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IEC 62368-1

Edition 1.0 2010-01

# INTERNATIONAL STANDARD



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## Audio/video, information and communication technology equipment – Part 1: Safety requirements

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE **XM**

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ICS 33.160.01; 35.020

ISBN 978-2-88910-684-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**AUDIO/VIDEO, INFORMATION AND COMMUNICATION  
TECHNOLOGY EQUIPMENT –**

**Part 1: Safety 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.
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International Standard IEC 62368-1 has been prepared by TC 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

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

FDIS	Report on voting
108/325/FDIS	108/355/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

Except for text preceded by “Note”, 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.

The “in some countries” notes regarding differing national practices are contained in the following subclauses:

0.2.1, 4.1.15, 5.4.2.4.3, 5.4.2.9, 5.4.5.1, 5.5.2.2, 5.5.2.7, 5.7.7, 10.3.2, 10.3.3.3, 10.3.3.4, 10.4.1, F.3.3.5, Table 15 and Table 16.

In this standard, the following print types or formats are used:

- requirements proper and normative annexes: in roman type;
- compliance statements and test specifications: *in italic type*;
- notes/explanatory matter: in smaller roman type;
- normative conditions within tables: in smaller roman type;
- terms that are defined in 3.3: **bold**.

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.

A bilingual version of this publication may be issued at a later date.

The contents of the corrigendum of June 2010 have been included in this copy.

NOTE 1 The attention of National Committees and National bodies who prepare national standards is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests. It is the recommendation of TC108 that the content of this publication be adopted for mandatory implementation nationally not earlier than five years from the date of publication of this standard.

NOTE 2 IEC 62368-1 is based on the principles of hazard based safety engineering, which is a different way of developing and specifying safety considerations than that of the current practice. While this standard is different from traditional IEC safety standards in its approach and while it is believed that IEC 62368-1 provides a number of advantages, its introduction and evolution is not intended to result in significant changes to the existing safety philosophy that led to the development of the safety requirements contained in IEC 60065 and IEC 60950-1. The predominant reason behind the creation of IEC 62368-1 is to simplify the problems created by the merging of the technologies of ITE and CE. The techniques used are novel so that a learning process is required and experience is needed in its application. Consequently, IEC/TC108 recommends that the first edition of this standard be considered as an alternative to IEC 60065 or IEC 60950-1 at least over the recommended transition period.

NOTE 3 Explanatory information related to IEC 62368-1 will be published as IEC/TR 62368-2. It will contain rationale together with explanatory information related to this standard.

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

## INTRODUCTION

### 0 Principles of this product safety standard

#### 0.1 Objective

This International Standard is a product safety standard that classifies energy sources, prescribes **safeguards** against those energy sources, and provides guidance on the application of, and requirements for those **safeguards**.

The prescribed **safeguards** are intended to reduce the likelihood of pain, injury and, in the case of fire, property damage.

The objective of the INTRODUCTION is to help designers to understand the underlying principles of safety in order to design safe equipment. These principles are informative and not an alternative to the detailed requirements of this standard.

#### 0.2 Persons

##### 0.2.1 General

This standard describes **safeguards** for the protection of three kinds of persons: the **ordinary person**, the **instructed person**, and the **skilled person**. This standard assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

NOTE In Australia, the work conducted by an **instructed person** or **skilled person** may require formal licensing from regulatory authorities.

##### 0.2.2 Ordinary person

**Ordinary person** is the term applied to all persons other than **instructed persons** and **skilled persons**. **Ordinary persons** include not only users of the equipment, but also all persons who may have access to the equipment or who may be in the vicinity of the equipment. Under **normal operating conditions** or **abnormal operating conditions**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing pain or injury. Under a **single fault condition**, **ordinary persons** should not be exposed to parts comprising energy sources capable of causing injury.

##### 0.2.3 Instructed person

**Instructed person** is a term applied to persons who have been instructed and trained by a **skilled person**, or who are supervised by a **skilled person**, to identify energy sources that may cause pain (see Table 1) and to take precautions to avoid unintentional contact with or exposure to those energy sources. Under **normal operating conditions**, **abnormal operating conditions** or **single fault conditions**, **instructed persons** should not be exposed to parts comprising energy sources capable of causing injury.

##### 0.2.4 Skilled person

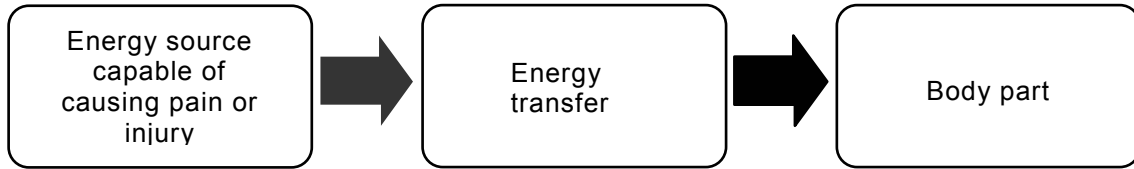
**Skilled person** is a term applied to persons who have training or experience in the equipment technology, particularly in knowing the various energies and energy magnitudes employed in the equipment. A **skilled person** is expected to use their training and experience to recognize energy sources capable of causing pain or injury and to take action for protection from injury from those energies. **Skilled persons** should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

#### 0.3 Model for pain and injury

This subclause presents an engineering-based model for pain and injury and their relationship to an energy source.

