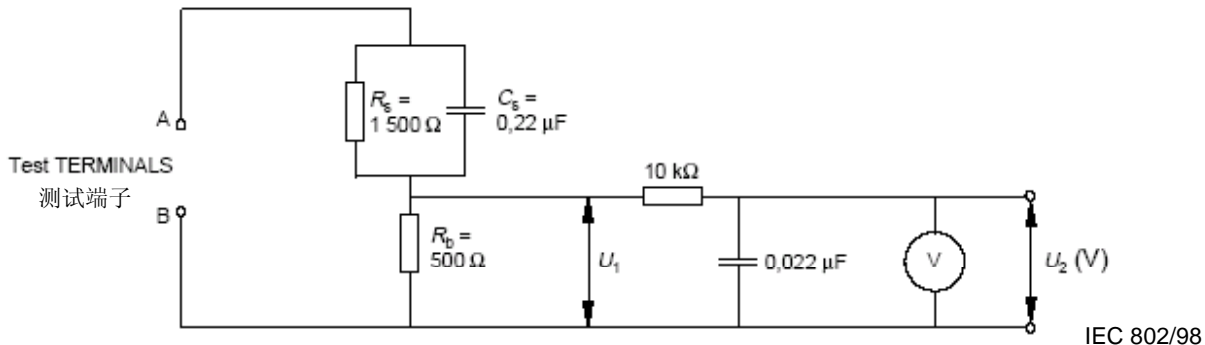
注1: 应注意的是, 当在高于或低于宽带极限处可能刚好有强信号, 在这种情况下, 测量结果在某种程度上将取决于实际使用的滤波器的逐个频率响应。

NOTE 2 – See 4.1.6. 注2: 见4.1.6。



Annex D (normative) 附录D

Measuring network for TOUCH CURRENTS 接触电流的测量网络



Resistance values in ohms (Ω) 阻值单位: 欧姆

V: Voltmeter or oscilloscope (r.m.s. or peak reading) 电压表或示波器 (有效值或峰值读数)

Input resistance 输入阻抗: $\geq 1 \text{ M}\Omega$

Input capacitance 输入容抗: $\geq 200 \text{ pF}$

Frequency range 频率范围: 15 Hz to 1 MHz and d.c. respectively 分别为15 Hz~1 MHz和直流

NOTE – Appropriate measures should be taken to obtain the correct value in case of non-sinusoidal waveforms.
注: 如果是非正弦波形, 应采用适当的措施, 以便得到正确的值。

The measuring instrument is calibrated by comparing the frequency factor of U_2 with the solid line in figure F.2 of IEC 60990 at various frequencies. A calibration curve is constructed showing the deviation of U_2 from the ideal curve as a function of frequency. 测量仪器通过将 U_2 的频率系数与GB/T12113中图2的实线在不同频率下进行比较来校准。划出表示 U_2 与理想曲线的偏差随频率变化的标准曲线。

TOUCH CURRENT = $U_2/500$ (peak value). 接触电流 = $U_2/500$ (峰值)

NOTE – See 9.1.1. 注: 见9.1.1

Figure D.1 – Measuring network for TOUCH CURRENTS according to IEC 60990 图D1 GB/T12113的接触电流的测量网络

Annex E (normative) 附录E (标准的附录)

Measurement of CLEARANCES and CREEPAGE DISTANCES 电气间隙和爬电距离的测量

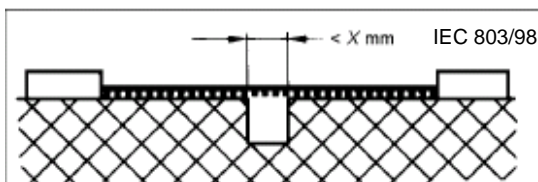
The methods of measuring and CLEARANCES and CREEPAGE DISTANCES which are specified in figures E.1 to E.10 are used in interpreting the requirements of this standard. 图E1到图E10所规定的电气间隙和爬电距离的测量方法是用来对本标准电气间隙和爬电距离的要求进行说明。

The minimum value of distance X is 0,25 mm for 13.3 and 1,0 mm for 13.2.

