

INTERNATIONAL STANDARD

IEC 60950-1

Second edition
2005-12

Information technology equipment – Safety –

Part 1: General requirements

© IEC 2005 Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CONTENTS

FOREWORD.....	15
INTRODUCTION.....	19
0 Principles of safety	19
0.1 General principles of safety	19
0.2 Hazards	21
0.3 Materials and components	29
1 General	31
1.1 Scope.....	31
1.2 Definitions	35
1.3 General requirements	67
1.4 General conditions for tests	69
1.5 Components	79
1.6 Power interface	93
1.7 Markings and instructions	93
2 Protection from hazards.....	111
2.1 Protection from electric shock and energy hazards	111
2.2 SELV circuits.....	129
2.3 TNV circuits.....	133
2.4 Limited current circuits.....	143
2.5 Limited power sources	145
2.6 Provisions for earthing and bonding	149
2.7 Overcurrent and earth fault protection in primary circuits	165
2.8 Safety interlocks	171
2.9 Electrical insulation	177
2.10 Clearances, creepage distances and distances through insulation	187
3 Wiring, connections and supply.....	243
3.1 General.....	243
3.2 Connection to a mains supply	249
3.3 Wiring terminals for connection of external conductors	263
3.4 Disconnection from the mains supply	269
3.5 Interconnection of equipment	275
4 Physical requirements	279
4.1 Stability.....	279
4.2 Mechanical strength.....	281
4.3 Design and construction	289
4.4 Protection against hazardous moving parts	307
4.5 Thermal requirements.....	309
4.6 Openings in enclosures	317
4.7 Resistance to fire.....	331
5 Electrical requirements and simulated abnormal conditions	349
5.1 Touch current and protective conductor current.....	349
5.2 Electric strength	367
5.3 Abnormal operating and fault conditions.....	375

6	Connection to telecommunication networks	385
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment.....	385
6.2	Protection of equipment users from overvoltages on telecommunication networks	389
6.3	Protection of the telecommunication wiring system from overheating	395
7	Connection to cable distribution systems.....	397
7.1	General.....	397
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment.....	397
7.3	Protection of equipment users from overvoltages on the cable distribution system.....	397
7.4	Insulation between primary circuits and cable distribution systems.....	399
Annex A (normative)	Tests for resistance to heat and fire	403
Annex B (normative)	Motor tests under abnormal conditions	409
Annex C (normative)	Transformers.....	421
Annex D (normative)	Measuring instruments for touch current tests	429
Annex E (normative)	Temperature rise of a winding.....	433
Annex F (normative)	Measurement of clearances and creepage distances	435
Annex G (normative)	Alternative method for determining minimum clearances	451
Annex H (normative)	Ionizing radiation	467
Annex J (normative)	Table of electrochemical potentials (see 2.6.5.6).....	469
Annex K (normative)	Thermal controls.....	471
Annex L (normative)	Normal load conditions for some types of electrical business equipment	475
Annex M (normative)	Criteria for telephone ringing signals.....	479
Annex N (normative)	Impulse test generators	489
Annex P (normative)	Normative references.....	493
Annex Q (normative)	Voltage dependent resistors (VDRs)	501
Annex R (informative)	Examples of requirements for quality control programmes	503
Annex S (informative)	Procedure for impulse testing.....	509
Annex T (informative)	Guidance on protection against ingress of water	513
Annex U (normative)	Insulated winding wires for use without interleaved insulation.....	517
Annex V (normative)	AC power distribution systems	523
Annex W (informative)	Summation of touch currents.....	537
Annex X (informative)	Maximum heating effect in transformer tests.....	543
Annex Y (normative)	Ultraviolet light conditioning test.....	547
Annex Z (informative)	Overvoltage categories (see 2.10.3.2 and Clause G.2).....	549
Annex AA (normative)	Mandrel test (see 2.10.5.8).....	551
Annex BB (informative)	Changes in the second edition	557

