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# INTERNATIONAL STANDARD



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## Safety in installations for electroheating and electromagnetic processing – Part 1: General requirements

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY IN INSTALLATIONS FOR ELECTROHEATING  
AND ELECTROMAGNETIC PROCESSING –****Part 1: General requirements**

## FOREWORD

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International Standard IEC 60519-1 has been prepared by IEC technical committee 27: Industrial electroheating and electromagnetic processing.

This sixth edition cancels and replaces the fifth edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) removal of noise from the scope;
- b) clarification of EMC requirements;
- c) risk classification of hazards based on emission for all processing frequencies;
- d) clarification of boundaries between IEC 60519 (all parts) and ISO 13577 (all parts).

The text of this International Standard is based on the following documents:

FDIS	Report on voting
27/1121/FDIS	27/1123/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

In this document, the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- **terms** used throughout this standard which have been defined in Clause 3: **in bold type**.

A list of all parts in the IEC 605019 series, published under the general title *Safety in installations for electroheating and electromagnetic processing*, can be found on the IEC website.

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

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- withdrawn,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

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



## INTRODUCTION

~~This fifth edition of IEC 60519-1 is a product safety publication and is intended to:~~

- ~~— include all types of installations or equipment that are in the scope of IEC TC 27 dealing with industrial **electroheating (EH)** and **electromagnetic processing of materials (EPM)**;~~
- ~~— cover in these General Requirements all hazards that are relevant for more than one type of equipment or installation individually dealt with in Particular Requirements;~~
- ~~— give requirements on electrical safety, touch currents, electric fields, magnetic fields and radiation, thus mirroring the broad scope of installations covered and their processing frequency;~~
- ~~— give means for verification of the requirements;~~
- ~~— make extensive use of the standards developed by IEC committees with horizontal or group safety functions and of relevant ISO standards by reference, including publications developed by ISO/TC 244 (more information is given in Annex H), in compliance with IEC Guide 104;~~
- ~~— be useable like a type C standard in the sense of ISO 12100;~~
- ~~— include all material, references and requirements suitable for risk assessment and list significant hazards.~~

~~This standard addresses mainly **manufacturers** making made-to-order equipment on a single project base. The **manufacturer** is well aware that it is his responsibility to make equipment safe through adequate risk reduction and it is the responsibility of the **user** to assess exposure of the **operator** in line with applicable health and safety regulations. Looking at projects providing single pieces of equipment or single installations, this clear division of responsibilities tends to blur, caused by inter alia~~

- ~~— development of the process (**normal operation**) through the **manufacturer** and **user**,~~
- ~~— shared definition of working procedures for the **operator** by the **manufacturer** and **user**,~~
- ~~— the scope of delivery often including all protective means,~~
- ~~— individual sales contracts where **users** require an assessment of exposure through the **manufacturer**.~~

~~Thus this standards provides information on exposure hazards and limits where relevant, well aware that this is exceeding the scope of a product standard.~~

These general requirements apply to all industrial **EH** and **EPM equipment**, unless an exception is given in the Particular requirements dealing with specific equipment in other parts of the IEC 60519 series. The provisions of other parts of the IEC 60519 series that directly apply to specific types of equipment take precedence over the provisions of this document.

Annex I and Annex J provide orientation with respect to the application of ISO 13577-1 in combination with this document.

This document presumes that the installation or equipment is operated and maintained only by personnel consisting of **skilled** or **instructed persons**.

This document is intended for verifying whether the **EH** or **EPM installation** or **equipment** meets the safety requirements of this document through design, site acceptance tests, routine tests or inspection.

Annex H provides a guide on the use of this document and a list of typical industrial **EH** and **EPM** processes.