距离X的最小值对13.3为0,25 mm, 对13.2为1,0 mm。

However, if the requirement for the CLEARANCE associated with the concerned CREEPAGE DISTANCE is less than 3,0 mm, the value X is one-third of the specified CLEARANCE, but not less than 0,2 mm. 然而, 如果电气间隙 (伴有与其有关的爬电距离) 的要求小于3,0 mm, 则X的数值为该规定的电气间隙的1/3, 但不小于0,2 mm。

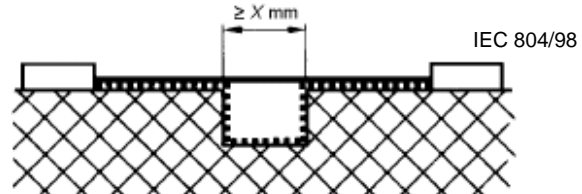
..... CREEPAGE DISTANCE 爬电距离 _____ CLEARANCE 电气间隙



Condition: Path under consideration includes a parallel or converging-sided groove of any depth with width less than X mm. 条件: 所要测量的通路包含有一条任意深度, 宽度小于 X mm, 槽壁平行或收缩的沟槽。

Rule: CLEARANCE and CREEPAGE DISTANCE are measured directly across the groove. 规则: 直接跨沟槽测量爬电距离和电气间隙。

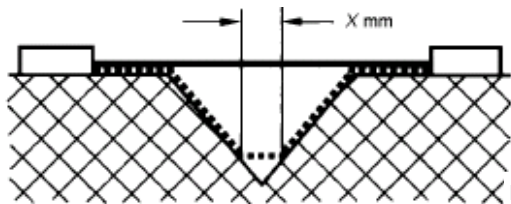
Figure E.1 – Narrow groove 图E1 窄沟槽



Condition: Path under consideration includes a parallelsided groove of any depth, and equal to or more than X mm wide. 条件: 所要测量的通路包含有一条任意深度, 宽度等于或大于 X mm, 槽壁平行的沟槽。

Rule: CLEARANCE is the "line-of-sight" distance, CREEPAGE DISTANCE path follows the contour of the groove. 规则: 电气间隙就是“视线”距离, 爬电距离的路径就是沿沟槽轮廓线伸展的通路。

Figure E.2 – Wide groove 图E2 宽沟槽

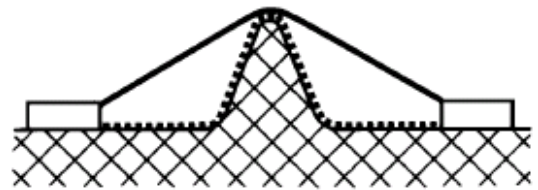


IEC 805/98

Condition: Path under consideration includes a V-shaped groove with internal angle of less than 80° and a width greater than X mm.
条件: 所要测量的通路包含有一条内角小于 80° 和宽度大于X mm的V型沟槽。

Rule: CLEARANCE is the "line-of-sight" distance. CREEPAGE DISTANCE path follows the contour of the groove but "short-circuits" the bottom of the groove by 1 mm (13.2) respectively 0,25 mm (13.3)
规则: 电气间隙就是“视线”距离。爬电距离就是沿沟槽轮廓线伸展的通路,但沟槽底部分别“短路”掉1 mm (13.2)或0,25 mm (13.3)。

Figure E.3 – V-shaped groove 图 E3 V型沟槽

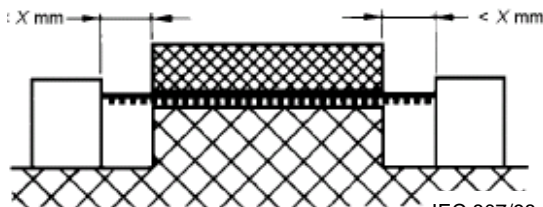


IEC 807/98

Condition: Path under consideration includes a rib.
条件: 所要测量的通路包含有一条肋条。

Rule: CLEARANCE is the shortest direct air path over the top of the rib. CREEPAGE DISTANCE path follows the contour of the rib. 规则: 电气间隙就是越过肋条顶部的最短直达空间通路。爬电距离的路径就是沿肋条轮廓线伸展的通路。

Figure E.4 – Rib 图 E4 肋条



IEC 807/98

Condition: Path under consideration includes an uncemented joint with grooves less than X mm wide on either side.
条件: 所要测量的通路包含有一条不粘合的接缝,而在其两侧各有一条宽度小于X mm的沟槽。

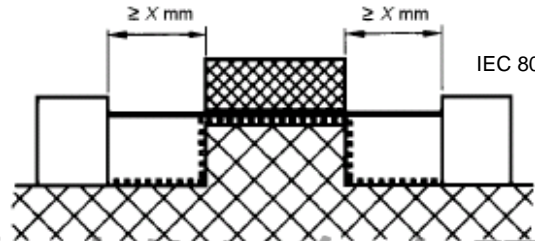
Rule: CREEPAGE DISTANCE and CLEARANCE path is the "line-of-sight" distance shown. 规则: 电气间隙和爬电距离就是如图所示的“视线”距离。