Bibliography	563
Index	589
Figure 2A – Test finger	115
Figure 2B – Test pin	117
Figure 2C – Test probe	117
Figure 2D - Accessibility of internal conductive parts	119
Figure 2E – Voltages in SELV circuits under single fault conditions.....	131
Figure 2F – Maximum voltages permitted after a single fault.....	135
Figure 2G – Test generator.....	143
Figure 2H – Examples of application of insulation.....	185
Figure 2J – Thermal ageing time	237
Figure 2K – Abrasion resistance test for coating layers.....	239
Figure 4A – Impact test using a steel ball	285
Figure 4B – Examples of cross-sections of designs of openings preventing vertical access.....	319
Figure 4C – Examples of louvre design	319
Figure 4D – Enclosure openings.....	321
Figure 4E – Typical bottom of a fire enclosure for partially enclosed component or assembly.....	323
Figure 4F – Baffle plate construction	325
Figure 5A – Test circuit for touch current of single-phase equipment on a star TN or TT power supply system	353
Figure 5B – Test circuit for touch current of three-phase equipment on a star TN or TT power supply system	353
Figure 6A – Test for separation between a telecommunication network and earth.....	389
Figure 6B – Application points of test voltage	391
Figure B.1 – Determination of arithmetic average temperature	411
Figure C.1 – Determination of arithmetic average temperature.....	423
Figure D.1 – Measuring instrument.....	429
Figure D.2 – Alternative measuring instrument	431
Figure F.1 – Narrow groove	437
Figure F.2 – Wide groove.....	437
Figure F.3 – V-shaped groove	437
Figure F.4 – Rib.....	437
Figure F.5 – Uncemented joint with narrow groove	439
Figure F.6 – Uncemented joint with wide groove.....	439
Figure F.7 – Uncemented joint with narrow and wide grooves	439
Figure F.8 – Narrow recess.....	441
Figure F.9 – Wide recess	441
Figure F.10 – Coating around terminals.....	443
Figure F.11 – Coating over printed wiring	443

Figure F.12 – Measurements through openings in enclosures	445
Figure F.13 – Intervening, unconnected conductive part	445
Figure F.14 – Solid insulating material.....	447
Figure F.15 – Thin sheet insulating material	447
Figure F.16 – Cemented joints in multi-layer printed board.....	447
Figure F.17 – Component filled with insulating compound	449
Figure F.18 – Partitioned bobbin	449
Figure M.1 – Definition of ringing period and cadence cycle	481
Figure M.2 – I_{TS1} limit curve for cadenced ringing signal	483
Figure M.3 – Peak and peak-to-peak currents.....	483
Figure M.4 – Ringing voltage trip criteria	487
Figure N.1 – ITU-T impulse test generator circuit.....	489
Figure N.2 – IEC 60065 impulse test generator circuit	491
Figure S.1 – Waveform on insulation without surge suppressors and no breakdown	509
Figure S.2 – Waveforms on insulation during breakdown without surge suppressors	511
Figure S.3 – Waveforms on insulation with surge suppressors in operation	511
Figure S.4 – Waveform on short-circuited surge suppressor and insulation	511
Figure V.1 – Examples of TN-S power distribution systems.....	527
Figure V.2 – Example of TN-C-S power distribution system.....	529
Figure V.3 – Example of TN-C power distribution system	529
Figure V.4 – Example of single-phase, three-wire TN-C power distribution system	531
Figure V.5 – Example of three line and neutral TT power distribution system.....	531
Figure V.6 – Example of three line TT power distribution system.....	533
Figure V.7 – Example of three line (and neutral) IT power distribution system	533
Figure V.8 – Example of three line IT power distribution system.....	535
Figure W.1 – Touch current from a floating circuit.....	537
Figure W.2 – Touch current from an earthed circuit	539
Figure W.3 – Summation of touch currents in a PABX.....	539
Figure AA.1 – Mandrel	551
Figure AA.2 – Initial position of mandrel	553
Figure AA.3 – Final position of mandrel	553
Table 1A – Voltage ranges of SELV and TNV circuits	51
Table 1B – Equivalence of flammability classes	59
Table 1C – Capacitor ratings according to IEC 60384-14	83
Table 1D – Informative examples of application of capacitors	85
Table 2A – Distance through insulation of internal wiring	121
Table 2B – Limits for power sources without an overcurrent protective device	147
Table 2C – Limits for power sources with an overcurrent protective device.....	147