# SAFETY IN INSTALLATIONS FOR ELECTROHEATING AND ELECTROMAGNETIC PROCESSING –

## Part 1: General requirements

### 1 ~~Scope and object~~

#### 1.1 ~~Scope~~

This part of IEC 60519 specifies the general safety requirements for industrial installations or equipment intended for **electroheating (EH)** and **electroheating** based treatment technologies as well as for **electromagnetic processing of materials (EPM)**. This document deals with the significant hazards, hazardous situations or hazardous events relevant to industrial **EH** and **EPM equipment**, as listed in Annex A, for **normal operation** and for **single fault condition** as well as under conditions of reasonably foreseeable misuse.

~~The requirements are applicable to industrial installations or equipment with the possible use as:~~

- ~~— equipment for direct and indirect resistance heating,~~
- ~~— equipment for electric resistance trace heating,~~
- ~~— equipment for induction heating,~~
- ~~— equipment using the effect of electromagnetic forces on materials,~~
- ~~— equipment for arc heating, including submerged arc heating,~~
- ~~— equipment for electroslag remelting,~~
- ~~— equipment for plasma heating and plasma surface treatment,~~
- ~~— equipment for microwave heating,~~
- ~~— equipment for dielectric heating,~~
- ~~— equipment using electron guns,~~
- ~~— equipment for infrared radiation heating,~~
- ~~— equipment for laser heating.~~

~~NOTE The list presents typical examples of equipment and its applications and is not exhaustive.~~

~~The overall safety requirements for the various types of **EH** or **EPM equipment** and **installations** result from the joint application of the General Requirements specified in this standard and Particular Requirements covering specific types of installations or equipment (guidelines are given in Annex G). If no Particular Requirement is covering a specific installation or equipment, the General Requirements are applicable as such.~~

This document specifies the requirements intended to be met by the **manufacturer** to ensure the safety of persons and property during the complete life cycle of the equipment from design through commissioning, operation, maintenance, inspection, to decommissioning, as well as in the event of foreseeable **single fault condition** that can occur in the equipment.

The rated voltage of **EH** and **EPM equipment** can be in the range of low voltage; details are given in 4.2.

This document does not apply to equipment and appliances within the scope of

- IEC 60079 (all parts) – i.e. equipment ~~or installations~~ intended for use in potentially explosive atmospheres;

- IEC 60335 (all parts) – i.e. household, commercial and similar electrical appliances, including room heating;
- IEC 60601 (all parts) – i.e. medical electrical equipment;
- IEC 60974 (all parts) – i.e. arc welding equipment;
- IEC 61010 (all parts) – i.e. equipment for laboratory use.

## 1.2—Object

~~The requirements refer to the complete life cycle of the installation or equipment from design through commissioning, operation, maintenance, inspection, to decommissioning. They cover the safety of persons and protection of the environment during normal operation and under single fault condition.~~

~~This standard presumes that the installation or equipment is operated and maintained only by personnel consisting of skilled or instructed persons.~~

~~This standard is intended for verifying that the EH or EPM equipment or installation meets the requirements of this standard through design, site acceptance tests, routine tests or inspection.~~

This document does not provide requirements for type testing.

NOTE Industrial equipment covered by this document is typically produced as a single unit or a very small number of units; such unit usually has a very high value and can cause severe harm at disintegration.

This document does not address data security and hazards arising from neglect of security.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60071-1:2006<sup>1</sup>, *Insulation co-ordination – Part 1: Definitions, principles and rules*  
IEC 60071-1:2006/AMD1:2010

IEC 60204-1:~~2005~~2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*  
~~IEC 60204-1:2005/AMD1:2008~~

IEC 60204-11:~~2000~~2018, *Safety of machinery – Electrical equipment of machines – Part 11: Requirements for ~~HV~~ equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60335-1:2010<sup>2</sup>, *Household and similar electrical appliances – Safety – Part 1: General requirements*  
IEC 60335-1:2010/AMD1:2013  
IEC 60335-1:2010/AMD2:2016

<sup>1</sup> A consolidated version of this publication exists, comprising IEC 60071-1:2006 and IEC 60071-1:2006/AMD1:2010.

<sup>2</sup> A consolidated version of this publication exists, comprising IEC 60335-1:2010, IEC 60335-1:2010/AMD1:2013 and IEC 60335-1:2010/AMD2:2016.