Figure E.5 – Uncemented joint with narrow groove 图 E5 带窄沟槽的未粘合接缝

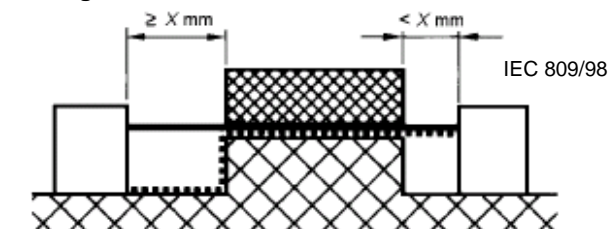
Condition: Path under consideration includes an uncemented joint with a groove equal to or more than X mm wide each side.
条件: 所要测量的通路包含一条不粘合的接缝,而在其两侧各有一条宽度等于或大于X mm的沟槽。

Rule: CLEARANCE is the "line-of-sight" distance. CREEPAGE DISTANCE path follows the contour of the groove. 规则: 电气间隙就是“视线”距离。爬电距离就是沿轮廓线伸展的通路

Figure E.6 – Uncemented joint with wide groove 图 E6 带宽沟槽的未粘合接缝



IEC 808/98

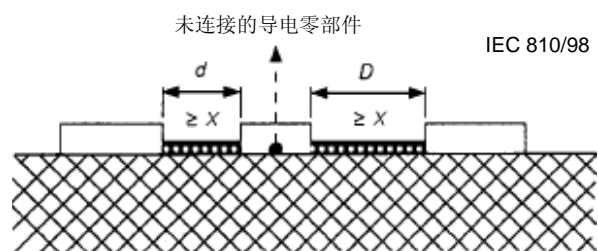


IEC 809/98

Condition: Path under consideration includes an uncemented joint with a groove on one side less than X mm wide and a groove on the other equal to or more than 1 mm wide.
条件: 所要测量的通路包含一条不粘合的接缝,而在其一侧有一条宽度小于X mm的沟槽,在另一侧有一条宽度等于或大于X mm的沟槽。

Rule: CLEARANCE and CREEPAGE DISTANCE paths are as shown in figure E.7. 规则: 电气间隙和爬电距离的通路如图E7所示。

Figure E.7 – Uncemented joint with narrow and wide grooves 图 E7 带窄沟槽和宽沟槽的未粘合接缝

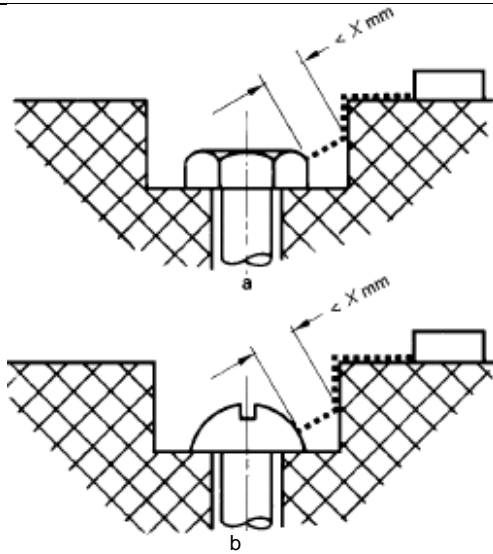


IEC 810/98

Condition: Insulation distance with intervening, unconnected conductive part. 条件: 中间插有不连接的导电零部件的绝缘距离。

Rule: CLEARANCE is the distance $d+D$, CREEPAGE DISTANCE is also $d+D$. Where the value of d or D is smaller than X it shall be considered as zero. 规则: 电气间隙就是距离 $d+D$ 。爬电距离也是距离 $d+D$ 。对 d 或 D 的数值小于 X 时,其数值应视为零。