Table 2D – Minimum size of protective bonding conductors	155
Table 2E – Test duration, a.c. mains supplies.....	157
Table 2F – Informative examples of protective devices in single-phase equipment or subassemblies.....	169
Table 2G – Informative examples of protective devices in three-phase equipment	169
Table 2H – Examples of application of insulation	181
Table 2J – AC mains transient voltages.....	197
Table 2K – Minimum clearances for insulation in primary circuits and between primary and secondary circuits	199
Table 2L – Additional clearances in primary circuits.....	201
Table 2M – Minimum clearances in secondary circuits	203
Table 2N – Minimum creepage distances	213
Table 2P – Tests for insulation in non-separable layers	221
Table 2Q – Minimum separation distances for coated printed boards	231
Table 2R – Insulation in printed boards	233
Table 3A – Sizes of cables and conduits for equipment having a rated current not exceeding 16 A.....	253
Table 3B – Sizes of conductors	257
Table 3C – Physical tests on power supply cords	261
Table 3D – Range of conductor sizes to be accepted by terminals	265
Table 3E – Sizes of terminals for mains supply conductors and protective earthing conductors	267
Table 4A – Minimum property retention limits after UV exposure.....	301
Table 4B – Temperature limits, materials and components.....	313
Table 4C – Touch temperature limits	315
Table 4D – Size and spacing of openings in metal bottoms of fire enclosures.....	327
Table 4E – Summary of material flammability requirements	347
Table 5A – Maximum current.....	357
Table 5B – Test voltages for electric strength tests based on peak working voltages Part 1..	371
Table 5B – Test voltages for electric strength tests based on peak working voltages Part 2..	373
Table 5C – Test voltages for electric strength tests based on required withstand voltages.	375
Table 5D – Temperature limits for overload conditions.....	383
Table B.1 – Temperature limits for motor windings (except for running overload test)	411
Table B.2 – Permitted temperature limits for running overload tests	413
Table C.1 – Temperature limits for transformer windings.....	423
Table F.1 – Value of X	435
Table G.1 – AC mains transient voltages	453

Table G.2 – Minimum clearances up to 2 000 m above sea level.....	463
Table J.1 – Electrochemical potentials (V).....	469
Table N.1 – Component values for Figures N.1 and N.2.....	491
Table R.1 – Rules for sampling and inspection – coated printed boards	505
Table R.2 – Rules for sampling and inspection – reduced clearances.....	507
Table T.1 – Extract from IEC 60529	515
Table U.1 – Mandrel diameter	519
Table U.2 – Oven temperature	519
Table X.1 – Test steps	545
Table Z.1 – Overvoltage categories.....	549

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INFORMATION TECHNOLOGY EQUIPMENT – SAFETY –

Part 1: General requirements

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60950-1 has been prepared by IEC technical committee 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

This second edition of IEC 60950-1 cancels and replaces the first edition of IEC 60950-1, issued in 2001, and constitutes a technical revision. The principal changes in this edition as compared with the first edition of IEC 60950-1 are given in Annex BB, including a list of changed subclause, table and figure numbers.

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

FDIS	Report on voting
108/135A/FDIS	108/147/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.

IEC 60950-1 includes the basic requirements for the safety of information technology equipment.

Additional parts of IEC 60950-1 will cover specific safety requirements for information technology equipment having limited applications or having special features as follows:

- Part 21: Remote feeding (published);
- Part 22: Equipment installed outdoors (planned);
- Part 23: Large data storage equipment (planned);

Except for notes, all text within a normative figure, or in a box under a normative table, is also normative. Text with a superscript reference is linked to a particular item in the table. Other text in a box under a table applies to the whole table.

Informative annexes and text beginning with the word "NOTE" are not normative. They are provided only to give additional information.

"Country" notes are also informative but call attention to requirements that are normative in those countries.

In this standard, the following print types are used:

- Requirements proper and normative annexes: roman type.
- Compliance statements and test specifications: italic type.
- Notes in the text and in tables: smaller roman type.
- Terms that are defined in 1.2: SMALL CAPITALS.

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

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

INTRODUCTION

0 Principles of safety

The following principles have been adopted by technical committee 108 in the development of this standard.

These principles do not cover performance or functional characteristics of equipment.

Words printed in SMALL CAPITALS are terms that are defined in 1.2 of this standard.

0.1 General principles of safety

It is essential that designers understand the underlying principles of safety requirements in order that they can engineer safe equipment.

These principles are not an alternative to the detailed requirements of this standard, but are intended to provide designers with an appreciation of the basis of these requirements. Where the equipment involves technologies and materials or methods of construction not specifically covered, the design of the equipment should provide a level of safety not less than those described in these principles of safety.

