SLOVENSKI PREDSTANDARD

oSIST prEN 60079-30-2:2006

december 2006

Eksplozivne atmosfere – 30-2. del: Električni uporovni grelni trakovi – Vodilo za zasnovo, inštalacijo in vzdrževanje

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

ICS 29.260.20

Referenčna številka
oSIST prEN 60079-30-2:2006(en)

31/662/FDIS

FINAL DRAFT INTERNATIONAL STANDARD
PROJET FINAL DE NORME INTERNATIONALE

Project number / Numéro de projet	**IEC 60079-30-2 Ed. 1.0**
IEC/TC or SC CEI/CE ou SC: **TC 31**	Secretariat / Secrétariat: **United Kingdom**
☒ Submitted for parallel voting in CENELEC / Soumis au vote parallèle au CENELEC	Distributed on / Diffusé le: **2006-09-29** — Voting terminates on / Vote clos le: **2006-12-01**
Also of interest to the following committees / Intéresse également les comités suivants: TC 18	Supersedes document / Remplace le document: 31/585/CDV and 31/625/RVC

Functions concerned
Fonctions concernées

☐ Safety / Sécurité ☐ EMC / CEM ☐ Environment / Environnement ☐ Quality assurance / Assurance de la qualité

INTERNATIONAL ELECTROTECHNICAL COMMISSION — COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

THIS DOCUMENT IS A DRAFT DISTRIBUTED FOR APPROVAL. IT MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, FINAL DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

CE DOCUMENT EST UN PROJET DIFFUSÉ POUR APPROBATION. IL NE PEUT ÊTRE CITÉ COMME NORME INTERNATIONALE AVANT SA PUBLICATION EN TANT QUE TELLE.

OUTRE LE FAIT D'ÊTRE EXAMINÉS POUR ÉTABLIR S'ILS SONT ACCEPTABLES À DES FINS INDUSTRIELLES, TECHNOLOGIQUES ET COMMERCIALES, AINSI QUE DU POINT DE VUE DES UTILISATEURS, LES PROJETS FINAUX DE NORMES INTERNATIONALES DOIVENT PARFOIS ÊTRE EXAMINÉS EN VUE DE LEUR POSSIBILITÉ DE DEVENIR DES NORMES POUVANT SERVIR DE RÉFÉRENCE DANS LES RÈGLEMENTATIONS NATIONALES.

Title

IEC 60079-30-2 Ed. 1.0: Explosive atmospheres - Part 30-2: Electrical resistance trace heating - Application guide for design, installation and maintenance

Titre

CEI 60079-30-2 Ed. 1.0: Atmosphères explosives - Partie 30-2: Traçage par résistance électrique - Guide d'application pour la conception, l'installation et la maintenance

ATTENTION
VOTE PARALLÈLE
CEI – CENELEC

L'attention des Comités nationaux de la CEI, membres du CENELEC, est attirée sur le fait que ce projet final de Norme internationale est soumis au vote parallèle. Un bulletin de vote séparé pour le vote CENELEC leur sera envoyé par le Secrétariat Central du CENELEC.

ATTENTION
IEC – CENELEC
PARALLEL VOTING

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this final Draft International Standard (DIS) is submitted for parallel voting. A separate form for CENELEC voting will be sent to them by the CENELEC Central Secretariat.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

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

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.
2) The formal decisions or agreements 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.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC 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 transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees 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 Publication or any other IEC 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 some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60079-30-2 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This edition cancels and replaces the first edition of IEC 62086-2 published in 2001 and constitutes a technical revision.

The general revisions and updating to produce the first edition of IEC 60079-30-2 are as a result of National comments received.

The main technical differences apart from the general revision and updating a former edition of IEC 62086-2, are as follows:

a) corrections;

b) extensive revision and additions for design and installation recommendations.

This Part 30-2 is to be used in conjunction with the first edition of IEC 60079-30-1:2006, *Explosive atmospheres – Part 30-1: Electrical resistance trace heating – General and testing requirements.*

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The 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 maintenance result date[1] 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.

1) The National Committees are requested to note that for this publication the maintenance result date is 2011.

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 gas atmospheres may be present, with the exception of those classified as zone 0.

It provides recommendations for the design, installation, maintenance and repair of trace heating equipment and 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.