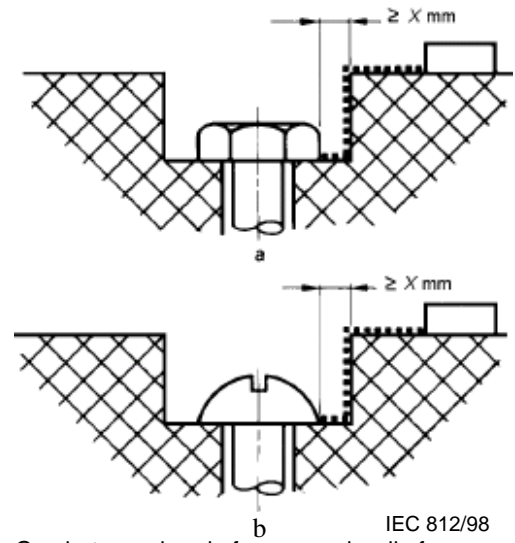
Figure E.8 – Intervening, unconnected conductive part 图 E8 插入中间的、不连接的导电零部件



IEC 811/98

Gap between head of screw and wall of recess too narrow to be taken into account. 螺钉头与凹槽槽壁之间的空隙太窄时不必考虑该空隙。

Figure E.9 – Narrow recess 图 E9 窄凹槽



IEC 812/98

Gap between head of screw and wall of recess wide enough to be taken into account. 螺钉头与凹槽槽壁之间的空隙足够宽时必须考虑该空隙。

Figure E.10 – Wide recess 图 E10 宽凹槽



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Annex F (normative) 附录F

Table of electrochemical potentials 电化学电位表

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	
锰, 锰合金	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
	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	
锌, 锌合金	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 锡/20 铁或钢镀锌	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			
铝	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				
钢镀锌	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					
铝锰合金	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						
低碳钢	0	0,05	0,1	0,15	0,25	0,35	0,4	0,45	0,6	0,65	0,7	0,75							
硬铝	0	0,05	0,1	0,2	0,3	0,35	0,4	0,55	0,6	0,66	0,7								
铅	0	0,05	0,1	0,2	0,3	0,35	0,4	0,55	0,6	0,66	0,7								
钢镀铬, 软焊料	0	0,05	0,15	0,25	0,3	0,35	0,5	0,55	0,6	0,65									
钢镀镍镀铬, 钢镀锡	0	0,1	0,2	0,25	0,3	0,45	0,5	0,55	0,6										
高铬不锈钢	0	0,1	0,15	0,2	0,35	0,4	0,45	0,5											
铜, 铜合金	0	0,05	0,1	0,25	0,3	0,35	0,4												
银焊料, 奥氏体不锈钢	0	0,05	0,2	0,25	0,3	0,35													
钢镀镍	0	0,15	0,2	0,25	0,3														
银	0	0,05	0,1	0,15															
铜镀银镀锡, 银合金	0	0,05	0,1																
碳	0	0,05																	
金, 铂	0																		



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NOTE 1 – 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.

NOTE 2 – See 15.2.

注1: 如果两种不同的金属接触所形成的电化学电位在约为0,6 V以下, 则由化学作用引起的腐蚀最小。表中列出了一些常用金属的接触所形成的电化学电位, 应避免使用分界线上面的组合。

2: 见15.2。



Annex G (normative) 附录G (标准的附录)

Flammability test methods 燃烧试验方法

NOTE – In Australia and New Zealand special national conditions apply which include tests based on reconciliation with the philosophy of IEC 60695 with respect to glow wire testing, needle flame testing, consequential testing and end product consequential testing. 注：在澳大利亚和新西兰，对包括基于和IEC 60695的原理相一致的试验在内的灼热丝试验、针焰试验、随后出现的试验和随后出现的产品试验采用国家特殊条件。

G.1 If no test specimens in accordance with IEC 60707, clause 4 are available, the following test methods may be applied. 如果不能提供符合GB/T11020-1998第4章规定的样品，则可以采用下列方法。

The test is made according to IEC 60695-2-2 on three specimens of end products as used in the apparatus. 用与设备中所用最终产品相同的三个样品，按GB/T5169.5的规定进行试验。

For the purpose of this standard, the following applies with regard to IEC 60695-2-2:

就本标准而言，GB/T5169.5要采用下列内容

Clause 7 – Initial measurements; not applicable 第7章 初始检测；不适用

Clause 8 – Test procedure 第8章 试验程序

– Subclause 8.2

The first sentence is replaced by the following: 第1句用下列内容代替

The test specimens are mounted in such a way as to simulate the conditions obtained when installed in the apparatus. 试验样品的安装应模拟其装配在设备中所处的状态。

– Subclause 8.4

Replace the third paragraph by the following: 第3段用下列内容代替

The test flame is applied to several points of the specimen, so that all critical areas are tested.

