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INTERNATIONAL STANDARD

colour inside

Explosive atmospheres – Part 30-2: Electrical resistance trace heating – Application guide for design, installation and maintenance

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EXPLOSIVE ATMOSPHERES –

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FOREWORD

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International Standard IEC/IEEE 60079-30-2 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.

NOTE A list of IEEE participants can be found at the following URL: http://standards.ieee.org/downloads/60079/60079-30-2-2015/60079-30-2-2015_wg-participants.pdf.

This first edition of IEC/IEEE 60079-30-2 cancels and replaces the first edition of IEC 60079-30-2 published in 2007 and constitutes a technical revision.

This edition includes the following significant changes, apart from a general review and updating of the first edition of IEC 60079-30-2, harmonization with IEEE Std 515, with respect to the previous edition:

- the relocation of trace heater product design methodology and requirements to IEC/IEEE 60079-30-1;
- the relocation and/or duplication of information on installation, maintenance, and repair to the MTs under SC31J for their addition into IEC 60079-14, IEC 60079-17, and IEC 60079-19;
- the inclusion of more detailed information on safety showers and eyewash units;
- the introduction of Annexes from IEEE Std 515.

The significance of changes between IEC 60079-30-2, Edition 1.0 (2007) and IEC/IEEE 60079-30-2, Edition 1.0 (2014) is as listed below:

Changes	Clause	Type		
		Minor and editorial changes	**Extension**	**Major technical changes**
Addition of clarification for the exclusion of areas coverage classifications of EPLs Ga and Da	1	X		
Addition of requirements for the Division method of area classification that may be applied by some users	1			C1
Relocation of heat loss design requirements to IEC/IEEE 60079-30-1	6.3	X		
Addition of safety shower and eyewash station design requirements	6.16			C2
Addition of Annex for an example of a design data record	Annex A	X		
Addition of Annex for a checklist of installation requirements	Annex B	X		
Addition of Annex for an example of a trace heater commissioning record	Annex C	X		
Addition of Annex for an example of a maintenance schedule and log record	Annex D	X		
Addition of Annex for pipe heat loss considerations	Annex E	X		
Addition of Annex for vessel heat loss considerations	Annex F	X		
Addition of Annex for heat up and cool down considerations	Annex G	X		
Addition of Annex for a method to determine the equivalent thickness of insulating cements	Annex H	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 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 – The requirements for the Division method of area classification are applicable only for users of this standard intending qualification for these areas.

C2 – The design requirements for safety showers and eyewash units have been included for harmonization and for added safety.

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

FDIS	Report on voting
31/1190/FDIS	31/1199/RVD

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

International standards are drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is intended to be used in conjunction with IEC/IEEE 60079-30-1:2014, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements.*

A list of all parts of IEC 60079 series, under the general title *Explosive atmospheres,* can be found on the IEC website.

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.

A bilingual version of this publication may be issued at a later date.

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EXPLOSIVE ATMOSPHERES –

Part 30-2: Electrical resistance trace heating – Application guide for design, installation and maintenance

1 Scope

This part of IEC 60079 provides guidance for the application of electrical resistance trace heating systems in areas where explosive atmospheres may be present, with the exclusion of those classified as requiring EPL Ga/Da (traditional relationship to Zone 0 and Zone 20 respectively). This standard also provides guidance for explosive atmospheres incorporating the Division method of area classification that may be applied by some users of this standard.

NOTE Information on the Division method is given in NFPA 70 and CSA C22.1.

It provides recommendations for the design, installation, maintenance and repair of trace heating systems including associated control and monitoring equipment. It does not cover devices that operate by induction heating, skin effect heating or direct pipeline heating, nor those intended for stress relieving.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-426, *International Electrotechnical Vocabulary – Part 426: Equipment for explosive atmospheres*

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

IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC/IEEE 60079-30-1, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-426, IEC 60079-0 and IEC/IEEE 60079-30-1 apply.

4 Application considerations

4.1 General

This part of IEC 60079 supplements the requirements specified in IEC 60079-14, IEC 60079-17 and IEC/IEEE 60079-30-1.