An energy source that causes pain or injury does so through the transfer of some form of energy to or from a body part.

This concept is represented by a three-block model (see Figure 1).



**Figure 1 – Three block model for pain and injury**

This safety standard specifies three classes of energy sources defined by magnitudes and durations of source parameters relative to either the body or to **combustible material** responses to those energy sources. Each energy class (see 4.2) is a function of the body part or the **combustible material** susceptibility to that energy magnitude (see Table 1).

**Table 1 – Response to energy class**

Energy source	Effect on the body	Effect on combustible materials
Class 1	Not painful, but may be detectable	Ignition not likely
Class 2	Painful, but not an injury	Ignition possible, but limited growth and spread of fire
Class 3	Injury	Ignition likely, rapid growth and spread of fire

The energy threshold for pain or injury is not constant throughout the population. For example, for some energy sources, the threshold is a function of body mass; the lower the mass, the lower the threshold, and vice-versa. Other body variables include age, state of health, state of emotions, effect of drugs, skin characteristics, etc. Furthermore, even where outward appearances otherwise appear equal, individuals differ in their thresholds of susceptibility to the same energy source.

The effect of duration of energy transfer is a function of the specific energy form. For example, pain or injury from thermal energy can be very short (1 s) for high skin temperature, or very long (several hours) for low skin temperature.

Furthermore, the pain or injury may occur some considerable time after the transfer of energy to a body part. For example, pain or injury from some chemical reaction may not be manifested for days, weeks, months, or years.

#### **0.4 Energy sources**

This subclause identifies the energy sources addressed by this standard, and the pain or injury that results from a transfer of that energy to the body, and the likelihood of property damage that results from fire escaping the equipment.

An electrical product is connected to an electrical energy source (for example, the **mains**), an external power supply, or a battery. An electrical product uses the electrical energy to perform its intended functions.

In the process of using electrical energy, the product transforms the electrical energy into other forms of energy, for example thermal energy, kinetic energy, optical energy, audio energy, electromagnetic energy, etc. Some energy transformations may be a deliberate part of the product function (for example, moving parts of a printer, images on a visual display unit, sound from a speaker, etc). Some energy transformations may be a by-product of the product

function (for example, heat dissipated by functional circuits, x-radiation from a cathode-ray tube, etc).

Some products may employ energy sources that are non-electrical energy sources such as batteries, moving parts, or chemicals, etc. The energy in these other sources may be transferred to or from a body part, or may be transformed into other energy forms (for example, a battery transforms chemical energy into electrical energy, or a moving body part transfers its kinetic energy to a sharp edge).

Examples of the types of energy forms and the associated injuries and property damage addressed in this standard are in Table 2.

**Table 2 – Examples of body response or property damage related to energy sources**

Forms of energy	Examples of body response or property damage	Clause
Electrical energy (for example, energized conductive parts)	Pain, fibrillation, cardiac arrest, respiratory arrest, skin burn, or internal organ burn	5
Thermal energy (for example, electrical ignition and spread of fire)	Electrically-caused fire leading to burn-related pain or injury, or property damage	6
Chemical reaction (for example, electrolyte, poison)	Skin damage, lung and other organ damage, or poisoning	7
Kinetic energy (for example, moving parts of equipment, or a moving body part against an equipment part)	Laceration, puncture, abrasion, contusion, crush, amputation, or loss of a limb, eye, ear, etc.	8
Thermal energy (for example, hot <b>accessible</b> parts)	Skin burn	9
Radiated energy (for example, electromagnetic energy, optical energy, acoustic energy)	Loss of sight, skin burn, or loss of hearing	10

## 0.5 Safeguards

### 0.5.1 General

This subclause introduces the three-block model for safety to explain the function of a **safeguard** and describes various manifestations of **safeguards**.

Many products necessarily employ energy capable of causing pain or injury. Equipment design cannot eliminate such energy use. Consequently, such products should employ a scheme that reduces the likelihood of such energy being transferred to a body part. The scheme that reduces the likelihood of energy transfer to a body part is a **safeguard** (see Figure 2).



**Figure 2 – Three block model for safety**

A **safeguard** is a device or scheme or system that

- is interposed between an energy source capable of causing pain or injury and a body part, and
- reduces the likelihood of transfer of energy capable of causing pain or injury to a body part.

NOTE **Safeguard** mechanisms against transfer of energy capable of causing pain or injury include

- attenuating the energy (reduces the value of the energy), or
- impeding the energy (slows the rate of energy transfer), or
- diverting the energy (changes the energy direction), or
- disconnecting, interrupting, or disabling the energy source, or
- enveloping the energy source (reduces the likelihood of the energy from escaping), or
- interposing a barrier between a body part and the energy source.

A **safeguard** can be applied to the equipment, to the local installation, to a person or can be a learned or directed behaviour (for example, resulting from an **instructional safeguard**) intended to reduce the likelihood of transfer of energy capable of causing pain or injury. A **safeguard** may be a single element or may be a set of elements.

