IEC/IEEE 60079-30-1

Edition 2.0 2025-09

# INTERNATIONAL STANDARD

**Explosive atmospheres -**
**Part 30-1: Electrical resistance trace heating - General and testing requirements**



ICS 29.260.20

ISBN 978-2-8327-0629-9

IEC/IEEE 60079-30-1:2025-09(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue
New York, NY 10016-5997
United States of America
stds.ipr@ieee.org
www.ieee.org

**About the IEC**
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About the IEEE**
IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE and its members inspire a global community through its highly cited publications, conferences, technology standards, and professional and educational activities.

**About IEC/IEEE publications**
The technical content of IEC/IEEE publications is kept under constant review by the IEC and IEEE. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

**IEC publications search - webstore.iec.ch/advsearchform**
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - webstore.iec.ch/justpublished**
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - webstore.iec.ch/csc**
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

**IEC Products & Services Portal - products.iec.ch**
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

**Electropedia - www.electropedia.org**
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



**Warning! Make sure that you obtained this publication from an authorized distributor.**

# CONTENTS

# Explosive atmospheres - Part 30-1: Electrical resistance trace heating - General and testing 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 document(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.

   IEEE Standards documents are developed within IEEE Societies and Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board. IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of IEEE and serve without compensation. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards. Use of IEEE Standards documents is wholly voluntary. *IEEE documents are made available for use subject to important notices and legal disclaimers (see* https://standards.ieee.org/ipr/disclaimers.html *for more information).*

   IEC collaborates closely with IEEE in accordance with conditions determined by agreement between the two organizations. This Dual Logo International Standard was jointly developed by the IEC and IEEE under the terms of that agreement.

2) The formal decisions of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees. The formal decisions of IEEE on technical matters, once consensus within IEEE Societies and Standards Coordinating Committees has been reached, is determined by a balanced ballot of materially interested parties who indicate interest in reviewing the proposed standard. Final approval of the IEEE standards document is given by the IEEE Standards Association (IEEE SA) Standards Board.

3) IEC/IEEE Publications have the form of recommendations for international use and are accepted by IEC National Committees/IEEE Societies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC/IEEE Publications is accurate, IEC or IEEE cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications (including IEC/IEEE Publications) transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC/IEEE Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC and IEEE do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC and IEEE are not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or IEEE or their directors, employees, servants or agents including individual experts and members of technical committees and IEC National Committees, or volunteers of IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board, for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC/IEEE Publication or any other IEC or IEEE Publications.

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 implementation of this IEC/IEEE Publication may require use of material covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. IEC or IEEE shall not be held responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patent Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

IEC/IEEE 60079-30-1 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres, in cooperation with the Petroleum & Chemical Industry Committee of the IEEE Industrial Applications Society under the IEC/IEEE Dual Logo Agreement.

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

This second edition of IEC/IEEE 60079-30-1 cancels and replaces the first edition of IEC/IEEE 60079-30-1 published in 2015. This edition constitutes a technical revision.

Users of this document are advised that interpretation sheets clarifying the interpretation of this document can be published. Interpretation sheets are available from the IEC webstore and can be found in the "history" tab of the page for each document.

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

The significance of changes between IEC/IEEE 60079-30-1, Edition 1.0 (2015) and IEC/IEEE 60079-30-1, Edition 2.0 (this document) is as listed below:

| | | Type | | |
|---|---|---|---|---|
| **Changes** | **Clause** | **Minor and editorial changes** | **Extension** | **Major technical changes** |
| Redefined Maximum withstand temperature as it applies to the performance benchmark test. | 3.20 | X | | |
| Separated maximum maintain temperature and maximum continuous operating temperature to clarify the meaning of both terms. | 3.15 and 3.16 | X | | |
| Addition of requirements for controllers and high temperature limiters, added specific reference standards. | 4.6.3 | | | C1 |
| Rewrite of the requirements for controlled design as it applies to the application of controllers and high temperature limiters as for use in EPL's. | 4.6.3 | | | C2 |
| Addition of requirement for specifying various temperatures defined by the standard and including them in user documentation. | 4.2 and 7 | | | C3 |
| Connection Integrity (integral components) | 5.1.17 | | X | |
| Applications of Trace Heating in empty conduit | Annex E | | X | |



NOTE The technical changes referred to include the significance of technical changes in the revised IEC Standard, but they do not form an exhaustive list of all modifications from the previous version.

**Explanations:**

**A) Definitions**

**Minor and editorial changes**

clarification
decrease of technical requirements
minor technical change
editorial corrections

These are changes which modify requirements in an editorial or a minor technical way. They include changes of the wording to clarify technical requirements without any technical change, or a reduction in level of existing requirement.

**Extension** addition of technical options

These are changes which add new or modify existing technical requirements, in a way that new options are given, but without increasing requirements for equipment that was fully compliant with the previous standard. Therefore, these will not have to be considered for products in conformity with the preceding edition.

