

INTERNATIONAL STANDARD



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

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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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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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 60519 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 60071-1:2006¹, *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 60335-1:2010², *Household and similar electrical appliances – Safety – Part 1: General requirements*
IEC 60335-1:2010/AMD1:2013
IEC 60335-1:2010/AMD2:2016

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

² 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 60364-4-41:2005³, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*
IEC 60364-4-41:2005/AMD1:2017

IEC 60364-4-42:2010⁴, *Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects*
IEC 60364-4-42:2010/AMD1:2014

IEC 60364-4-44:2007⁵, *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 60364-5-53:2001⁶, *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 60398:2015⁷, *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*

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

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

⁵ 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.

⁶ 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.

⁷ ~~To be published.~~