Ideally, the order of preference for providing **safeguards** is:

- **equipment safeguards**;
- **installation safeguards**;
- **instructional safeguards** invoking **personal protective equipment**, or avoidance behaviour.

In practice, **safeguard** selection will take account of the nature of the energy source, the intended user, the functional requirements of the equipment, and similar considerations.

### 0.5.2 Equipment safeguard

An **equipment safeguard** may be a **basic safeguard**, a **supplementary safeguard**, a **double safeguard**, or a **reinforced safeguard**.

### 0.5.3 Installation safeguard

**Installation safeguards** are not controlled by the equipment manufacturer, although in some cases, **installation safeguards** may be specified in the equipment installation instructions.

Generally, with respect to equipment, an **installation safeguard** is a **supplementary safeguard**.

NOTE For example, the protective earthing **supplementary safeguard** is located partly in the equipment and partly in the installation. The protective earthing **supplementary safeguard** is not effective until the equipment is connected to the installation.

Requirements for **installation safeguards** are not addressed in this standard. However, this standard does assume some **installation safeguards**, such as protective earthing, are in place and are effective.

### 0.5.4 Instructional safeguard

An **instructional safeguard** is a visual indicator (symbols or words or both) or an audible message describing the existence and location of an energy source capable of causing pain or injury and is intended to invoke a specific behaviour on the part of a person to reduce the likelihood of transfer of energy to a body part (see Annex F).

An **instructional safeguard** may be a **basic safeguard**, or a **supplementary safeguard**.

When accessing locations where the unit needs to be energized to perform a service activity, an **instructional safeguard** may be considered acceptable protection to bypass an **equipment safeguard** such that the person is made aware of how to avoid contact with a class 2 energy source.

If **equipment safeguards** would interfere with or prohibit the equipment function, an **instructional safeguard** may be a **reinforced safeguard**.

Provision of an **instructional safeguard** does not result in an **ordinary person** becoming an **instructed person** (see 0.5.8).

#### 0.5.5 Personal safeguard

A **personal safeguard** may be a **basic safeguard**, a **supplementary safeguard**, or a **reinforced safeguard**.

Requirements for **personal safeguards (personal protective equipment)** are not addressed in this standard. However, this standard does assume that **personal safeguards** are available for use as specified by the manufacturer.

#### 0.5.6 Safeguards during ordinary or instructed person service conditions

During **ordinary person** or **instructed person** service conditions, **safeguards** for such persons may be necessary. Such **safeguards** can be **equipment safeguards**, **personal safeguards**, or **instructional safeguards**. Application of these **safeguards** is specified in the respective clauses.

#### 0.5.7 Equipment safeguards during skilled person service conditions

During **skilled person** service conditions, **equipment safeguards** should be provided to protect against the effects of a body's involuntary reaction (for example, startle) that might cause unintentional contact with a class 3 energy source located outside the view of the **skilled person**.

NOTE This **safeguard** typically applies in large equipment, where the **skilled person** may need to partially or wholly enter between two or more class 3 energy source locations while servicing.

#### 0.5.8 Precautionary safeguard

A **precautionary safeguard** is the training and experience or supervision of an **instructed person** by a **skilled person** to use precautions to protect the **instructed person** against class 2 energy sources. **Precautionary safeguards** are not specifically prescribed in this standard but are assumed to be effective when the term **instructed person** is used.

During equipment servicing, an **instructed person** may need to remove or defeat an **equipment safeguard**. In this case, an **instructed person** must then apply precaution as a **safeguard** to avoid injury.

#### 0.5.9 Skill safeguard

A **skill safeguard** is the education, training, knowledge and experience of the **skilled person** that is employed to protect the **skilled person** against class 2 and class 3 energy sources. **Skill safeguards** are not specifically prescribed in this standard but are assumed to be effective when the term **skilled person** is used.

During equipment servicing, a **skilled person** may need to remove or defeat an **equipment safeguard**. In this case, a **skilled person** must then apply skill as a **safeguard** to avoid injury.

### 0.5.10 Examples of safeguard characteristics

Table 3 lists some examples of **safeguard** characteristics.

**Table 3 – Examples of safeguard characteristics**

<b>Safeguard</b>	<b>Basic safeguard</b>	<b>Supplementary safeguard</b>	<b>Reinforced safeguard</b>
<b>Equipment safeguard:</b> a physical part of an equipment	Effective under <b>normal operating conditions</b>	Effective in the event of failure of the <b>basic safeguard</b>	Effective under <b>normal operating conditions</b> and in the event of a <b>single fault condition</b> elsewhere in the equipment
	Example: <b>basic insulation</b>	Example: <b>supplementary insulation</b>	Example: <b>reinforced insulation</b>
	Example: normal temperatures below ignition temperatures	Example: <b>fire enclosure</b>	Not applicable
<b>Installation safeguard:</b> a physical part of a man-made installation	Effective under <b>normal operating conditions</b>	Effective in the event of failure of an equipment <b>basic safeguard</b>	Effective under <b>normal operating conditions</b> and in the event of a <b>single fault condition</b> elsewhere in the equipment
	Example: wire size	Example: overcurrent protective device	Example: socket outlet
<b>Personal safeguard:</b> a physical device worn on the body	In the absence of any <b>equipment safeguard</b> , effective under <b>normal operating conditions</b>	Effective in the event of failure of an equipment <b>basic safeguard</b>	In the absence of any <b>equipment safeguard</b> , effective under <b>normal operating conditions</b> and in the event of a <b>single fault condition</b> elsewhere in the equipment
	Example: glove	Example: insulating floor mat	Example: electrically-insulated glove for handling live conductors
<b>Instructional safeguard:</b> a voluntary or instructed behaviour intended to reduce the likelihood of transfer of energy to a body part	In the absence of any <b>equipment safeguard</b> , effective under <b>normal operating conditions</b>	Effective in the event of failure of an equipment <b>basic safeguard</b>	Only effective on an exceptional basis, when providing all appropriate <b>safeguards</b> would prevent the intended functioning of the equipment
	Example: <b>instructional safeguard</b> to disconnect telecommunication cable before opening the cover	Example: after opening a door, an <b>instructional safeguard</b> against hot parts	Example: <b>instructional safeguard</b> of hot parts in an office photocopier, or a continuous roll paper cutter on a commercial printer