Designers shall take into account not only normal operating conditions of the equipment but also likely fault conditions, consequential faults, foreseeable misuse and external influences such as temperature, altitude, pollution, moisture, overvoltages on the MAINS SUPPLY and overvoltages on a TELECOMMUNICATION NETWORK or a CABLE DISTRIBUTION SYSTEM. Dimensioning of insulation spacings should take account of possible reductions by manufacturing tolerances, or where deformation could occur due to handling, shock and vibration likely to be encountered during manufacture, transport and normal use.

The following priorities should be observed in determining what design measures to adopt:

- where possible, specify design criteria that will eliminate, reduce or guard against hazards;
- where the above is not practicable because the functioning of the equipment would be impaired, specify the use of protective means independent of the equipment, such as personal protective equipment (which is not specified in this standard);
- where neither of the above measures is practicable, or in addition to those measures, specify the provision of markings and instructions regarding the residual risks.

There are two types of persons whose safety needs to be considered, USERS (or OPERATORS) and SERVICE PERSONS.

USER is the term applied to all persons other than SERVICE PERSONS. Requirements for protection should assume that USERS are not trained to identify hazards, but will not intentionally create a hazardous situation. Consequently, the requirements will provide protection for cleaners and casual visitors as well as the assigned USERS. In general, USERS

should not have access to hazardous parts, and to this end, such parts should only be in SERVICE ACCESS AREAS or in equipment located in RESTRICTED ACCESS LOCATIONS.

When USERS are admitted to RESTRICTED ACCESS LOCATIONS they shall be suitably instructed.

SERVICE PERSONS are expected to use their training and skill to avoid possible injury to themselves and others due to obvious hazards that exist in SERVICE ACCESS AREAS of the equipment or on equipment located in RESTRICTED ACCESS LOCATIONS. However, SERVICE PERSONS should be protected against unexpected hazards. This can be done by, for example, locating parts that need to be accessible for servicing away from electrical and mechanical hazards, providing shields to avoid accidental contact with hazardous parts, and providing labels or instructions to warn personnel about any residual risk.

Information about potential hazards can be marked on the equipment or provided with the equipment, depending on the likelihood and severity of injury, or made available for SERVICE PERSONS. In general, USERS shall not be exposed to hazards likely to cause injury, and information provided for USERS should primarily aim at avoiding misuse and situations likely to create hazards, such as connection to the wrong power source and replacement of fuses by incorrect types.

MOVABLE EQUIPMENT is considered to present a slightly increased risk of shock, due to possible extra strain on the supply cord leading to rupture of the earthing conductor. With HAND-HELD EQUIPMENT, this risk is increased; wear on the cord is more likely, and further hazards could arise if the units were dropped. TRANSPORTABLE EQUIPMENT introduces a further factor because it can be used and carried in any orientation; if a small metallic object enters an opening in the ENCLOSURE it can move around inside the equipment, possibly creating a hazard.

0.2 Hazards

Application of a safety standard is intended to reduce the risk of injury or damage due to the following:

- electric shock;
- energy related hazards;
- fire;
- heat related hazards;
- mechanical hazards;
- radiation;
- chemical hazards.

0.2.1 Electric shock

Electric shock is due to current passing through the human body. The resulting physiological effects depend on the value and duration of the current and the path it takes through the body. The value of the current depends on the applied voltage, the impedance of the source and the impedance of the body. The body impedance depends in turn on the area of contact, moisture in the area of contact and the applied voltage and frequency. Currents of approximately half a milliampere can cause a reaction in persons in good health and may cause injury indirectly due to involuntary reaction. Higher currents can have more direct effects, such as burn or muscle tetanization leading to inability to let go or to ventricular fibrillation.

Steady state voltages up to 42,4 V peak, or 60 V d.c., are not generally regarded as hazardous under dry conditions for an area of contact equivalent to a human hand. Bare parts that have to be touched or handled should be at earth potential or properly insulated.

Some equipment will be connected to telephone and other external networks. Some TELECOMMUNICATION NETWORKS operate with signals such as voice and ringing superimposed on a steady d.c. supply voltage; the total may exceed the values given above for steady-state voltages. It is common practice for the SERVICE PERSONS of telephone companies to handle parts of such circuits bare-handed. This has not caused serious injury, because of the use of cadenced ringing and because there are limited areas of contact with bare conductors normally handled by SERVICE PERSONS. However, the area of contact of a part accessible to the USER, and the likelihood of the part being touched, should be further limited (for example, by the shape and location of the part).