This part supplements the requirements specified in IEC 60079-30-1.

2 Normative references

The following referenced documents are indispensable for the application 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 60079-0:2004, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

IEC 60079-1:2003, *Electrical apparatus for explosive gas atmospheres – Part 1:Flameproof enclosures "d"*

IEC 60079-7:2001, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety 'e'*

IEC 60079-10:2002, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IEC 60079-14:1996, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

IEC 60079-17:1996, *Electrical apparatus for explosive gas atmospheres – Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines)*

IEC 60079-30-1:2006, *Explosive atmospheres – Part 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 60079-0, IEC 60079-1 and IEC 60079-7 apply.

NOTE Additional terms and definitions applicable to explosive atmospheres can be found in IEC 60050 (426)[2].

4 Application considerations

4.1 General

This standard supplements the requirements of IEC 60079-14 and IEC 60079-17.

Where trace heating systems are to be installed in explosive gas atmospheres, full details of the hazardous area classification(s) (IEC 60079-10) shall be specified. The specification shall state the zone (1 or 2), gas group (IIA, IIB or IIC) and temperature classification in accordance with IEC 60079-0. Where special considerations apply or where site conditions may be especially onerous, these conditions shall be detailed in the trace heating specification.

Where trace heating systems are to be installed on mobile equipment or interchangeable skid units, the specification for these trace heating systems should accommodate the worst 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 pipeline and vessel leaks soaking the thermal insulation. Particular attention should be given to the materials of piping systems, as well as the electric trace heating systems, as related to the effective earth-leakage/ground-fault return path. The use of non-metallic or lined or coated piping systems may further complicate the earth-leakage/ground-fault return path and special consideration should be given to these piping systems. Earth-leakage/ground-fault return paths established at the time of installation may become degraded due to corrosion during the operation of the plant.

---

[2] IEC 60050-426, International Electrotechnical Vocabulary (IEV) – Part 426: Electrical apparatus for explosive atmospheres

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 techniques (see 6.13).

4.3.2 Type II

A Type II process is one for which the temperature should be maintained within a moderate band. Control by pipeline sensing 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 pipe-sensing controllers using thermocouple or resistance-temperature detector (RTD) units 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, together with the circuit monitoring criticality as described in Table 1.

Table 1 – Process types

Is trace heating a critical component of the process?	Desired accuracy of process temperature control		
	Above a minimum point Type I	Within a moderate band Type II	Within a narrow band Type III
Yes = Critical (C-)	C – I	C – II	C – III
No = Non-critical (NC-)	NC – I	NC – II	NC – III

When trace heating is critical to the process, circuit monitoring for correct operation, malfunction alarms, and back-up (redundant) 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. This is sometimes known as "redundancy". 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 should be considered a key component in the performance of an electrical trace heating system. The thermal insulation system is normally designed to prevent the majority of heat loss with the trace heating system compensating for the remainder. Therefore, problems with thermal insulation will 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;
– selection of the proper insulation size.

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;
– polyisocyanurate;
– perlite silicate.

For soft insulants (mineral fibre, fibreglass, etc.), actual pipe size insulation may be used in many cases by banding the insulation tightly. Care should be taken to prevent the trace heater from being buried within the insulation, which may cause damage to the trace heater or may restrict proper heat transfer. As an alternative, the next largest pipe size insulation that can easily enclose pipe and electric trace heater is also acceptable. Rigid insulation (calcium silicate, expanded silica, cellular glass, etc.), may be pipe-size insulation if board sections are cut to fit the longitudinal joint. This type of installation technique is commonly referred to as an extended leg installation. Alternatively, the next largest insulation size may be selected to accommodate the trace heater. In all cases, the insulation size and thickness should be clearly specified.