IEC 60335-2-24, *Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers*

IEC 60335-2-89, *Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor*

IEC 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-41:2005<sup>3</sup>, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*  
IEC 60364-4-41:2005/AMD1:2017

IEC 60364-4-42:2010<sup>4</sup>, *Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects*  
IEC 60364-4-42:2010/AMD1:2014

IEC 60364-4-44:2007<sup>5</sup>, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*  
IEC 60364-4-44:2007/AMD1:2015  
IEC 60364-4-44:2007/AMD2:2018

IEC 60364-5-53:2001<sup>6</sup>, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*  
IEC 60364-5-53:2001/AMD1:2002  
IEC 60364-5-53:2001/AMD2:2015

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 60398:2015<sup>7</sup>, *Installations for electroheating and electromagnetic processing – General performance test methods*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60529:1989, *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*

<sup>3</sup> A consolidated version of this publication exists, comprising IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1:2017.

<sup>4</sup> A consolidated version of this publication exists, comprising IEC 60364-4-42:2010 and IEC 60364-4-42:2010/AMD1:2014.

<sup>5</sup> A consolidated version of this publication exists, comprising IEC 60364-4-44:2007, IEC 60364-4-44:2007/AMD1:2015 and IEC 60364-4-44:2007/AMD2:2018.

<sup>6</sup> A consolidated version of this publication exists, comprising IEC 60364-5-53:2001, IEC 60364-5-53:2001/AMD1:2002 and IEC 60364-5-53:2001/AMD2:2015.

<sup>7</sup> ~~To be published.~~

IEC 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60865-1:2011, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC 60909-0:2016, *Short-circuit currents in three-phase a.c. systems – Part 0: Calculation of currents*

IEC 60990:1999/2016, *Methods of measurement of touch current and protective conductor current*

~~IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase and not subject to conditional connection*~~

~~IEC TS 61000-3-5, *Electromagnetic compatibility (EMC) – Part 3-5: Limits – Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75 A*~~

~~IEC TR 61000-3-6, *Electromagnetic compatibility (EMC) – Part 3-6: Limits – Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*~~

~~IEC 61000-3-11, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current  $\leq 75$  A and subject to conditional connection*~~

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

~~IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*~~

IEC 61000-6-7:2014, *Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61082-1:2014, *Preparation of documents used in electrotechnology – Part 1: Rules*

~~IEC 61310 (all parts), *Safety of machinery – Indication, marking and actuation*~~

IEC 61310-1:2007, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, acoustic and tactile signals*

IEC 61310-2:2007, *Safety of machinery – Indication, marking and actuation – Part 2: Requirements for marking*

IEC 61310-3:2007, *Safety of machinery – Indication, marking and actuation – Part 3: Requirements for the location and operation of actuators*

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IEC 61786-2:2014<sup>8</sup>, *Measurement of DC magnetic fields, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings – Part 2: ~~Guidance~~ Basic standard for measurements*

IEC 61936-1:2010<sup>9</sup>, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*  
IEC 61936-1:2010/AMD1:2014

IEC 62061:2005<sup>10</sup>, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*  
IEC 62061:2005/AMD1:2012  
IEC 62061:2005/AMD2:2015

IEC 62271 (all parts), *High-voltage switchgear and controlgear*

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

IEC 82079-1:2012, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements*

CISPR 11:2015<sup>11</sup>, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

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CISPR 11:2015/AMD2:2019

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~~ISO/IEC Guide 51, Safety aspects — Guidelines for their inclusion in standards~~

<sup>8</sup> ~~To be published.~~

<sup>9</sup> A consolidated version of this publication exists, comprising IEC 61936-1:2010 and IEC 61936-1:2010/AMD1:2014.

<sup>10</sup> A consolidated version of this publication exists, comprising IEC 62061:2005, IEC 62061:2005/AMD1:2012 and IEC 62061:2005/AMD2:2015.