## 0.6 Electrically-caused pain or injury (electric shock)

### 0.6.1 General

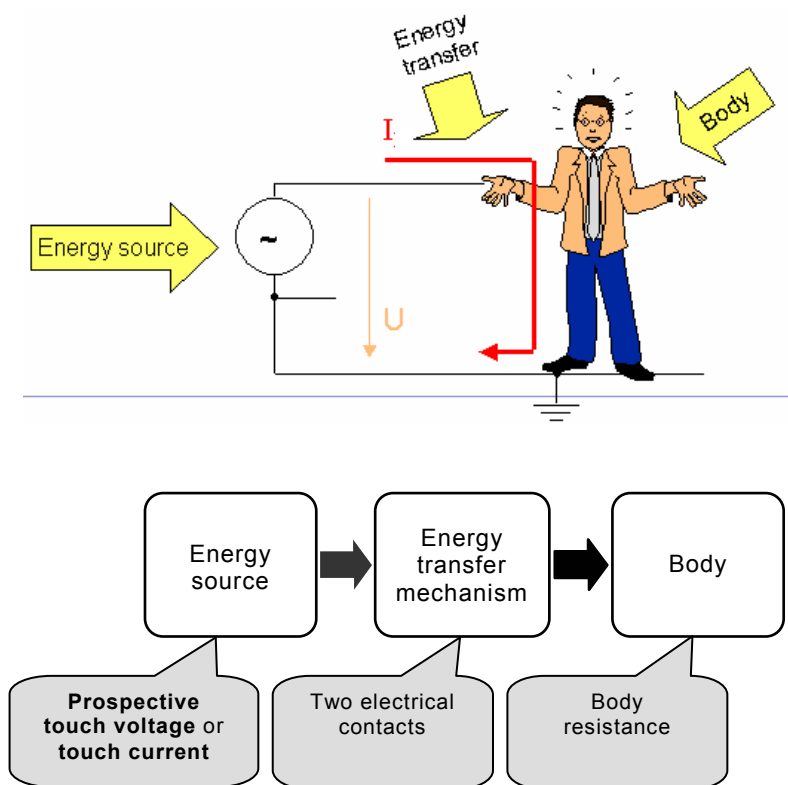
This subclause describes models for electrically-caused pain or injury and models for reducing the likelihood of transfer of electrical energy capable of causing pain or injury to a body part.

### 0.6.2 Models for electrically-caused pain or injury

Electrically-caused pain or injury may occur when electrical energy capable of causing pain or injury is transferred to a body part (see Figure 3).

Electrical energy transfer occurs when there are two or more electrical contacts to the body:

- the first electrical contact is between a body part and a conductive part of the equipment;
- the second electrical contact is between another body part, and
  - earth, or
  - another conductive part of the equipment.

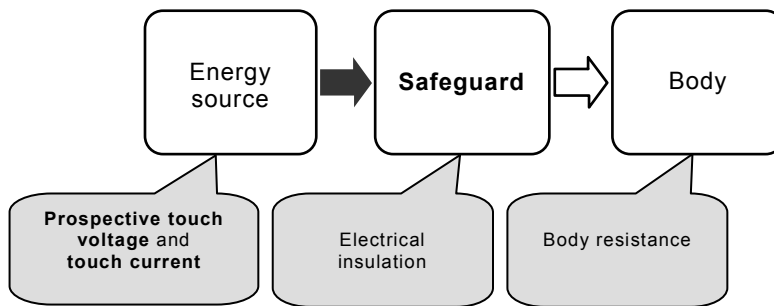


**Figure 3 – Schematic and model for electrically-caused pain or injury**

Depending on the magnitude, duration, wave shape, and frequency of the current, the effect to the human body varies from undetectable to detectable to painful to injurious.

### 0.6.3 Models for protection against electrically-caused pain or injury

Protection against electrically-caused pain or injury requires that one or more **safeguards** be interposed between an electrical energy source capable of causing pain or injury and a body part (see Figure 4).



**Figure 4 – Model for protection against electrically-caused pain or injury**

Protection against electrically-caused pain is provided under **normal operating conditions** and **abnormal operating conditions**. Such protection requires that, under **normal operating conditions** and **abnormal operating conditions**, a **basic safeguard** be interposed between an electrical energy source capable of causing pain and an **ordinary person**.