5.3 Selection of weather barrier (cladding)

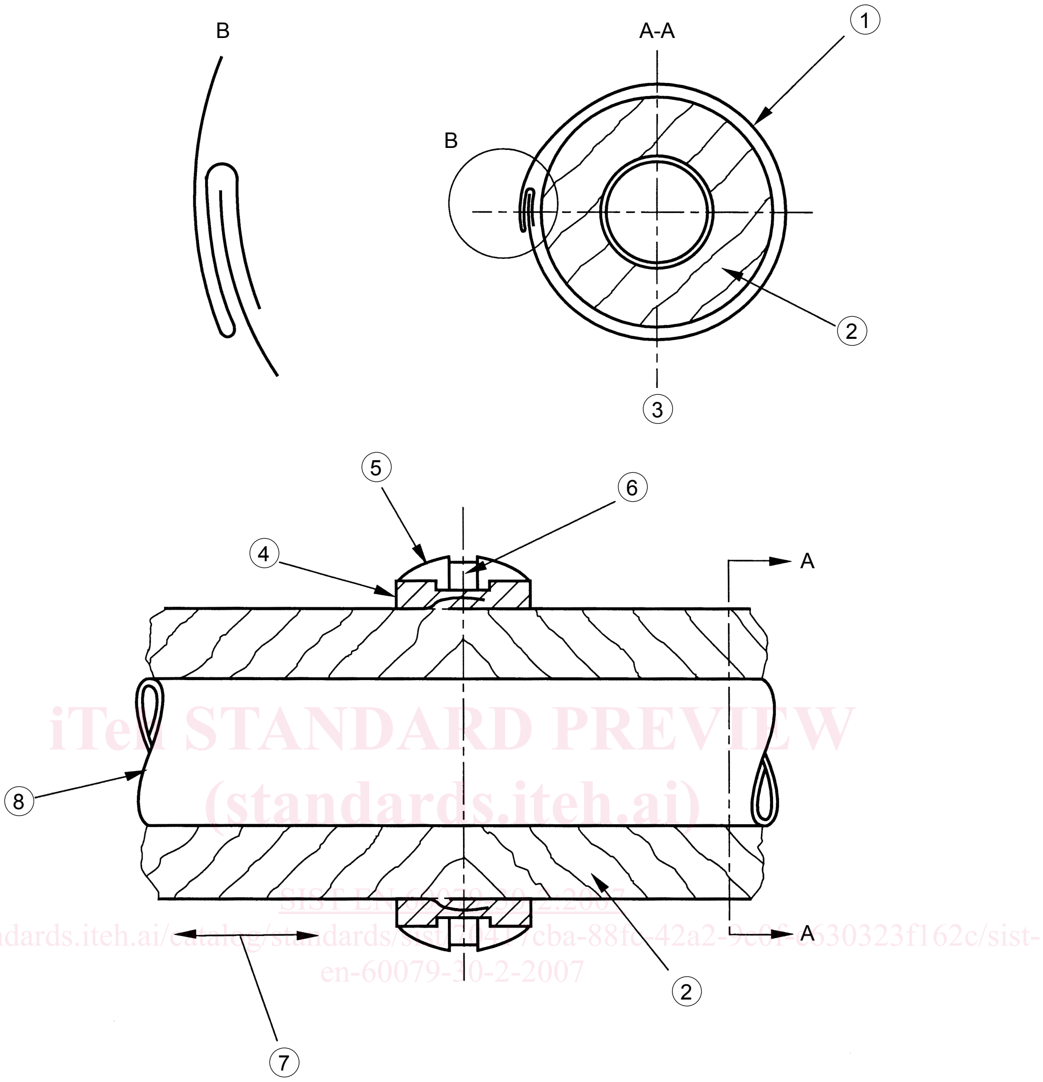
Proper operation of an electrically trace heated system depends upon the insulation being dry. Electric tracing normally has insufficient heat output to dry wet thermal insulation. Some insulation materials, even though removed from the piping and force dried, never regain their initial characteristics after once being wet.

Straight piping may be weather-protected with metal jacketing, polymeric, or a mastic system. When metal jacketing is used, it should be smooth with formed, modified “S” longitudinal joints. The circumferential end joints should be sealed with closure bands and supplied with sealant on the outer edge or where they overlap (see Figure 1).

Jacketing that is overlapped or otherwise closed without sealant is not effective as a barrier to moisture. A single, unsealed joint can allow a considerable amount of water to leak into the insulation during a rainstorm.

The type of weather barrier used should, as a minimum, be based on a consideration of the following:

– effectiveness in excluding moisture;
– corrosive nature of chemicals in the area;
– fire protection requirements;
– durability to mechanical abuse;
– cost.