<sup>11</sup> A consolidated version of this publication exists, comprising CISPR 11:2015, CISPR 11:2015/AMD1:2016 and CISPR 11:2015/AMD2:2019.

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IEEE C95.6:2002, *IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz*

ISO 3864-1:2011, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 6385:2016, *Ergonomics principles in the design of work systems*

ISO 7000, *Graphical symbols for use on equipment* — ~~Registered symbols~~ (available at <http://www.graphical-symbols.info/equipment>)

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

ISO 12100:2010, *Safety of machinery – General principles for design – Risk assessment and risk reduction*

ISO 13577-1:2016, *Industrial furnaces and associated processing equipment – Safety – Part 1: General requirements*

ISO 13577-2:2014, *Industrial furnaces and associated processing equipment – Safety – Part 2: Combustion and fuel handling systems*

ISO 13577-3:2016, *Industrial furnaces and associated processing equipment – Safety – Part 3: Generation and use of protective and reactive atmosphere gases*

ISO 13732-1:2006, *Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces*

~~ISO 13849 (all parts), Safety of machinery – Safety-related parts of control systems~~

ISO 13849-1:2015, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

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ISO 13857:2008, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

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ISO 14159:2002, *Safety of machinery – Hygiene requirements for the design of machinery*

ISO 19353:2019, *Safety of machinery – Fire prevention and fire protection*



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Safety in installations for electroheating and electromagnetic processing –  
Part 1: General requirements**

**Sécurité dans les installations destinées au traitement électrothermique  
et électromagnétique –  
Partie 1: Exigences générales**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY IN INSTALLATIONS FOR ELECTROHEATING  
AND ELECTROMAGNETIC PROCESSING –****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.
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- 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 60519-1 has been prepared by IEC technical committee 27: Industrial electroheating and electromagnetic processing.

This sixth edition cancels and replaces the fifth edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) removal of noise from the scope;
- b) clarification of EMC requirements;
- c) risk classification of hazards based on emission for all processing frequencies;
- d) clarification of boundaries between IEC 60519 (all parts) and ISO 13577 (all parts).

The text of this International Standard is based on the following documents:

FDIS	Report on voting
27/1121/FDIS	27/1123/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

In this document, the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- **terms** used throughout this standard which have been defined in Clause 3: **in bold type**.

A list of all parts in the IEC 605019 series, published under the general title *Safety in installations for electroheating and electromagnetic processing*, can be found on the IEC website.

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

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

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



## INTRODUCTION

These general requirements apply to all industrial **EH** and **EPM equipment**, unless an exception is given in the Particular requirements dealing with specific equipment in other parts of the IEC 60519 series. The provisions of other parts of the IEC 60519 series that directly apply to specific types of equipment take precedence over the provisions of this document.

Annex I and Annex J provide orientation with respect to the application of ISO 13577-1 in combination with this document.

This document presumes that the installation or equipment is operated and maintained only by personnel consisting of **skilled** or **instructed persons**.

This document is intended for verifying whether the **EH** or **EPM installation** or **equipment** meets the safety requirements of this document through design, site acceptance tests, routine tests or inspection.

Annex H provides a guide on the use of this document and a list of typical industrial **EH** and **EPM** processes.

# SAFETY IN INSTALLATIONS FOR ELECTROHEATING AND ELECTROMAGNETIC PROCESSING –

## Part 1: General requirements

### 1 Scope

This part of IEC 60519 specifies the general safety requirements for industrial installations or equipment intended for **electroheating (EH)** and **electroheating** based treatment technologies as well as for **electromagnetic processing of materials (EPM)**. This document deals with the significant hazards, hazardous situations or hazardous events relevant to industrial **EH** and **EPM equipment**, as listed in Annex A, for **normal operation** and for **single fault condition** as well as under conditions of reasonably foreseeable misuse.

This document specifies the requirements intended to be met by the **manufacturer** to ensure the safety of persons and property during the complete life cycle of the equipment from design through commissioning, operation, maintenance, inspection, to decommissioning, as well as in the event of foreseeable **single fault condition** that can occur in the equipment.