**Major technical changes**

addition of technical requirements
increase of technical requirements

These are changes to technical requirements (addition, increase of the level or removal) made in a way that a product in conformity with the preceding edition will not always be able to fulfil the requirements given in the later edition. These changes have to be considered for products in conformity with the preceding edition. For these changes additional information is provided in clause B) below.

NOTE 1 These changes represent current technological knowledge. However, these changes should not normally have an influence on equipment already placed on the market.

**B) Information about the background of 'Major technical changes'**

C1 There are no additional requirements for temperature controllers and high temperature limiters beyond those of the general industrial standards.

C2 The application of temperature controllers and high temperature limiters shall be as specified.

C3 The documentation shall include the various temperatures specified in the standard.



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

| Draft | Report on voting |
|---|---|
| 31/1867/FDIS | 31/1893/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 document is to be used in conjunction with IEC 60079-0, *Explosive atmospheres - Part 0: Equipment - General requirements* and IEC/IEEE 60079-30-2, *Explosive atmospheres - Part 30-2: Electrical resistance trace heating - Guidance on application for design, installation and maintenance.*

A list of all parts of IEC 60079 series, under the general title *Explosive atmospheres,* 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

– reconfirmed,
– withdrawn, or
– revised.

# INTRODUCTION

IEC/IEEE 60079-30-1 is intended to provide a comprehensive overview of the essential requirements and testing appropriate to electric surface heating equipment used in explosive atmospheres. The requirements of this part of IEC 60079 are considered to be the minimum requirements for Equipment Protection Levels (EPLs) Gb, Gc, Db, and Dc in explosive atmospheres for gases, dusts, and fibres/flyings. While some of this work already exists in national standards or international standards, this document has collated much of this existing work and added to it. This document also contains the minimum requirements for users applying the Division method of area classification.

## 1 Scope

This part of IEC 60079 specifies general and testing requirements for electrical resistance trace heaters for application in explosive atmospheres with the exclusion of those for Equipment Protection Levels (EPL) Ga, Da, Ma and Mb equipment. This document covers trace heaters that comprise either factory or field (worksite) assembled units, and which can be series trace heaters, parallel trace heaters, trace heater pads, or trace heater panels that have been assembled and/or terminated in accordance with the manufacturer's instructions.

This document also includes requirements for termination assemblies and control methods used with trace heating systems. The explosive atmospheres referred to in this document are those defined in IEC 60079-10-1 and IEC 60079-10-2.

Annex F and Annex G outline the application of this document for those users applying the Division method of area classification.

## 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 60050-151, *International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices*



IEC 60079-0, *Explosive atmospheres - Part 0: Equipment - General requirements*

IEC 60079-7, *Explosive atmospheres - Part 7: Equipment protection by increased safety "e"*



IEC/IEEE 60079-30-2, *Explosive atmospheres - Part 30-2: Electrical resistance trace heating - Guidance on application for design, installation and maintenance*

IEC 60695-11-3, *Fire hazard testing - Part 11-3: Test flames - 500 W flames - Apparatus and confirmational test methods*

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

ASTM G155, *Standard practice for operating xenon arc light apparatus for exposure of non-metallic materials*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0, IEC 60079-7, IEC 60050-151 (except as modified by this clause) and the following apply.

ISO and IEC 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

**3.1**
**ambient temperature**
<trace heating> temperature surrounding the object under consideration

Note 1 to entry: Where a trace heater or surface heater is enclosed in thermal insulation, the ambient temperature is the temperature external to the thermal insulation.

**3.1.1**
**maximum ambient temperature**
highest specified ambient temperature

**3.2**
**branch circuit**
<trace heating> portion of the wiring installation between the overcurrent device protecting the circuit and the trace heater unit(s)

**3.3**
**connection**
**termination**
termination or splice used to attach trace heaters or surface heaters to power wiring or to connect sections of these devices

**3.3.1**
**cold lead**
<trace heating> electrically insulated conductor or conductors that do not produce significant heat and are used to connect a trace heater to a branch circuit



**3.3.2**
**end termination**
<trace heating> termination, which can be heat producing, applied to a trace heater at the end opposite to that where the power is supplied



**3.3.3**
**power termination**
<trace heating> termination applied to the end of a trace heater at which the power is supplied

**3.3.4**
**tee**
<trace heating> electrical connection of trace heaters, in series or in parallel, to accommodate a branch of a trace heater

**3.4**
**controlled design**
design where the applicable temperature controller and/or high temperature limiter is used in establishing/limiting the maximum sheath temperature

**3.5**
**electrically conductive covering**
metallic braid, metallic sheath, or alternative covering with sufficient conductivity so that, when bonded to ground, it will allow a ground fault protective device to operate under a fault condition

**3.6**
**factory fabricated**
<trace heating> trace heater unit or set, including the necessary terminations and connections, assembled by the manufacturer

**3.7**
**field assembled**
<trace heating> trace heaters supplied unterminated with terminating components to be assembled at the work site

**3.8**
**heat loss**
<trace heating> energy flow from a workpiece, pipe, or vessel or equipment to its surroundings

**3.9**
**heat sink**
<trace heating> part that conducts and dissipates heat away from a workpiece

Note 1 to entry: Typical heat sinks are pipe shoes, pipe supports and items of large mass such as valve actuators or pump bodies.