试验火焰施加到样品的几个点上，以使所有关键区域都经受到试验。

Clause 9 – Observations and measurements. 第9章 观察和测量

– Subclause 9.2

The second paragraph is replaced by the following: 第2段用下列内容代替

Duration of the burning denotes the time interval from the moment the test flame is removed until any flame has been extinguished. 燃烧持续时间是指出从移开试验火焰的瞬间一直到任何火焰熄灭的间隔时间。

G.1.1 If flammability category FV 0 according to IEC 60707 is required, in addition, the following applies with regard to IEC 60695-2-2. 如果要求符合GB/T11020的FV0级，则GB/T5169.5还要采用下列内容。

Clause 5 – Severities 第5章 严酷等级

The values of duration of application of the test flame are as follows: 施加试验火焰的时间如下

The test flame is applied for 10 s. If a self-sustaining flame does not last longer than 15 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 15 s, the test flame is then applied for 2 min at the same point or at any other point. 施加试验火焰10 s，如果样品自身维持火焰不超过15 s，则在相同部位或任何其他部位再施加试验火焰1 min，如果样品自身维持火焰仍不超过15 s，则在相同部位或任何其他部位再施加试验火焰2 min。

Clause 10 – Evaluation of test results 第10章 试验结果评定

The existing text is replaced by the following: 现行条文用下列内容代替

After the first application of the test flame, the test specimens shall not be consumed completely. After any application of the test flame, the duration of the burning of any specimen shall not exceed 15 s, while the average burning time shall not exceed 10 s. The tissue paper shall not ignite and the board shall not scorch. 第一次施加试验火焰后，试验样品不应完全燃尽。任一次施加试验火焰后，任何样品的燃烧持续时间不应超过15 s，且平均燃烧时间不超过10 s，薄纸既不起燃，白松木板也不炭化。

G.1.2 If flammability category FV 1 according to IEC 60707 is required, in addition, the following applies with regard to IEC 60695-2-2. 如果要求符合GB/T11020的FV1级，则GB/T5169.5还要采用下列内容。

Clause 5 – Severities 第5章 严酷等级

The values of duration of application of the test flame are as follows: 施加试验火焰的时间如下

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.

施加试验火焰10 s，如果样品自身维持火焰不超过30 s，则在相同部位或任何其他部位再施加试验火焰1 min，如果样品自身维持火焰仍不超过30s，则在相同部位或任何其他部位再施加试验火焰2 min。

Clause 6 – Preconditioning (only applicable to components of 14.4.1) 第6章 预处理（仅适用于14.4.1的元件）



The existing text is replaced by: 现行条文用下列内容代替

The specimens are stored for 2 h in an oven at a temperature of (100 ± 2) °C.

样品在温度为 (100 ± 2) °C的烘箱中放置2 h。

Clause 10 – Evaluation of test results 第10章 试验结果评定

The existing text is replaced by the following: 现行条文用下列内容代替

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.

第一次施加试验火焰后, 样品不应完全燃尽。任一次施加试验火焰后, 自身维持火焰应在30 s内熄灭, 薄纸既不起燃, 白松木板也不炭化。

G.1.3 If flammability category FV 2 according to IEC 60707 is required, in addition, the following applies with regard to IEC 60695-2-2. 此外, 如果要求符合GB/T11020的FV2级, 则还要采用GB/T5169.5的下列内容。

Clause 5 – Severities 第5章 严酷等级

The values of duration of application of the test flame are as follows: 施加试验火焰的时间如下

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.

施加试验火焰10 s, 如果样品自身维持火焰不超过30 s, 则在相同部位或任何其他部位再施加试验火焰1 min,

如果样品自身维持火焰仍不超过30s, 则在相同部位或任何其他部位再施加试验火焰2 min。

Clause 10 – Evaluation of test results 第10章 试验结果评定

The existing text is replaced by the following: 现行条文用下列内容代替

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.

第一次施加试验火焰后, 样品不应完全燃尽。任一次施加试验火焰后, 自身维持火焰应在30 s内熄灭。

G.1.4 If flammability category FH 3-40 mm/min according to IEC 60707 is required, the following applies with regard to IEC 60695-2-2. 如果要求符合GB/T11020的FH 3-40 mm/min级, 则采用GB/T5169.5的下列内容。

Irrespective of the actual thickness in the apparatus the test is made on test specimens with a thickness of 3 mm. 使用厚度为3 mm的样品进行试验, 不考虑其在设备中的实际厚度。

NOTE – Test is under consideration. 注: 试验正在考虑中。

G.2 Compliance of cables and insulation of wires is checked according to IEC 60695-2-2.