The most common **basic safeguard** against an electrical energy source capable of causing pain is electrical insulation (also known as **basic insulation**) interposed between the energy source and a body part.

Protection against electrically-caused injury is provided under **normal operating conditions**, **abnormal operating conditions**, and **single fault conditions**. Such protection requires that, under **normal operating conditions** and **abnormal operating conditions**, both a **basic safeguard** and a **supplementary safeguard** be interposed between an electrical energy source capable of causing injury and an **ordinary person** (see 4.3.2.4), or an **instructed person** (see 4.3.3.3). In the event of a failure of either **safeguard**, the other **safeguard** becomes effective.

The **supplementary safeguard** against an electrical energy source capable of causing injury is interposed between the **basic safeguard** and a body part. A **supplementary safeguard** may be additional electrical insulation (**supplementary insulation**) or a protectively earthed conductive barrier or other construction that performs the same function.

The most common **safeguard** against an electrical energy source capable of causing injury is electrical insulation (also known as **double insulation** or **reinforced insulation**) interposed between the energy source and a body part.

Likewise, a **reinforced safeguard** may be interposed between an electrical energy source capable of causing injury and a body part.

## **0.7 Electrically-caused fire**

### **0.7.1 General**

This subclause describes models to reduce the likelihood of ignition (within the equipment) or to reduce the likelihood of fire (originating within the equipment) from spreading beyond the equipment.

### **0.7.2 Models for electrically-caused fire**

Electrically-caused fire is due to conversion of electrical energy to thermal energy (see Figure 5), where the thermal energy heats a fuel material followed by ignition and combustion.

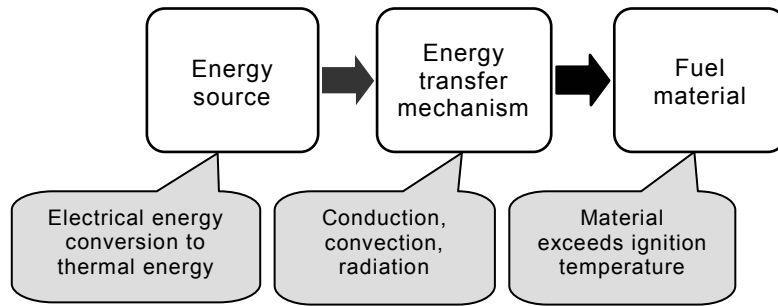


Figure 5 – Model for electrically-caused fire

Electrical energy is converted to thermal energy either in a resistance or in an arc and is transferred to a fuel material by conduction, convection, or radiation. As the fuel material heats, it chemically decomposes into gases, liquids and solids. When the gas is at its ignition temperature, the gas can be ignited by an ignition source. When the gas is at its spontaneous ignition temperature, the gas will ignite by itself. Both result in fire.

### 0.7.3 Models for protection against electrically-caused fire

The **basic safeguard** against electrically-caused fire (see Figure 6) is that the temperature of a material, under **normal operating conditions** and **abnormal operating conditions**, does not cause the material to ignite.

The **supplementary safeguard** against electrically-caused fire reduces the likelihood of ignition or, in the case of ignition, reduces the likelihood of spread of fire.

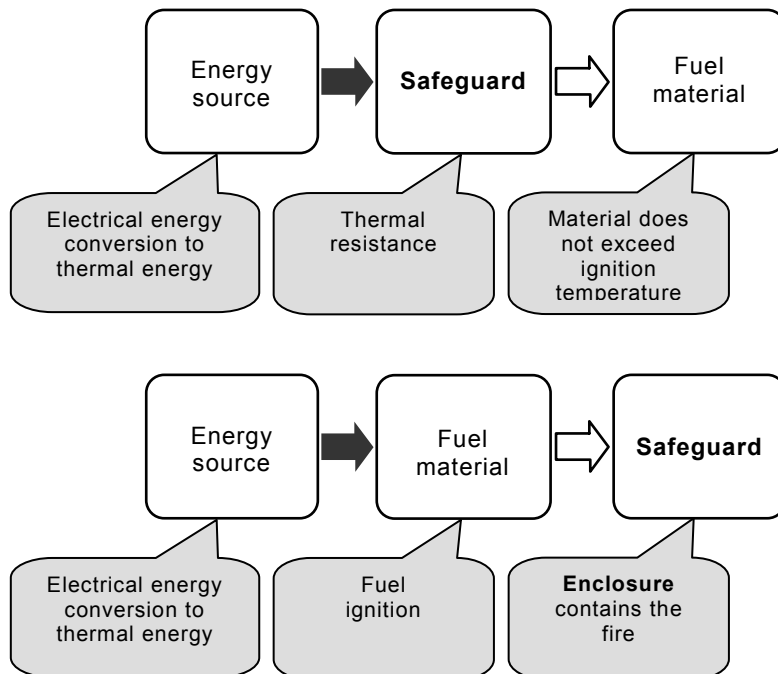


Figure 6 – Models for protection against fire

### 0.8 Chemically-caused injury

This subclause describes models for reducing the likelihood of injury from exposure to chemicals.