It is normal to provide two levels of protection for USERS to prevent electric shock. Therefore, the operation of equipment under normal conditions and after a single fault, including any consequential faults, should not create a shock hazard. However, provision of additional protective measures, such as protective earthing or SUPPLEMENTARY INSULATION, is not considered a substitute for, or a relief from, properly designed BASIC INSULATION.

Harm may result from:

Contact with bare parts normally at HAZARDOUS VOLTAGES.

Breakdown of insulation between parts normally at HAZARDOUS VOLTAGES and accessible conductive parts.

Examples of measures to reduce risks:

Prevent USER access to parts at HAZARDOUS VOLTAGES by fixed or locked covers, SAFETY INTERLOCKS, etc. Discharge accessible capacitors that are at HAZARDOUS VOLTAGES.

Provide BASIC INSULATION and connect the accessible conductive parts and circuits to earth so that exposure to the voltage which can develop is limited because overcurrent protection will disconnect the parts having low impedance faults within a specified time; or provide a metal screen connected to protective earth between the parts, or provide DOUBLE INSULATION or REINFORCED INSULATION between the parts, so that breakdown to the accessible part is not likely to occur.

Contact with circuits connected to TELECOMMUNICATION NETWORKS that exceed 42,4 V peak or 60 V d.c.

Limit the accessibility and area of contact of such circuits, and separate them from unearthed parts to which access is not limited.

Breakdown of USER-accessible insulation.

Insulation that is accessible to the USER should have adequate mechanical and electrical strength to reduce the likelihood of contact with HAZARDOUS VOLTAGES.

TOUCH CURRENT (leakage current) flowing from parts at HAZARDOUS VOLTAGES to accessible parts, or failure of a protective earthing connection. TOUCH CURRENT may include current due to EMC filter components connected between PRIMARY CIRCUITS and accessible parts.

Limit TOUCH CURRENT to a specified value, or provide a high integrity protective earthing connection.

0.2.2 Energy related hazards

Injury or fire may result from a short-circuit between adjacent poles of high current supplies or high capacitance circuits, causing:

- burns;
- arcing;
- ejection of molten metal.

Even circuits whose voltages are safe to touch may be hazardous in this respect.

Examples of measures to reduce risks include:

- separation;
- shielding;
- provision of SAFETY INTERLOCKS.

0.2.3 Fire

Risk of fire may result from excessive temperatures either under normal operating conditions or due to overload, component failure, insulation breakdown or loose connections. Fires originating within the equipment should not spread beyond the immediate vicinity of the source of the fire, nor cause damage to the surroundings of the equipment.

Examples of measures to reduce risks include:

- providing overcurrent protection;
- using constructional materials having appropriate flammability properties for their purpose;
- selection of parts, components and consumable materials to avoid high temperature which might cause ignition;
- limiting the quantity of combustible materials used;

- shielding or separating combustible materials from likely ignition sources;
- using ENCLOSURES or barriers to limit the spread of fire within the equipment;
- using suitable materials for ENCLOSURES so as to reduce the likelihood of fire spreading from the equipment.

0.2.4 Heat related hazards

Injury may result from high temperatures under normal operating conditions, causing:

- burns due to contact with hot accessible parts;
- degradation of insulation and of safety-critical components;
- ignition of flammable liquids.

Examples of measures to reduce risks include:

- taking steps to avoid high temperature of accessible parts;
- avoiding temperatures above the ignition point of liquids;
- provision of markings to warn USERS where access to hot parts is unavoidable.

0.2.5 Mechanical hazards

Injury may result from:

- sharp edges and corners;
- moving parts that have the potential to cause injury;
- equipment instability;
- flying particles from imploding cathode ray tubes and exploding high pressure lamps.

Examples of measures to reduce risks include:

- rounding of sharp edges and corners;
- guarding;
- provision of SAFETY INTERLOCKS;
- providing sufficient stability to free-standing equipment;
- selecting cathode ray tubes and high pressure lamps that are resistant to implosion and explosion respectively;
- provision of markings to warn USERS where access is unavoidable.