For the purpose of this standard, the following applies with regard to IEC 60695-2-2.

电缆和绝缘导线是否合格按GB/T5169.5的规定来检验。

就本标准而言, 采用GB/T5169.5的下列内容:

Clause 5 – Severities 第5章 严酷等级

The values of duration of the application of the test flame are as follows: 施加试验火焰的时间如下

– first specimen 第一个样品: 10 s 第1个样品

– second specimen 第二个样品: 60 s

– third specimen 第三个样品: 120 s

Clause 7 – Initial measurements: not applicable 第7章 初始检测: 不适用。

Clause 8 – Test procedure 第8章 试验程序

– Add the following to 8.4: 8.4增加下列内容

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. 支撑起燃烧器, 使其轴线与垂直方向成45°。电缆或导线与垂直方向也保持45°, 而其轴线所在垂直平面与燃烧器所在垂直平面成正交。

– Subclause 8.5 is replaced by the following: 8.5用下列内容代替

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. 设备中所使用的各种类型的电缆或导线, 均要取3个样品进行试验。例如: 有金属屏蔽和套管的电缆。

Clause 9 – Observations and measurements 第9章 观察和测量

– Subclause 9.1 does not apply. 9.1不适用。

– Subclause 9.2

The second paragraph is replaced by the following: 第2段用下列内容代替

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Duration of the burning denotes the time interval from the moment the test flame is removed until any flame has extinguished. 燃烧持续时间是指从试验火焰移开瞬间一直到任何火焰熄灭的间隔时间。

Clause 10 – Evaluation of the results 第10章 试验结果评定

The existing text is replaced by the following: 现行条文用下列内容代替

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. 试验期间, 绝缘材料的任何燃烧应稳定且无明显的蔓延。在试验火焰移开后, 任何火焰应在30 s内自行熄灭。

Annex N (informative) 附录N (提示的附录)

ROUTINE TEST 例行试验

INTRODUCTION 引言

The tests given in this annex are intended to reveal, as far as safety is concerned, unacceptable variations in material or manufacture. These tests do not impair the properties and the reliability of the apparatus, and should be made by the manufacturer on each apparatus during or at the end of the production.

本附录规定的试验是要就有关安全要求, 检查在材料上或制造上是否存在不能允许的不一致。这些试验不损害设备的性能和可靠性, 这些试验应由制造厂商在生产过程或生产线末端对每台设备进行。

In general, more tests, such as repetition of TYPE TESTS and sampling tests, have to be made by the manufacturer to ensure that every apparatus is in conformity with the sample that withstood the TYPE TEST of this standard, according to experience gained by the apparatus manufacturer. 通常, 根据设备制造厂商的经验, 制造厂商应该进行更多的试验, 例如重复型式试验和抽样试验, 以确保每一台设备都能与经受住本标准规定的型式试验的样品保持一致。

The manufacturer may use a test procedure which is better suited to his production arrangements and may make the tests at an appropriate stage during production, provided it can be proved that apparatus which withstand the tests carried out by the manufacturer provide at least the same degree of safety as apparatus that withstand the tests specified in this annex. 制造厂商可以采用一种更适合其生产计划的试验程序, 而且可以在生产过程适当的阶段进行试验, 只要能证明经受住由制造厂商所进行的试验的设备与经受住本附录规定的试验的设备至少具有相同的安全水平即可。

NOTE – Generally, an appropriate quality assurance system should be employed, for example according to the ISO 9000 series [15]. 注: 通常应使用一个适当的质量保证体系, 例如符合GB/T19000系列标准的质量保证体系。

The following rules are given as an example for ROUTINE TEST: 下面给出一些规则, 作为例行试验的一个例子:

N.1 Tests during the production process 生产过程中的试验

N.1.1 Correct polarity and connection of components or subassemblies 元器件或组件的正确极性和连接

If incorrect polarity or connection of components or subassemblies might result in a safety hazard, the correct polarity and connection of these components or subassemblies should be checked by measurement or inspection. 如果元器件或组件的极性或不正确可能危及安全, 则应通过测量或检查对这些元器件或组件的极性和连接进行检验。

N.1.2 Correct values of components 元器件值的正确性

If incorrect values of components might result in a safety hazard, the correct value of these components should be checked by measurement or inspection. 如果元器件值不正确可能危及安全, 则应通过测量或检查来检验元器件值是否正确。