Chemically-caused injury is due to a chemical reaction with a body part. The extent of injury by a given agent depends on both the magnitude and duration of exposure and on the body part susceptibility to that agent.

The **basic safeguard** against chemically-caused injury is containment of the material.

**Supplementary safeguards** against chemically-caused injury may include:

- a second container or a spill-resistant container;
- containment trays;
- tamper-proof screws to prevent unauthorized access;
- **instructional safeguards**.

National and regional regulations govern the use of and exposure to chemicals used in equipment. These regulations do not enable a practical classification of chemicals in the manner in which other energy sources are classified in this standard. Therefore, energy source classifications are not applied in Clause 7.

## 0.9 Mechanically-caused injury

This subclause describes models for reducing the likelihood of injuries such as cuts, bruises, broken bones, etc. due to transfer of kinetic energy to a body part.

Mechanically-caused injury is due to kinetic energy transfer to a body part when a collision occurs between a body part and an equipment part. The kinetic energy is a function of the relative motion between a body part and **accessible** parts of the equipment, including parts ejected from the equipment that collide with a body part.

Examples of kinetic energy sources are:

- body motion relative to sharp edges and corners;
- part motion due to rotating or other moving parts, including pinch points;
- part motion due to loosening, exploding, or imploding parts;
- equipment motion due to instability;
- equipment motion due to wall, ceiling, or rack mounting means failure;
- equipment motion due to handle failure;
- part motion due to an exploding battery;
- equipment motion due to cart or stand instability or failure.

The **basic safeguard** against mechanically-caused injury is a function of the specific energy source. **Basic safeguards** may include:

- rounded edges and corners;
- an **enclosure** to prevent a moving part from being **accessible**;
- an **enclosure** to prevent expelling a moving part;
- a **safety interlock** to control access to an otherwise moving part;
- means to stop the motion of a moving part;
- means to stabilize the equipment;
- handles;
- mounting means;
- means to contain parts expelled during **explosion** or implosion.

The **supplementary safeguard** against mechanically-caused injury is a function of the specific energy source. **Supplementary safeguards** may include:

- **instructional safeguards**;
- instructions and training;
- additional **enclosures** or barriers;
- **safety interlocks**.

The **reinforced safeguard** against mechanically-caused injury is a function of the specific energy source. **Reinforced safeguards** may include:

- extra thick glass on the front of a CRT;
- rack slide-rails and means of support;
- **safety interlock**.

## **0.10 Thermally-caused injury (skin burn)**

### **0.10.1 General**

This subclause describes models for thermally-caused injury and models for reducing the likelihood of thermal energy capable of causing pain or injury being transferred to a body part.

### **0.10.2 Models for thermally-caused injury**

Thermally-caused injury may occur when thermal energy capable of causing injury is transferred to a body part (see Figure 7).

Thermal energy transfer occurs when a body touches a hot equipment part. The extent of injury depends on the temperature difference, the thermal mass of the object, rate of thermal energy transfer to the skin, and duration of contact.

The requirements in this standard only address **safeguards** against thermal energy transfer by conduction. This standard does not address **safeguards** against thermal energy transfer by convection or radiation.

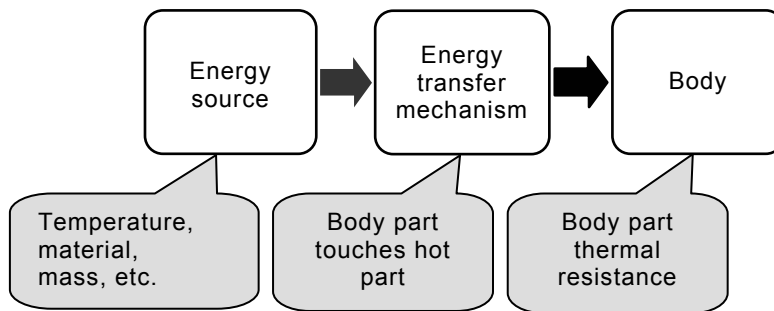


Figure 7 – Schematic and model for thermally-caused injury

Depending on the temperature, contact duration, material properties, and mass of the material, the perception of the human body varies from warmth to heat that may result in pain or injury (burn).

### 0.10.3 Models for protection against thermally-caused pain or injury

Protection against thermally-caused pain or injury requires that one or more **safeguards** be interposed between a thermal energy source capable of causing pain or injury and an **ordinary person** (see Figure 8).

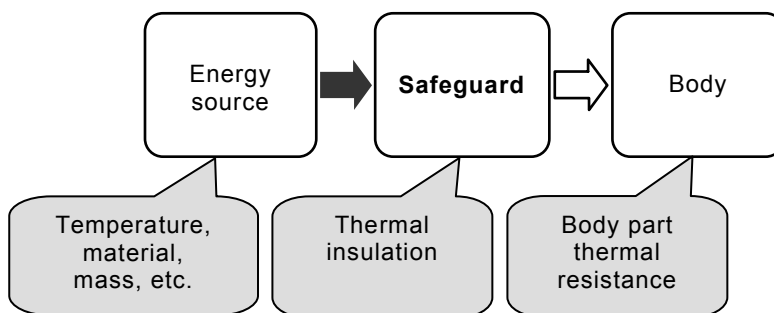


Figure 8 – Model for protection against thermally-caused injury

Protection against thermally-caused pain is required under **normal operating conditions** and **abnormal operating conditions**. Such protection requires that a **basic safeguard** be

interposed between a thermal energy source capable of causing pain and an **ordinary person**.

