

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Safety in electroheating installations –
Part 10: Particular requirements for electrical resistance trace heating systems
for industrial and commercial applications**

**Sécurité dans les installations électrothermiques –
Partie 10: Exigences particulières pour les systèmes de chauffage par traçage à
résistance électrique pour applications industrielles et commerciales**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY IN ELECTROHEATING INSTALLATIONS –

Part 10: Particular requirements for electrical resistance trace heating systems for industrial and commercial applications

FOREWORD

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International Standard IEC 60519-10 has been prepared by IEC technical committee 27: Industrial electroheating and electromagnetic processing.

This second edition cancels and replaces the first edition published in 2005. This edition constitutes a technical revision.

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

- The structure has been amended and adjusted to IEC 60519-1:2010;
- References to IEC 62395-1¹ and IEC 62395-2² have been completed.

1 Second edition to be published.

2 First edition (replacing IEC/TS 62395-2:2008) to be published.

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

| CDV | Report on voting |
|------------|------------------|
| 27/853/CDV | 27/873/RVC |

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.

A list of all parts in the IEC 60519 series, published under the general title *Safety in electroheating installations*, can be found on the IEC website.

The clauses of parts of the IEC 60519 series (hereinafter called Particular requirements) supplement or modify the corresponding clauses of IEC 60519-1:2010 (*General requirements* hereinafter called Part 1).

This part of IEC 60519 is to be read in conjunction with Part 1. It supplements or modifies the corresponding clauses of Part 1. Where the text indicates an "addition" to or a "replacement" of the relevant provision of Part 1, these changes are made to the relevant text of Part 1. Where no change is necessary, the words "This clause of Part 1 is applicable" are used. When a particular subclause of Part 1 is not mentioned in this part, that subclause applies as far as is reasonable.

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Additional specific provisions to those in Part 1, given as individual clauses or subclauses, are numbered starting from 101.

- NOTE The following numbering system is used:
- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
 - unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
 - additional annexes are lettered AA, BB, etc.

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

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

INTRODUCTION

It is the objective of this standard that, when in accordance with the standard, electrical trace heating systems operate safely under their normal defined conditions of use, by

- a) employing heaters of the appropriate construction and meeting the test criteria detailed in IEC 62395-1;
- b) operating at safe temperatures when designed, installed, and maintained in accordance with IEC 62395-2;
- c) having at least the minimum levels of overcurrent and ground-fault protection, and an evenly distributed electrically conductive metallic braid, sheath or other equivalent electrically conductive material, as specified in IEC 62395-1 and IEC 62395-2.

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SAFETY IN ELECTROHEATING INSTALLATIONS –

Part 10: Particular requirements for electrical resistance trace heating systems for industrial and commercial applications

1 Scope and object

This clause of Part 1 is replaced by the following.

Replacement:

This part of IEC 60519 provides safety requirements for electrical resistance trace heating systems used in industrial and commercial applications for piping, vessels, roofs, concrete slab heating and other similar applications.

This standard pertains to trace heating systems that may comprise either factory fabricated or field (work-site) assembled units, and which may be series heater cables, parallel heater cables, heater pads or heater panels that have been assembled and/or terminated in accordance with manufacturer's instructions.

Typical applications include but are not limited to

- the freeze protection of pipes, tanks and vessels, including fire water systems;
- maintaining required temperatures of equipment, including pipes, tanks and vessels;
- earth thermal storage,
- hot water temperature maintenance;
- snow melting of surfaces;
- de-icing of roofs and gutters.

This standard does not include or provide for any requirements in potentially explosive atmospheres.

This part of IEC 60519 does not cover induction, impedance or skin effect heating.

NOTE Specific requirements and test criteria for electrical resistance trace heating systems and design, installation, and maintenance requirements for these systems are detailed in IEC 62395-1 and IEC 62395-2.

This standard provides general safety requirements for the installation, operation, maintenance and repair of systems and individual circuits and for trace heating systems designs. These safety considerations concern the protection of persons and the environment against dangers of electrical origin and also against certain dangers of non-electrical origin, common to all types of equipment and installations.

2 Normative references

This clause of Part 1 is applicable, except as follows.

Additions:

IEC 60519-1:2010, *Safety in electroheating installations – Part 1: General requirements*

IEC 62395-1³, *Electrical resistance trace heating systems for industrial and commercial applications – Part 1: General and testing requirements*

IEC 62395-2⁴, *Electrical resistance trace heating systems for industrial and commercial applications – Part 2: Application guide for system design, installation and maintenance*

3 Terms and definitions

This clause of Part 1 is applicable with the following additions.

Additions:

3.101

ambient temperature

average temperature of air or another medium in the vicinity of the equipment

Note 1 to entry: Where electrical trace heaters are enclosed in thermal insulation, the ambient temperature is the temperature exterior to such thermal insulation.

[SOURCE: IEC 60050-826:2004, 826-10-03, modified – The content of the note has been modified]

3.102

branch circuit

portion of the wiring installation between the overcurrent device protecting the circuit and the trace heater(s)

3.103

end termination

termination, which may be heat producing, applied to a trace heater at the end opposite to that where the power is supplied

[SOURCE: IEC 60050-426:2008, 426-20-04]

3.104

factory fabricated unit

trace heater cable, tape or device, including the necessary terminations and connections, assembled by the manufacturer

3.105

field assembled unit

trace heaters supplied in bulk with terminating components to be assembled at the work site

3.106

heat loss

energy flow from a pipe, vessel or equipment to its surroundings

3.107

heater pad

trace heater comprising series or parallel connected elements having sufficient flexibility to conform to the shape of the surface to be heated

³ Second edition to be published.