N.1.3 Protective earth connection of screens and metal barriers 屏蔽物和金属挡板的保护接地连接

For CLASS I apparatus with a screen or metal barrier (see 8.5) between HAZARDOUS LIVE parts and TERMINALS regarded as ACCESSIBLE (see 8.4) or ACCESSIBLE conductive parts respectively, the continuity of the protective earth connection should be checked as late as possible during the production process between the screen or metal barrier and 对在危险带电零部件与认为是可触及的端子(见8.4)或可触及导电零部件之间分别有屏蔽物或金属挡板(见8.5)的I类设备, 在生产过程中, 该屏蔽物或金属挡板与下列部件之间的保护接地连续性应尽可能晚地进行检查:

- the protective earth contact of the MAINS plug or appliance inlet, or 电源插头或器具输入插座的保护接地插销; 或
- the PROTECTIVE EARTH TERMINAL in case of a PERMANENTLY CONNECTED APPARATUS. 永久性连接式设备的保护接地端子。

The test current applied for 1 s to 4 s should be in the order of 10 A a.c., derived from a source having a no-load voltage not exceeding 12 V. 施加交流10A的试验电流1 s~ 4 s, 供电电源的空载电压不超过12V。



The measured resistance should not exceed 测得的电阻值不应超过:

- 0,1 Ω for apparatus with a detachable power supply cord, 带有可拆卸电源线的设备为0,1 Ω ,
- 0,2 Ω for apparatus with a non-detachable power supply cord. 带有不可拆卸电源线的设备为0,2 Ω。

NOTE – Care should be taken that the contact resistance between the tip of the measuring probe and the metal parts under test does not influence the test results. 注: 应注意测量探头端部与被试金属零部件之间的接触电阻不应影响测量结果。

N.1.4 Correct position of internal wiring 内部导线的正确位置

If incorrect position of internal wiring might impair the safety, the correct position of internal wiring should be checked by inspection. 如果内部导线的位置不正确可能影响安全,则应通过检查来检验内部导线的位置是否正确。

N.1.5 Correct fit of internal plug connections 内部插头连接件的正确位置

If incorrect fit of internal plug connections might impair the safety, the correct fit of internal plug connections should be checked by inspection or manual test.

如果内部插头连接件的不正确安装可能影响安全, 则应通过检查或手动试验来检验内部插头连接件是否正确安装。

N.1.6 Safety relevant markings inside the apparatus 设备内部有关安全性的标记

The legibility of markings relevant to safety inside the apparatus, for example with regard to fuse-links, should be checked by inspection. 应通过检查来检验设备内部与安全有关的标记, 例如有关熔断体的标记的清晰可辨度。

N.1.7 Correct mounting of mechanical parts 机械零部件的正确安装

If incorrect mounting of mechanical parts might impair the safety, the correct mounting should be checked by inspection or manual test.

如果机械零部件的安装不正确可能影响安全, 则应通过检查或手动试验来检验是否正确安装。

N.2 Tests at the end of the production process 生产线末端试验

The following tests should be made on the apparatus when completely assembled and just before packing.

下列试验应在设备已组装完毕且在包装前进行。

N.2.1 Dielectric strength test 抗电强度试验

The insulation of the apparatus should be checked by the following tests. In general, these tests are considered to be sufficient. 设备的绝缘应通过下列的试验来进行检验, 通常, 这些试验被认为是足够的。

An a.c. test voltage of substantially sine-wave form, having MAINS frequency, or a d.c. test voltage or a combination of both with a peak value specified in table N.1, is applied between the MAINS supply TERMINALS connected in parallel and: 并联在一起的电源端子与由于不正确安装当一旦绝缘发生故障时可能使其变成带电的下列部件之间分别施加与电源频率相同的正弦波交流试验电压或直流试验电压, 或者符合表N.1规定峰值的这二者组合的试验电压:

- TERMINALS regarded as ACCESSIBLE (see 8.4), and 被认为是可触及的端子 (见8.4); 和
- ACCESSIBLE conductive parts respectively, 可触及导电零部件

which may become HAZARDOUS LIVE in the event of an insulation fault as a result of incorrect assembly.