Protection against thermally-caused injury is required under **normal operating conditions**, **abnormal operating conditions** and **single fault conditions**. Such protection requires that a **basic safeguard** and a **supplementary safeguard** be interposed between a thermal energy source capable of causing injury and an **ordinary person**.

The **basic safeguard** against a thermal energy source capable of causing pain or injury is thermal insulation interposed between the energy source and a body part. In some cases, a **basic safeguard** against a thermal energy source capable of causing pain or injury may be an **instructional safeguard** identifying the hot parts and how to reduce the likelihood of injury. In some cases, a **basic safeguard** reduces the likelihood of a non-injurious thermal energy source from becoming a thermal energy source capable of causing pain or injury.

Examples of such **basic safeguards** are:

- control of electrical energy being converted to thermal energy (for example, a **thermostat**);
- heat sinking, etc.

The **supplementary safeguard** against a thermal energy source capable of causing injury is thermal insulation interposed between the energy source and a body part. In some cases, a **supplementary safeguard** against a thermal energy source capable of causing pain or injury may be an **instructional safeguard** identifying the hot parts and how to reduce the likelihood of injury.

### 0.11 Radiation-caused injury

This subclause describes models for reducing the likelihood of injury from exposure to radiated energy.

Radiation-caused injury within the scope of this standard is generally attributed to one of the following energy transfer mechanisms:

- heating of a body organ caused by exposure to non-ionising radiation, such as the highly localised energy of a laser impinging on the retina, or heating a larger volume such as the energy from a high frequency wireless, electromagnetic fields, or high frequency transmitter, or
- auditory injury caused by over stimulation of the ear by excessive peaks or sustained loud sound, leading to physical or nerve damage.

Radiated energy is transferred by impingement of wave emission upon a body part.

The **basic safeguard** against radiation-caused injury is containment of the energy within an **enclosure** that is opaque to the radiated energy.

The **basic safeguard** against auditory injury is the provision of warnings and information advising the user how to use the equipment correctly.

Examples of **basic safeguards** against auditory pain and injury are the provision of warnings and information advising the user how to use the equipment correctly. Examples of **supplementary safeguards** against auditory injury are the provision of a **safety interlock** or a soundproof **enclosure**.

There are several **supplementary safeguards** against radiation-caused injury. The **supplementary safeguards** may include **safety interlocks** to disconnect power to the generator, tamper-proof screws to prevent unauthorized access, etc.

# AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT –

## Part 1: Safety requirements

### 1 Scope

This part of IEC 62368 is applicable to the safety of electrical and electronic equipment within the field of audio, video, information and communication technology, and business and office machines with a **rated voltage** not exceeding 600 V. This standard does not include requirements for performance or functional characteristics of equipment.

NOTE 1 Examples of equipment within the scope of this standard are given in Annex A.

This part of IEC 62368 is also applicable to components and subassemblies intended for incorporation in this equipment. Such components and subassemblies need not comply with every requirement of the standard, provided that the complete equipment, incorporating such components and subassemblies, does comply.

This standard specifies **safeguards** for **ordinary persons, instructed persons, and skilled persons**.

NOTE 2 In Australia, the work conducted by an **instructed person** or a **skilled person** may require formal licensing from regulatory authorities.

This standard assumes an altitude of 2 000 m unless specified otherwise by the manufacturer.

This standard does not apply to equipment to be used in wet areas. Additional requirements may apply.

This standard does not apply to equipment for outdoor installation.

NOTE 3 Information and communication technology equipment that is intended for use outdoors is covered by IEC 60950-22.

This standard does not include requirements for functional safety.

NOTE 4 For specific functional and software safety requirements of electronic safety-related systems (for example, protective electronic circuits), see IEC 61508-1.

This standard does not address:

- manufacturing processes except safety testing;
- injurious effects of gases released by thermal decomposition or combustion;
- disposal processes;
- effects of transport (other than as specified in this standard);
- effects of storage of materials, components, or the equipment itself;
- the likelihood of injury from particulate radiation such as alpha particles and beta particles;
- the likelihood of thermal injury due to radiated or convected thermal energy;
- the likelihood of injury due to flammable liquids;
- the use of the equipment in oxygen-enriched or **explosive** atmospheres;
- exposure to chemicals other than those specified in Clause 7;
- electrostatic discharge events.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027-1, *Letter symbols to be used in electrical technology – Part 1: General*

IEC 60065, *Audio, video and similar electronic apparatus – Safety requirements*

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

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC/TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60086-4, *Primary batteries – Part 4: Safety of lithium batteries*

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60127-1:2006, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

IEC 60227-1:2007, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60227-7:2003, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 7: Flexible cables screened and unscreened with two or more conductors*

IEC 60245-1:2003, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60309-1, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60317 (all parts), *Specifications for particular types of winding wires*

IEC 60317-43, *Specifications for particular types of winding wires – Part 43: Aromatic polyimide tape wrapped round copper wire, class 240*