⁴ First edition (replacing IEC/TS 62395-2:2008) to be published.

3.108**heater panel**

non-flexible trace heater comprising series or parallel connected elements fabricated to conform to the general shape of the surface to be heated

3.109**integral component**

component such as a heat shrink termination, a cold lead connection, a moulded end seal or a splice, which conforms to the general shape of the trace heater or surface heater and is exposed to the same environment as the trace heater or surface heater, which may be factory-fabricated or field-assembled, and which is not intended to be re-used in the event of a repair or modification

3.110**minimum ambient temperature**

lowest ambient temperature specified at which the trace heater is operable and performs according to specified requirements

3.111**sheath**

uniform and continuous metallic or non-metallic outer covering enclosing the trace heater, used to provide protection for the cable against influence from the surroundings (corrosion, moisture, etc.)

3.112**sheath temperature**

temperature of the outermost continuous covering that may be exposed to the surrounding atmosphere

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3.113**temperature sensor****temperature sensing element**

device designed to respond to temperature providing an electrical signal or mechanical operation

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3.114**thermal insulation**

material having air- or gas-filled pockets, void spaces, or heat reflecting surfaces that, when properly applied, retards the transfer of heat

3.115**trace heater**

device designed for the purpose of producing heat on the principle of electrical resistance and typically composed of one or more metallic conductors or an electrically conductive material, suitably electrically insulated and protected

Note 1 to entry: This can be in the form of a trace heater cable, heater panel or heater pad.

3.116**trace heater cable**

circular or flattened cable shaped construction with one or more discrete or continuous electrically insulated heating elements

3.117**trace heater unit**

series trace heater cable, parallel trace heater cable, heater pad or heater panel suitably terminated in conformity with the manufacturer's instructions

3.118**trace heating**

utilisation of electric trace heater cables, pads, panels and support components, for the purpose of raising or maintaining temperatures

3.119**weather barrier**

material that, when installed on the outer surface of thermal insulation, protects the thermal insulation from water or other liquids, from physical damage caused by sleet, wind or mechanical abuse, and deterioration caused by solar radiation or atmospheric contamination

3.120**workpiece**

object to which a trace heater is applied

4 Classification of electroheating equipment

This clause of Part 1 is applicable, except as follows.

Addition:

NOTE The majority of trace heaters are mains frequency equipment.

5 General requirements

This clause of Part 1 is applicable, except as follows.

Additions:

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5.101 Trace heating system

Electrical resistance trace heating systems shall be operated and maintained to ensure safe operation. This includes the requirement for metallic sheath, braid, screen, or equivalent conductive material, overcurrent and ground fault equipment protection for each branch circuit, and control and temperature requirements.

Specific requirements for the electrical, thermal and mechanical properties of trace heating systems shall apply according to IEC 62395-1 and IEC 62395-2.

All parts of a trace heater unit intended for use in contact with potable water shall be constructed of materials that meet the relevant toxicity requirement.

5.102 Typical applications

Trace heating systems can be grouped into four different types of installations. These are characterized by different requirements for testing, and trace heating systems are usually certified for a specific type of installation or application. Typical applications for the different types of installation are as follows:

- a) installations of trace heating on pipes, vessels and associated equipment – applications include:
 - freeze protection and temperature maintenance,
 - hot water lines,
 - oil and chemical lines,
 - sprinkler systems;

- b) outdoor exposed area installations of trace heating – applications include:
 - roof de-icing,
 - gutter and downspout de-icing,
 - catch basins and drains,
 - rail heating;
- c) installation with embedded trace heating – applications include:
 - snow melting,
 - frost heave protection,
 - floor warming,
 - energy storage systems,
 - door frames;
- d) installations with trace heating inside conduit or piping – applications include:
 - snow melting – in conduit,
 - frost heave protection – in conduit,
 - floor warming – in conduit,
 - energy storage systems – in conduit,
 - internal trace heating of potable water lines,
 - enclosed drains and culverts.

5.103 Use of certified equipment

Trace heaters shall be certified for use in specific installations or applications and meet the applicable requirements.

[IEC 60519-10:2013](#)

Connections and end terminations are either integral components or separate components. Integral components, whether intended to be factory fabricated or field assembled, shall be subjected to the same certification requirements as the trace heater. System components, other than integral components, shall be evaluated in accordance with standards relevant to their construction and use.

It is acceptable to substitute components of a trace heating system in accordance with the following:

- a) components specifically listed in the manufacturer's installation or maintenance instructions shall not be replaced with similar parts unless authorized by the trace heating system manufacturer;
- b) generic components specified in the manufacturer's installation or maintenance instructions may be replaced with any suitably rated and certified (if applicable) component;
- c) components that are part of a wiring system that supplies power to the trace heater may be replaced with suitable components acceptable to the local regulating authority.

6 Isolation and switching

This clause of Part 1 is applicable as related to the following required items:

- a) a means of isolating all line conductors from the supply;
- b) overcurrent protection;
- c) ground fault equipment protection.