The rated voltage of **EH** and **EPM equipment** can be in the range of low voltage; details are given in 4.2.

This document does not apply to equipment and appliances within the scope of

- IEC 60079 (all parts) – i.e. equipment intended for use in potentially explosive atmospheres;
- IEC 60335 (all parts) – i.e. household, commercial and similar electrical appliances, including room heating;
- IEC 60601 (all parts) – i.e. medical electrical equipment;
- IEC 60974 (all parts) – i.e. arc welding equipment;
- IEC 61010 (all parts) – i.e. equipment for laboratory use.

This document does not provide requirements for type testing.

NOTE Industrial equipment covered by this document is typically produced as a single unit or a very small number of units; such unit usually has a very high value and can cause severe harm at disintegration.

This document does not address data security and hazards arising from neglect of security.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60071-1:2006<sup>1</sup>, *Insulation co-ordination – Part 1: Definitions, principles and rules*  
IEC 60071-1:2006/AMD1:2010

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<sup>1</sup> A consolidated version of this publication exists, comprising IEC 60071-1:2006 and IEC 60071-1:2006/AMD1:2010.

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60204-11:2018, *Safety of machinery – Electrical equipment of machines – Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60335-1:2010<sup>2</sup>, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60335-1:2010/AMD1:2013

IEC 60335-1:2010/AMD2:2016

IEC 60335-2-24, *Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers*

IEC 60335-2-89, *Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor*

IEC 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-41:2005<sup>3</sup>, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-41:2005/AMD1:2017

IEC 60364-4-42:2010<sup>4</sup>, *Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects*

IEC 60364-4-42:2010/AMD1:2014

IEC 60364-4-44:2007<sup>5</sup>, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-4-44:2007/AMD1:2015

IEC 60364-4-44:2007/AMD2:2018

IEC 60364-5-53:2001<sup>6</sup>, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*

IEC 60364-5-53:2001/AMD1:2002

IEC 60364-5-53:2001/AMD2:2015

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

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<sup>2</sup> A consolidated version of this publication exists, comprising IEC 60335-1:2010, IEC 60335-1:2010/AMD1:2013 and IEC 60335-1:2010/AMD2:2016.

<sup>3</sup> A consolidated version of this publication exists, comprising IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1:2017.

<sup>4</sup> A consolidated version of this publication exists, comprising IEC 60364-4-42:2010 and IEC 60364-4-42:2010/AMD1:2014.

<sup>5</sup> A consolidated version of this publication exists, comprising IEC 60364-4-44:2007, IEC 60364-4-44:2007/AMD1:2015 and IEC 60364-4-44:2007/AMD2:2018.

<sup>6</sup> A consolidated version of this publication exists, comprising IEC 60364-5-53:2001, IEC 60364-5-53:2001/AMD1:2002 and IEC 60364-5-53:2001/AMD2:2015.

IEC 60398:2015, *Installations for electroheating and electromagnetic processing – General performance test methods*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60529:1989, *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 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60865-1:2011, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC 60909-0:2016, *Short-circuit currents in three-phase a.c. systems – Part 0: Calculation of currents*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-7:2014, *Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61082-1:2014, *Preparation of documents used in electrotechnology – Part 1: Rules*

IEC 61310-1:2007, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, acoustic and tactile signals*

IEC 61310-2:2007, *Safety of machinery – Indication, marking and actuation – Part 2: Requirements for marking*

IEC 61310-3:2007, *Safety of machinery – Indication, marking and actuation – Part 3: Requirements for the location and operation of actuators*

IEC 61439 (all parts), *Low-voltage switchgear and controlgear assemblies*

IEC 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*

IEC 61786-1:2013, *Measurement of DC magnetic, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings – Part 1: Requirements for measuring instruments*

IEC 61786-2:2014, *Measurement of DC magnetic, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings – Part 2: Basic standard for measurements*