IEC 60320-1, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

IEC 60320-2-2, *Appliance couplers for household and similar general purposes – Part 2-2: Interconnection couplers for household and similar equipment*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60332-1-3, *Tests on electric and optical fibre cables under fire conditions – Part 1-3: Test for vertical flame propagation for a single insulated wire or cable – Procedure for determination of flaming droplets/particles*

IEC 60332-2-1, *Tests on electric and optical fibre cables under fire conditions – Part 2-1: Test for vertical flame propagation for a single small insulated wire or cable – Apparatus*

IEC 60332-2-2, *Tests on electric and optical fibre cables under fire conditions – Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame*

IEC 60384-14:2005, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment*

IEC 60505, *Evaluation and qualification of electrical insulation systems*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 60691:2002, *Thermal-links – Requirements and application guide*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

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

IEC 60695-11-5:2004, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60695-11-20:1999, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test methods*

IEC/TS 60695-11-21, *Fire hazard testing – Part 11-21: Test flames – 500 W vertical flame test method for tubular polymeric materials*

IEC 60728-11:2005, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*

IEC 60730 (all parts), *Automatic electrical controls for household and similar use*

IEC 60730-1:1999, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60738-1, *Thermistors – Directly heated positive temperature coefficient – Part 1: Generic specification*

IEC 60747-5-5:2007, *Semiconductor devices – Discrete devices – Part 5-5: Optoelectronic devices – Photocouplers*

IEC 60825 (all parts), *Safety of laser products*

IEC 60825-1:2007, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60825-2:2004, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 60825-12:2004, *Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information*

IEC 60851-3:2009, *Winding wires – Test methods – Part 3: Mechanical properties*

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*

IEC 60851-6:1996, *Winding wires – Test methods – Part 6: Thermal properties*

IEC 60896-11, *Stationary lead-acid batteries – Part 11: Vented types – General requirements and methods of tests*

IEC 60896-21:2004, *Stationary lead-acid batteries – Part 21: Valve regulated types – Methods of test*

IEC 60896-22, *Stationary lead-acid batteries – Part 22: Valve regulated types – Requirements*

IEC 60906-1, *IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V a.c.*

IEC 60906-2, *IEC system of plugs and socket-outlets for household and similar purposes – Part 2: Plugs and socket-outlets 15 A 125 V a.c.*

IEC 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60950-23, *Information technology equipment – Safety – Part 23: Large data storage equipment*

IEC 60990:1999, *Methods of measurement of touch current and protective conductor current*

IEC 60998-1, *Connecting devices for low-voltage circuits for household and similar purposes – Part 1: General requirements*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 60999-2, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm<sup>2</sup> up to 300 mm<sup>2</sup> (included)*

IEC 61051-2:1991, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*

IEC 61056-1, *General purpose lead-acid batteries (valve-regulated types) – Part 1: General requirements, functional characteristics – Methods of test*

IEC 61056-2, *General purpose lead-acid batteries (valve-regulated types) – Part 2: Dimensions, terminals and marking*

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*

IEC/TS 61201:2007, *Use of conventional touch voltage limits – Application guide*

IEC 61204-7, *Low-voltage power supplies, d.c. output – Part 7: Safety requirements*

IEC 61293, *Marking of electrical equipment with ratings related to electrical supply – Safety requirements*

IEC 61427, *Secondary cells and batteries for photovoltaic energy systems (PVES) – General requirements and methods of test*

IEC/TS 61430, *Secondary cells and batteries – Test methods for checking the performance of devices designed for reducing explosion hazards – Lead-acid starter batteries*

IEC 61434, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Guide to designation of current in alkaline secondary cell and battery standards*

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61558-2 (all parts), *Safety of power transformers, power supplies, reactors and similar products*

IEC 61810-1:2008, *Electromechanical elementary relays – Part 1: General requirements*

IEC 61959, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Mechanical tests for sealed portable secondary cells and batteries*

IEC 61960, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications*

IEC 61965:2003, *Mechanical safety of cathode ray tubes*

IEC 61984, *Connectors - Safety requirements and tests*

IEC 62133, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

IEC 62282-2, *Fuel cell technologies – Part 2: Fuel cell modules*

IEC/TS 62393, *Portable and hand-held multimedia equipment – Mobile computers – Battery run-time measurement*

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

IEC 62485-2, *Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries<sup>1</sup>*

ISO 178, *Plastics – Determination of flexural properties*

ISO 179-1, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 180, *Plastics – Determination of Izod impact strength*

ISO 306, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 871, *Plastics – Determination of ignition temperature using a hot-air furnace*

ISO 3864 (all parts), *Graphical symbols – Safety colours and safety signs*

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*

ISO 4046-4:2002, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

ISO 4892-1, *Plastics – Methods of exposure to laboratory light sources – Part 1: General guidance*

ISO 4892-2:2006, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-4, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame carbon-arc lamps*

ISO 7000:2004, *Graphical symbols for use on equipment – Index and synopsis*

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<sup>1</sup> To be published.

ISO 7010, *Graphical symbols – Safety colours and safety signs – Safety signs used in workplaces and public areas*

ISO 8256, *Plastics – Determination of tensile-impact strength*

ISO 9772, *Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame*

ISO 9773, *Plastics – Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source*