Key

1 metal jacket

2 insulation

3 metal jacket insulated pipe

4 mastic sealer

5 closure band

6 insulated strap

7 movement

8 pipe

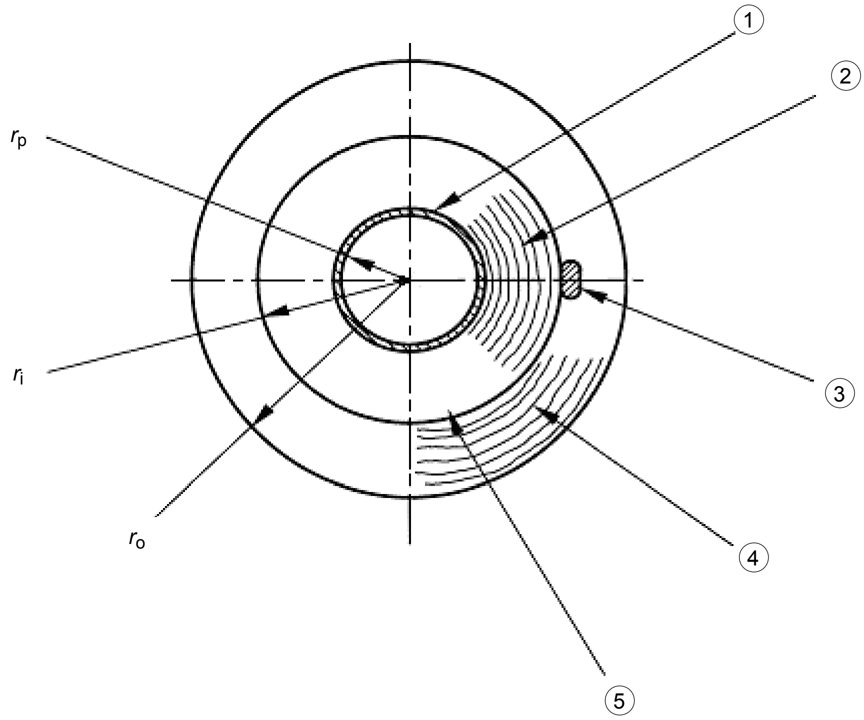
Figure 1 – Thermal insulation – Weather-barrier installation

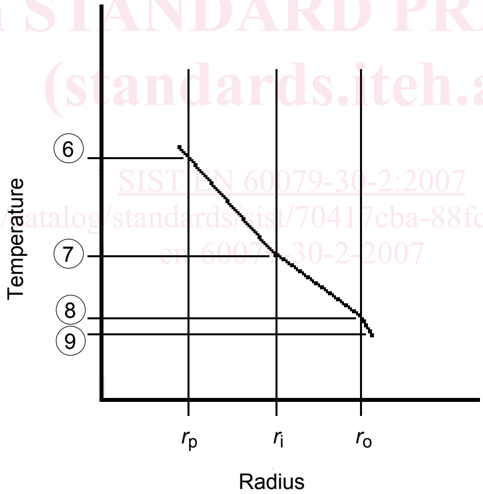
5.4 Selection of economical thickness

At a minimum, an economic consideration of the insulation will weigh the initial costs of the materials and installation against the energy saved over the life of the insulation. It should be noted that the actual insulation thicknesses do not always correspond exactly to the nominal insulation thickness. When choosing the insulation size, considerations should be made as to whether or not the actual pipe-size insulation is suitable for accommodating both pipe and trace heater.

5.5 Double insulation

The double insulation technique may be employed when the pipe temperature exceeds the maximum allowable temperature of the trace heater. Prevention of the freezing of condensate in high-temperature steam lines when these lines are not in use is a typical application. It consists of locating the trace heater between two layers of insulation surrounding the pipe. The essence of the double-insulation technique is to determine the correct combination of inner and outer insulation type and thickness that will result in an acceptable interface temperature for the trace heater. This relationship is illustrated in Figure 2. Note that maximum ambient temperature conditions should be considered in this determination.





Key

1 pipe

2 inner insulation layer

3 heat tracer

4 outer insulation layer

5 metal foil (aluminium)

6 maximum temperature pipe

7 interface temperature

8 outer insulation surface temperature

9 ambient temperature

Figure 2 – Typical temperature profile