**3.10**
**heat transfer aid**
<trace heating> thermally conductive material, such as metallic foil or heat transfer compound used to increase the heat transfer efficiency from trace heaters to the workpiece

**3.11**
**high limit temperature**
<trace heating> maximum allowable temperature of the system, including piping, fluid and trace heating system

**3.12**
**high temperature limiter**
safety device, or combination of safety devices, incorporating a means of sensing temperature and a means of switching power to the trace heater before the maximum surface temperature is exceeded



**3.13**
**integral components**
component such as a heat shrink termination, a cold lead connection, a molded end seal, or a splice, which conforms to the general shape of the trace heater and is exposed to the same environment as the trace heater, which can be factory fabricated or field assembled, and is not intended to be re-used in the event of a repair or modification

**3.14**
**maximum continuous exposure temperature**
<trace heating> highest allowable continuous temperature to which the trace heating system can be exposed while de-energized as declared by the manufacturer

**3.15**
**maximum maintain temperature**
<trace heating> specified maximum workpiece or process temperature that the trace heater is able to maintain as declared by the manufacturer

**3.16**
**maximum continuous operating temperature**
specified maximum workpiece temperature; at which, the trace heater, can operate continuously when energized as declared by the manufacturer

**3.17**
**maximum intermittent exposure temperature**
<trace heating> highest allowable intermittent temperature to which a trace heater can be exposed, as declared by the manufacturer

**3.18**
**maintain temperature**
<trace heating> specified temperature of a workpiece or process that the trace heaters shall be able to maintain continuously when energized as declared by the manufacturer

**3.19**
**maximum sheath temperature**
<trace heating> maximum temperature of the outermost continuous covering of a trace heater

**3.20**
**maximum withstand temperature**
<trace heating> maximum continuous exposure temperature or the maximum intermittent exposure temperature (energized or de-energized) whichever is higher, as declared by the manufacturer

**3.21**
**minimum installation temperature**
<trace heating> minimum temperature at which the trace heating system can be handled and installed

**3.22**
**MI trace heater**
<trace heating> mineral insulated metal sheathed trace heater typically containing one or more heating conductors

**3.23**
**operating voltage**
<trace heating> actual voltage applied to the trace heater when in service



**3.24**
**outdoor exposure**
<trace heating> exposure to outdoor conditions of ultraviolet light and moisture

**3.25**
**overjacket**
<trace heating> continuous layer of non-metallic material applied outside the metallic sheath or screen to protect against corrosion

**3.26**
**parallel trace heater**
<trace heating> heating element that is electrically connected in parallel with another parallel trace heater, either continuously or in zones, so that the power output per lineal length is maintained, irrespective of any change in length for the continuous type or for any number of discrete zones

**3.27**
**rated output**
<trace heating> total power or power per unit length or unit surface area of a trace heater, at rated voltage, temperature and length or area

**3.28**
**rated voltage**
<trace heating> rated value of the voltage assigned by the manufacturer to which operating and performance characteristics of trace heaters are referred

**3.29**
**routine test**
test that is carried out by the manufacturer of the trace heater on all trace heaters during or after the production process

**3.30**
**series trace heater**
<trace heating> heating element electrically connected in series with another series trace heater with a single current path and with a specific resistance at a given temperature for a given length

**3.31**
**sheath**
<trace heating> uniform and continuous metallic or non-metallic outer covering enclosing the trace heater used to provide protection against influence from the surroundings (corrosion, moisture, abrasion etc.)

Note 1 to entry: See overjacket (3.25)

**3.32**
**sheath temperature**
<trace heating> temperature of the outermost continuous covering (braid, sheath, or overjacket) that can be exposed to the surrounding atmosphere

**3.33**
**stabilized design**
<trace heating> design where the temperature of the trace heater, by design and use, stabilizes below the high limit temperature, under the most unfavourable conditions



**3.34**
**start-up current**
<trace heating> current response of a trace heater following energization

**3.35**
**surface heater**
trace heater pad or trace heater panel

**3.36**
**system documentation**
<trace heating> information prepared by the manufacturer to allow satisfactory understanding, installation and safe use of the trace heating system

**3.37**
**temperature controller**
<trace heating> device or combination of devices incorporating a means of sensing temperature and of controlling the energy to the trace heater

**3.38**
**temperature sensor**
device designed to respond to temperature providing an electrical signal or mechanical operation

**3.39**
**thermal insulation**
<trace heating> material having air- or gas-filled pockets, voids, or heat reflecting surfaces that, when properly applied, retards the transfer of heat