0.2.6 Radiation

Injury to USERS and to SERVICE PERSONS may result from some forms of radiation emitted by equipment. Examples are sonic (acoustic), radio frequency, infra-red, ultraviolet and ionizing radiation, and high intensity visible and coherent light (lasers).

Examples of measures to reduce risks include:

- limiting the energy level of potential radiation sources;
- screening radiation sources;
- provision of SAFETY INTERLOCKS;
- provision of markings to warn USERS where exposure to the radiation hazard is unavoidable.

0.2.7 Chemical hazards

Injury may result from contact with some chemicals or from inhalation of their vapours and fumes.

Examples of measures to reduce risks include:

- avoiding the use of constructional and consumable materials likely to cause injury by contact or inhalation during intended and normal conditions of use;
- avoiding conditions likely to cause leakage or vaporization;
- provision of markings to warn USERS about the hazards.

0.3 Materials and components

Materials and components used in the construction of equipment should be so selected and arranged that they can be expected to perform in a reliable manner for the anticipated life of the equipment without creating a hazard, and would not contribute significantly to the development of a serious fire hazard. Components should be selected so that they remain within their manufacturers' ratings under normal operating conditions, and do not create a hazard under fault conditions.

INFORMATION TECHNOLOGY EQUIPMENT – SAFETY –

Part 1: General requirements

1 General

1.1 Scope

1.1.1 Equipment covered by this standard

This standard is applicable to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a RATED VOLTAGE not exceeding 600 V.

This standard is also applicable to such information technology equipment:

- designed for use as telecommunication terminal equipment and TELECOMMUNICATION NETWORK infrastructure equipment, regardless of the source of power;
- designed and intended to be connected directly to, or used as infrastructure equipment in, a CABLE DISTRIBUTION SYSTEM, regardless of the source of power;
- designed to use the AC MAINS SUPPLY as a communication transmission medium (see Clause 6, Note 4 and 7.1, Note 4).

This standard is also applicable to components and subassemblies intended for incorporation in information technology equipment. It is not expected that such components and subassemblies comply with every aspect of the standard, provided that the complete information technology equipment, incorporating such components and subassemblies, does comply.

NOTE 1 Examples of aspects with which uninstalled components and subassemblies may not comply include the marking of the power rating and access to hazardous parts.

NOTE 2 This standard may be applied to the electronic parts of equipment even if that equipment does not wholly fall within its Scope, such as large-scale air conditioning systems, fire detection systems and fire extinguishing systems. Different requirements may be necessary for some applications.

This standard specifies requirements intended to reduce risks of fire, electric shock or injury for the OPERATOR and layman who may come into contact with the equipment and, where specifically stated, for a SERVICE PERSON.

This standard is intended to reduce such risks with respect to installed equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

Examples of equipment that is in the scope of this standard are:

Generic product type	Specific example of generic type
banking equipment	monetary processing machines including automated teller (cash dispensing) machines (ATM)
data and text processing machines and associated equipment	data preparation equipment, data processing equipment, data storage equipment, personal computers, plotters, printers, scanners, text processing equipment, visual display units
data network equipment	bridges, data circuit terminating equipment, data terminal equipment, routers
electrical and electronic retail equipment	cash registers, point of sale terminals including associated electronic scales
electrical and electronic office machines	calculators, copying machines, dictation equipment, document shredding machines, duplicators, erasers, micrographic office equipment, motor-operated files, paper trimmers (punchers, cutting machines, separators), paper jogging machines, pencil sharpeners, staplers, typewriters
other information technology equipment	photoprinting equipment, public information terminals, multimedia equipment
postage equipment	mail processing machines, postage machines
telecommunication network infrastructure equipment	billing equipment, multiplexers, network powering equipment, network terminating equipment, radio basestations, repeaters, transmission equipment, telecommunication switching equipment
telecommunication terminal equipment	facsimile equipment, key telephone systems, modems, PABXs, pagers, telephone answering machines, telephone sets (wired and wireless)

NOTE 3 The requirements of IEC 60065 may also be used to meet safety requirements for multimedia equipment. See IEC Guide 112, *Guide on the safety of multimedia equipment*.

This list is not intended to be comprehensive, and equipment that is not listed is not necessarily excluded from the Scope.

Equipment complying with the relevant requirements in this standard is considered suitable for use with process control equipment, automatic test equipment and similar systems requiring information processing facilities. However, this standard does not include requirements for performance or functional characteristics of equipment.