IEC 61936-1:2010<sup>7</sup>, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*  
IEC 61936-1:2010/AMD1:2014

IEC 62061:2005<sup>8</sup>, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

IEC 62061:2005/AMD1:2012

IEC 62061:2005/AMD2:2015

IEC 62271 (all parts), *High-voltage switchgear and controlgear*

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IEC 82079-1:2012, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements*

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ISO 13577-2:2014, *Industrial furnaces and associated processing equipment – Safety – Part 2: Combustion and fuel handling systems*

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<sup>7</sup> A consolidated version of this publication exists, comprising IEC 61936-1:2010 and IEC 61936-1:2010/AMD1:2014.

<sup>8</sup> A consolidated version of this publication exists, comprising IEC 62061:2005, IEC 62061:2005/AMD1:2012 and IEC 62061:2005/AMD2:2015.

<sup>9</sup> A consolidated version of this publication exists, comprising CISPR 11:2015, CISPR 11:2015/AMD1:2016 and CISPR 11:2015/AMD2:2019.

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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**SÉCURITÉ DANS LES INSTALLATIONS DESTINÉES AU TRAITEMENT  
ÉLECTROTHERMIQUE ET ÉLECTROMAGNÉTIQUE –****Partie 1: Exigences générales****AVANT-PROPOS**

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La Norme internationale IEC 60519-1 a été établie par le comité d'études 27 de l'IEC: Chauffage électrique industriel et traitement électromagnétique.

Cette sixième édition annule et remplace la cinquième édition parue en 2015. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) suppression du bruit du domaine d'application;
- b) clarification des exigences relatives à la CEM;

- c) classification des risques associés aux dangers, fondée sur l'émission pour toutes les fréquences de traitement;
- d) clarification des limites entre l'IEC 60519 (toutes les parties) et l'ISO 13577 (toutes les parties).

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
27/1121/FDIS	27/1123/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Dans le présent document, les caractères d'imprimerie suivants sont utilisés:

- exigences et définitions: caractères romains;
- NOTES: petits caractères romains;
- **termes** utilisés dans l'ensemble de la présente norme qui ont été définis à l'Article 3: **caractères gras**.

Une liste de toutes les parties de la série IEC 60519, publiées sous le titre général *Sécurité dans les installations destinées au traitement électrothermique et électromagnétique*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives au document recherché. À cette date, le document sera

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## INTRODUCTION

Les présentes exigences générales s'appliquent à tous les **équipements** industriels **EH** et **EPM**, à moins qu'une exception ne soit indiquée dans les Exigences particulières traitant d'un équipement spécifique dans d'autres parties de la série IEC 60519. Les dispositions des autres parties de la série IEC 60519 qui s'appliquent directement à des types spécifiques d'équipement prévalent sur les dispositions du présent document.

L'Annexe I et l'Annexe J fournissent une orientation quant à l'application de l'ISO 13577-1 conjointement au présent document.

Le présent document part du principe que les installations ou les équipements sont exploités et entretenus exclusivement par un personnel composé de **personnes qualifiées** ou **averties**.

Le présent document est destiné à vérifier que l'**installation** ou l'**équipement EH** ou **EPM** satisfait à ses exigences de sécurité en matière de conception, d'essais d'acceptation sur site, d'essais individuels de série ou d'examen.

L'Annexe H fournit un guide d'utilisation du présent document et une liste de processus industriels **EH** et **EPM** types.

# SÉCURITÉ DANS LES INSTALLATIONS DESTINÉES AU TRAITEMENT ÉLECTROTHERMIQUE ET ÉLECTROMAGNÉTIQUE –

## Partie 1: Exigences générales

### 1 Domaine d'application

La présente partie de l'IEC 60519 spécifie les exigences générales de sécurité relatives aux installations ou équipements industriels destinés à l'**électrothermie (EH)** et aux technologies de traitement fondées sur l'**électrothermie** ainsi qu'au **traitement électromagnétique des matériaux (EPM)**. Le présent document traite des dangers significatifs, des situations dangereuses ou des événements dangereux liés aux **équipements** industriels **EH** et **EPM**, tels qu'ils sont répertoriés dans l'Annexe A, dans des **conditions de fonctionnement normal** et en **condition de premier défaut** ainsi que dans des conditions de mauvaise utilisation raisonnablement prévisibles.