NOTE 1 – TERMINALS regarded as ACCESSIBLE and ACCESSIBLE conductive parts may be connected together during the dielectric strength test. 注1: 在抗电强度试验时, 认为可触及的端子和可触导电零部件可以连接在一起。

Table N.1 – Test voltage 表N1 试验电压

Application of test voltage 试验电压的施加部位	Test voltage V (peak) a.c. or d.c. 试验电压, 交流V (峰值)或直流V	
	Rated MAINS voltage 额定电源电压 ≤150	Rated MAINS voltage 额定电源电压 >150
BASIC INSULATION 基本绝缘	1 130 (800 r.m.s. 有效值)	2 120 (1 500 r.m.s.)
DOUBLE or REINFORCED INSULATION 双重或加强绝缘	2 120 (1 500 r.m.s.)	3 540 (2 500 r.m.s.)

Before the test voltage is applied, intimate contact should be made with the specimen.

试验电压施加之前, 应将样品完全连接好。

Initially, not more than half of the prescribed test voltage is applied, then it is raised with a steepness not exceeding 1 560 V/ms to the full value which is held for 1 s to 4 s. 一开始, 施加不大于规定值一半的试验电压, 然后以不超过1 560 V/ms的速率将试验电压升高到全值, 保持1 s ~4 s。

NOTE 2 – A steepness of 1 560 V/ms corresponds to the steepness of a sine-wave with a MAINS frequency of 60 Hz.

注2: 1 560 V/ms的速率对应于电网电源频率为60 Hz的正弦波速率。

During the test, MAINS switches and functional switches, if any, CONDUCTIVELY CONNECTED TO THE MAINS, should be in the on-position and it should be secured by suitable means so that the test voltage is completely effective.

No flash-over or breakdown should occur during the test. The test voltage source should be provided with a current sensing (over-current) device which, when activated, gives an indication that the test has been failed.



The test voltage source should still deliver the prescribed voltage until current tripping occurs.

试验时与电网电源导电连接的电源开关和功能开关（如果有）应置于通位，而且应用适当的方法使通位固定住，以便使试验电压完全有效。

NOTE 3 – The tripping current should not exceed 100 mA. 注3：切断电流应不超过100 mA。

NOTE 4 – Tripping of the current sensing device is regarded as a flash-over or breakdown.

注4：电流敏感装置断开被认为有飞弧或击穿。

N.2.2 Protective earth connection 保护接地连接

For CLASS I apparatus, the continuity of the protective earth connection should be checked between the protective earth contact of the MAINS plug or appliance inlet, or the PROTECTIVE EARTH TERMINAL in case of a PERMANENTLY CONNECTED APPARATUS, and 对I类设备，电源插头或器具输入插座的保护接地插销，或永久连接式设备的保护接地端子与下列部件之间的保护接地连接的连续性应分别进行检查：

- the ACCESSIBLE conductive parts, including TERMINALS regarded as ACCESSIBLE (see 8.4), which should be connected to the PROTECTIVE EARTH TERMINAL, and 与保护接地端子连接的可触及导电零部件，包括被认为是可触及的端子（见8.4）；以及
- the protective earth contact of socket-outlets respectively, if provided to deliver power to other apparatus. 向其他设备供电的输出插座的保护接地接触件。

The test current applied for 1 s to 4 s should be in the order of 10 A a.c., derived from a source having a no-load voltage not exceeding 12 V. 施加交流10A的试验电流1 s~ 4 s，供电电源的空载电压不超过12V。

The measured resistance should not exceed测得的电阻值不应超过：

- 0,1 Ω for apparatus with a detachable power supply cord, 带有可拆卸电源线的设备为0,1 Ω ,
- 0,2 Ω for apparatus with a non-detachable power supply cord. 带有不可拆卸电源线的设备为0,2 Ω 。

NOTE – Care should be taken that the contact resistance between the tip of the measuring probe and the conductive parts under test does not influence the test results. 注：应注意测量探头端部与被试导电零部件之间的接触电阻不要影响测量结果。

N.2.3 Safety relevant markings on the outside of the apparatus 设备外部有关安全性的标记

The legibility of safety relevant markings on the outside of the apparatus, for example with regard to the supply voltage, should be checked by inspection.

应通过检查来检验设备外部与安全有关的标记，例如有关电源电压标记的清晰可辨度。

Annex P (informative) 附录P

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GB 8898-2001 《音频、视频及类似电子设备 安全要求》 第1号修改单

本修改单经中国国家标准化管理委员会于2001年11月26日以国标委高新函[2002]66号文批准,自2003年1月1日起实施。

正文第 18.2.3 条中(第 54 面倒数第 15 行)

“显像管屏面的撞击点距显像管有用区的边缘至少应为 20cm” 的“cm” 改为“mm”。



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