Where trace heating systems are to be installed in explosive atmospheres, full details of the area classifications shall be specified. The specification shall state, as applicable, the

required equipment protection levels Gb, Gc, Db, and Dc (traditional relationship to Zone 1, Zone 2, Zone 21, and Zone 22 respectively), and/or the Division 1 and Division 2 explosive atmospheres, the gas or dust groups, and temperature classification. Where special considerations apply or where site conditions may be especially onerous, these conditions shall be detailed in the trace heating specification.

The specification for heating systems to be installed on mobile equipment or skid units (e.g. re-locatable structures) should accommodate the adverse conditions in which the trace heating system may be used.

Where any parts of the trace heating system are likely to be exposed, those parts should be suitable for the environment.

4.2 Corrosive areas

All components of electric trace heating systems should be examined to verify that they are compatible with any corrosive materials that may be encountered during the lifetime of the system. Trace heating systems operating in corrosive environments have a higher potential for failure than in non-corrosive environments. Deterioration of the thermal insulation system is made worse by corrosion of the weather barrier and the possibility of moisture leaks soaking the thermal insulation.

4.3 Process temperature accuracy

4.3.1 Type I

A Type I process is one for which the temperature should be maintained above a minimum point. Ambient sensing control may be acceptable. Large blocks of power may be controlled by means of a single control device and an electrical distribution panel board. Heat input may be provided unnecessarily at times and wide temperature excursions should be tolerable. Energy efficiency may be improved through the use of dead-leg control or ambient proportional control techniques (see 6.14).

4.3.2 Type II

A Type II process is one for which the temperature should be maintained within a moderate band. Control by mechanical thermostats is typical.

4.3.3 Type III

A Type III process is one for which the temperature should be controlled within a narrow band. Electronic controllers using thermocouple or resistance-temperature detector (RTD) process temperature sensors facilitate field (work site) calibration and provide maximum flexibility in the selection of temperature alarm and monitoring functions. Heat input capability may be provided to preheat an empty pipe or raise the fluid temperature, or both, within a specified range and time interval. Type III systems require strict adherence to flow patterns and thermal insulation systems.

4.4 Installation considerations

If failure of any part of the trace heating system can result in a safety or process problem, then the trace heating system may be considered to be a critical component of the total process. The temperature control and circuit monitoring requirements of an application may be defined according to the temperature control types described in 4.3.

When trace heating is critical to the process, circuit monitoring for correct operation, malfunction alarms, and back-up trace heaters should be considered. Spare or back-up controllers can be specified to be automatically activated in the event of a fault being indicated by the monitoring/alarm system. Back-up trace heaters may allow maintenance or repairs to be performed without a process shutdown and may be used to enhance reliability.

5 Thermal insulation

5.1 General

The selection, installation and maintenance of thermal insulation is a key component in the performance of an electrical trace heating system. The thermal insulation system is normally designed to limit heat loss with the trace heating system compensating for the remainder. Therefore, problems with thermal insulation have a direct impact on the overall system performance.

The primary function of thermal insulation is to reduce the rate of heat transfer from a surface that is operating at a temperature other than ambient. This reduction of energy loss may:

– reduce operating expenses;
– improve system performance;
– increase system output capability.

Prior to any heat loss analysis for an electrically traced pipeline, vessel or other mechanical equipment, a review of the selection of the insulation system is recommended. The principal areas for consideration are as follows:

– selection of an insulation material;
– selection of a weather barrier (cladding);
– selection of the economic insulation thickness with consideration for optimum trace heater design;
– selection of the proper insulation size.

Information about the equivalent thickness of insulating cements is given in Annex H.

5.2 Selection of insulating material

The following are important aspects to be considered when selecting an insulation material. These factors should be considered and the selection optimised according to the operator's criteria:

– temperature rating;
– thermal conductivity, λ, of the insulation;
– mechanical properties;
– chemical compatibility and corrosion resistance;
– moisture resistance;
– health risks during installation;
– fire resistance;
– toxicological properties when exposed to fire;
– costs.

Insulation materials commonly available include:

– expanded silica;
– mineral fibre;
– cellular glass;
– urethane;
– fibreglass;
– calcium silicate;