Le présent document spécifie les exigences destinées à être satisfaites par le **constructeur** pour assurer la sécurité des personnes et des biens pendant le cycle de vie complet de l'équipement, de sa conception à sa mise en service, son exploitation, sa maintenance, son examen, jusqu'à sa mise à l'arrêt définitif, ainsi qu'en cas de **condition de premier défaut** prévisible pouvant se produire dans l'équipement.

La tension assignée des **équipements EH** et **EPM** peut se situer dans la plage de basse tension; des informations détaillées sont fournies en 4.2.

Le présent document ne s'applique pas aux équipements et appareils couverts par les domaines d'application de:

- l'IEC 60079 (toutes les parties) – c'est-à-dire les équipements destinés à l'utilisation dans des atmosphères potentiellement explosives;
- l'IEC 60335 (toutes les parties) – c'est-à-dire les appareils électrodomestiques, commerciaux et analogues, y compris le chauffage de locaux;
- l'IEC 60601 (toutes les parties) – c'est-à-dire l'équipement électromédical;
- l'IEC 60974 (toutes les parties) – c'est-à-dire le matériel de soudage à l'arc;
- l'IEC 61010 (toutes les parties) – c'est-à-dire le matériel utilisé en laboratoire.

Le présent document ne spécifie pas les exigences relatives aux essais de type.

NOTE L'équipement industriel couvert par le présent document est généralement produit sous la forme d'une seule unité ou d'un petit nombre d'unités; une telle unité a généralement une très grande valeur et peut provoquer de graves dommages en cas de désintégration.

Le présent document ne traite pas de la sécurité des données ni des dangers engendrés par un défaut de sûreté.

### 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60071-1:2006<sup>1</sup>, *Coordination de l'isolement – Partie 1: Définitions, principes et règles*  
IEC 60071-1:2006/AMD1:2010

IEC 60204-1:2016, *Sécurité des machines – Équipement électrique des machines – Partie 1: Exigences générales*

IEC 60204-11:2018, *Sécurité des machines – Équipement électrique des machines – Partie 11: Exigences pour les équipements fonctionnant à des tensions supérieures à 1 000 V en courant alternatif ou 1 500 V en courant continu et ne dépassant pas 36 kV*

IEC 60228:2004, *Âmes des câbles isolés*

IEC 60335-1:2010<sup>2</sup>, *Appareils électrodomestiques et analogues – Sécurité – Partie 1: Exigences générales*

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<sup>1</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60071-1:2006 et l'IEC 60071-1:2006/AMD1:2010.

<sup>2</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60335-1:2010, l'IEC 60335-1:2010/AMD1:2013 et l'IEC 60335-1:2010/AMD2:2016.

<sup>3</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60364-4-41:2005 et l'IEC 60364-4-41:2005/AMD1:2017.

<sup>4</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60364-4-42:2010 et l'IEC 60364-4-42:2010/AMD1:2014.

<sup>5</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60364-4-44:2007, l'IEC 60364-4-44:2007/AMD1:2015 et l'IEC 60364-4-44:2007/AMD2:2018.



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<sup>6</sup> Il existe une version consolidée de cette publication comprenant l'IEC 60364-5-53:2001, l'IEC 60364-5-53:2001/AMD1:2002 et l'IEC 60364-5-53:2001/AMD2:2015.

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<sup>7</sup> Il existe une version consolidée de cette publication comprenant l'IEC 61936-1:2010 et l'IEC 61936-1:2010/AMD1:2014.

<sup>8</sup> Il existe une version consolidée de cette publication comprenant l'IEC 62061:2005, l'IEC 62061:2005/AMD1:2012 et l'IEC 62061:2005/AMD2:2015.

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