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

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ELECTRICAL RESISTANCE TRACE HEATING SYSTEMS FOR INDUSTRIAL AND COMMERCIAL APPLICATIONS –

Part 2: Application guide for system design, installation and maintenance

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This document is published as an IEC/IEEE Dual Logo standard.

This standard cancels and replaces IEC 62395-2:2013. This edition constitutes a technical revision.

This standard includes the following significant technical changes with respect to IEC 62395-2:2013:

- a) Design considerations for trace heating on sprinkler systems have been expanded and a figure has been added to illustrate how to avoid undue shadowing of spray patterns from insulated sprigs close to sprinkler heads;
- b) Specific details of design considerations for trace heating for emergency eyewash units and safety showers have been added.

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

Draft	Report on voting
27/1183/FDIS	27/1185/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with the rules given in the ISO/IEC Directives, Part 2, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications/.

This standard is intended to be used in conjunction with IEC/IEEE 62395-1.

A list of all parts in the IEC 62395 series, under the general title *Electrical resistance trace heating systems for industrial and commercial applications*, can be found on the IEC website.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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INTRODUCTION

IEC/IEEE 62395-1 provides the essential requirements and testing appropriate to electrical resistance trace heating equipment used in industrial and commercial applications. While some of this work already exists in national or international standards, this document has collated much of this existing work and added considerably to it.

IEC/IEEE 62395-2 provides detailed recommendations for the system design, installation, maintenance and repair of electrical resistance trace heating systems in industrial and commercial applications which can include piping, vessels, roofs and concrete slab heating applications.

It is the objective of the IEC/IEEE 62395 series that, when in normal use, electrical trace heating systems operate safely under their defined conditions of use, by

- a) employing heaters of the appropriate construction so as to meet the test criteria and requirements detailed in IEC/IEEE 62395-1. The construction includes a metallic sheath, braid, screen or equivalent electrically conductive covering;
- b) operating at safe temperatures when designed, installed, and maintained in accordance with IEC/IEEE 62395-2;
- c) having at least the minimum levels of overcurrent and earth-fault protection required in IEC/IEEE 62395-1 and IEC/IEEE 62395-2.

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ELECTRICAL RESISTANCE TRACE HEATING SYSTEMS FOR INDUSTRIAL AND COMMERCIAL APPLICATIONS –

Part 2: Application guide for system design, installation and maintenance

1 Scope

This part of IEC/IEEE 62395 provides detailed recommendations for the system design, installation, maintenance and repair of electrical resistance trace heating systems in industrial and commercial applications. This document does not include or provide for any applications in potentially explosive atmospheres.

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

The products covered by this document are intended to be installed by persons who are suitably trained in the techniques required and that only trained personnel carry out especially critical work, such as the installation of connections and terminations. Installations are intended to be carried out under the supervision of a qualified person who has undergone supplementary training in electric trace heating systems.

This document does not cover induction, impedance or skin effect heating.

Trace heating systems and surface heating systems can be grouped into different types of installations. These are characterized by different requirements for testing and are usually certified for a specific type of installation or application. Typical applications for the different types of installation are shown in Table 1.

Table 1 – Trace heater and surface heater types and related attributes

Trace heater type	Intended installations	Examples of installations	Required attributes
A	Insulated surfaces (including pipe)	Hot water lines Freeze protection Grease lines Fuel oil lines Pre-insulated pipe Below grade trace heating Sprinkler systems	Dielectric, thermal, mechanical, moisture exclusion, and performance characteristics verification Sprinkler system verification (if specified for use)
B	Outdoor exposed areas	Roof deicing Gutter and downspouts deicing Catch basins and drains Rail heating systems	Dielectric, thermal, mechanical, moisture exclusion, and performance characteristics verification Increased moisture resistance UV and condensation resistance Resistance to cutting Abrasion resistance Tension test Rail system tests (if specified for use)

Trace heater type	Intended installations	Examples of installations	Required attributes
C	Installations with embedded trace heating	Embedded snow melting Embedded frost heave protection Embedded floor warming Embedded energy storage systems Embedded door frames	Dielectric, thermal, mechanical, moisture exclusion, and performance characteristics verification Resistance to cutting Resistance to crushing
D	Installations with trace heater inside conduit or piping	Embedded snow melting Embedded frost heave protection Embedded floor warming Embedded energy storage systems Embedded door frames Internal trace heating for freeze protection of potable water lines Enclosed drains and culverts	Dielectric, thermal, mechanical, moisture exclusion, and performance characteristics verification Increased moisture resistance (pressurized or non-pressurized) Pull-strength evaluation
NOTE Trace heating systems intended for use in explosive atmospheres are the subject of IEC/IEEE 60079-30-1 and IEC/IEEE 60079-30-2.			

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/IEEE 62395-1:2024, *Electrical resistance trace heating systems for industrial and commercial applications – Part 1: General and testing requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC/IEEE 62395-1 apply.

ISO, IEC and IEEE maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEEE Standards Dictionary Online: available at <http://dictionary.ieee.org>

NOTE General definitions are given in the International Electrotechnical Vocabulary, IEC 60050 (all parts).

4 Surface heating of vessels and piping systems

4.1 Application description

4.1.1 General

Piping and vessels often utilise surface-mounted trace heating systems to maintain water above freezing-point and to maintain process fluids and gases at given temperature levels. The trace heaters compensate for heat losses to the environment that are reduced but not eliminated by thermal insulation.

Equipment subject to ultraviolet exposure can degrade due to surface oxidation, which can possibly lead to surface embrittlement and cracking. Corrosive atmospheres can affect the same exposed surfaces and can accelerate degradation of surfaces that are also susceptible to ultraviolet exposure. Chemical exposure can affect all equipment, whether covered by thermal insulation or not.

The trace heating equipment for piping and vessels is often protected from corrosion and ultraviolet exposure to some degree by the thermal insulation. However, these systems can have components that are exposed to the environment such as electrical connection components and weather barrier around the thermal insulation. The selection of trace heating equipment should include a review of the suitability of equipment to the expected environmental conditions.

4.1.3 Trace heating systems considerations

Trace heating systems can range from simple pipe freeze protection in commercial buildings to process temperature maintenance and heat-up applications in large complex piping/vessel systems in industrial facilities. The details required for design can vary based on the complexity of the application. Control systems and requirements for monitoring can also vary depending on the control and design requirements.

Trace heating equipment should be chosen that is suitable for the application. For example, plastic piping has a much lower maximum exposure temperature than metallic piping. The trace heating and control system should keep the piping temperature within the allowed range.

Higher temperature processes should utilize trace heating and thermal insulation equipment that are suitable for the maximum exposure temperatures.

4.2 Design information – General

4.2.1 General

The requirements for system design include the development of basic heat loss (load) requirements, installation instructions for electrical, control and monitoring requirements, and trace heating system layouts for large, detailed, complex installations such as industrial facilities. While each design component requires individual treatment, the final system should be evaluated as an integration of these component parts.

Trace heating system design should conform to all IEC requirements for the use of electrical equipment and to the requirements of this document. Consideration should be given to the maintenance of the trace heating systems to maintain energy efficiency and to routine testing of the installed systems for safe and proper operation.

Persons involved in the design and planning of electric trace heating systems should be suitably trained in all techniques required.

4.2.2 Electrical system design

The evaluation of electrical resistance heating systems includes an initial assessment of energy requirements and the associated electrical distribution equipment. The selection of the type of trace heating equipment and the control equipment affects the requirements of the electrical system design. Additional information is given in 4.4.