SLOVENSKI STANDARD
oSIST prEN IEC 60079-28:2024

01-november-2024

Eksplozivne atmosfere - 28. del: Zaščita opreme, ki uporablja optično sevanje, in sistemov za prenos optičnega sevanja

Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation

Explosionsgefährdete Bereiche - Teil 28: Schutz von Geräten und Übertragungssystemen, die mit optischer Strahlung arbeiten

Atmosphères explosives - Partie 28: Protection du matériel et des systèmes de transmission utilisant le rayonnement optique

Ta slovenski standard je istoveten z: **prEN IEC 60079-28:2024**

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

oSIST prEN IEC 60079-28:2024 **en,fr,de**

31/1793/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 60079-28 ED3**	
DATE OF CIRCULATION: **2024-09-06**	CLOSING DATE FOR VOTING: **2024-11-29**
SUPERSEDES DOCUMENTS: **31/1726/CD, 31/1761A/CC**	

IEC TC 31 : EQUIPMENT FOR EXPLOSIVE ATMOSPHERES	
SECRETARIAT: United Kingdom	SECRETARY: Mr Tom Stack
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any relevant “In Some Countries” clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE AC/22/2007 OR NEW GUIDANCE DOC).

TITLE:

Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation

PROPOSED STABILITY DATE: 2029

NOTE FROM TC/SC OFFICERS:

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

EXPLOSIVE ATMOSPHERES –

Part 28: Protection of equipment and transmission systems using optical radiation

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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is 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 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 60079-28 has been prepared by MT 60079-28, of IEC technical committee 31 Equipment for explosive atmospheres.

This third edition cancels and replaces the second edition 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.

The significance of the changes between IEC 60079-28, Edition 3 and IEC 60079-28, Edition 2 is as listed below:

106 **Significance of changes with respect to IEC 60079-28:2015**

		Type		
Significant Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Ignition test is removed	5.4 to 5.7; Annex A (of Ed.2)			C1
Clarification of the applicability of IEC 60079-28 for laser equipment, optical fibre equipment and any optical system that converts light into convergent beams with focal points within the hazardous area only.	1	X		
The structure of this document was modified; new clause “Type verifications and tests” added	5	X		
New subclause “Optical detector”	5.1		X	
The possibility to do calculations for the assessment of optical power is clarified	5.2		X	
Additional examples for the marking are added.	6		X	

107 NOTE 1 The technical changes referred to include the significance of technical changes in the revised IEC
108 Standard, but they do not form an exhaustive list of all modifications from the previous version. More guidance may
109 be found by referring to the Redline Version of the standard.

Explanation of the Types of Significant Changes:

A) Definitions

1) 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.

2) 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.

3) 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 2 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 changes

C1 The alternative option of an ignition test is removed because questions have been raised regarding the repeatability of the verification test across test labs. Additionally, it was identified that an application of a safety factor is not sufficiently defined and not possible to apply for real test samples.

110

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

112

113 Full information on the voting for the approval of this International Standard can be found in the
114 report on voting indicated in the above table.

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

116 This document has been drafted in accordance with the ISO/IEC Directives, Part 2, and
117 developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC
118 Supplement, available at www.iec.ch/members_experts/refdocs. The main document types
119 developed by IEC are described in greater detail at www.iec.ch/publications.

120 The committee has decided that the contents of this document will remain unchanged until the
121 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
122 specific document. At this date, the document will be

123 • reconfirmed,
124 • withdrawn,
125 • replaced by a revised edition, or
126 • amended.

127

128 The National Committees are requested to note that for this document the stability date
129 is 20XX.

130 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
131 AT THE PUBLICATION STAGE.

132

INTRODUCTION

Optical systems in the form of light sources utilizing optical components such as filters or lenses, optical fibers etc. include but are not limited to communications, surveying, sensing and measurement. In material processing, optical radiation of high irradiance is used. Where the installation is inside or close to explosive atmospheres, the radiation from such systems can pass through these atmospheres. Depending on the characteristics of the radiation it might then be able to ignite a surrounding explosive atmosphere. The presence or absence of an additional absorber, such as particles, significantly influences the ignition.

There are four possible ignition mechanisms:

a) Optical radiation is absorbed by surfaces or particles, causing them to heat up, and under certain circumstances this may allow them to attain a temperature which will ignite a surrounding explosive atmosphere.

b) Thermal ignition of a gas volume, where the optical wavelength matches an absorption band of the gas or vapour.

c) Photochemical ignition due to photo dissociation of oxygen molecules by radiation in the ultraviolet wavelength range.

d) Direct laser induced breakdown of the gas or vapour at the focus of a strong beam, producing plasma and a shock wave both eventually acting as ignition source. These processes can be supported by a solid material close to the breakdown point.

The most likely case of ignition occurring in practice with lowest radiation power of ignition capability is case a). Under some conditions for pulsed radiation case d) also will become relevant. These two cases are addressed in this document. Although one should be aware of ignition mechanism b) and c) explained above, they are not addressed in this document due to the very special situation with ultraviolet radiation and with the absorption properties of most gases (see Annex A).

This document describes precautions and requirements to be taken when using optical radiation in explosive gas or dust atmospheres.

There are optical systems outside the scope of this document because the optical radiation associated with this systems is considered not to be a risk of ignition for the following reasons:

– due to low radiated power or divergent light; and

– as hot surfaces created due to a too small distance from the radiation source to an absorber which is already considered by general requirements for lighting equipment.

When optical systems are associated with electrical Ex Equipment and where the electrical Ex Equipment is located in a hazardous area then other parts of the IEC 60079 series will also apply. This document provides guidance for:

– Ignition hazards associated with optical systems in explosive atmospheres as defined in IEC 60079-10-1 and IEC 60079-10-2; and

– Control of ignition hazards from Ex Equipment using optical radiation in explosive atmospheres.

EXPLOSIVE ATMOSPHERES –

Part 28: Protection of equipment and transmission systems using optical radiation

1 Scope

This part of IEC 60079 specifies additional requirements for Ex Equipment, Ex associated equipment or Ex Components containing optical systems emitting optical radiation, which is exposed to explosive atmospheres. These additional requirements are applicable for all equipment groups and all Equipment Protection Levels (EPL).

This document contains requirements for optical radiation in the wavelength range from 380 nm to 10 µm. It covers the following ignition mechanisms:

- Optical radiation is absorbed by surfaces or particles, causing them to heat up, and under certain circumstances this may allow them to attain a temperature which will ignite a surrounding explosive atmosphere.
- In rare special cases, direct laser induced breakdown of the gas at the focus of a strong beam, producing plasma and a shock wave both eventually acting as ignition source. These processes can be supported by a solid material close to the breakdown point.

NOTE 1 See a) and d) of the introduction.

This document applies to

i) laser equipment; and

ii) optical fibre equipment; and

iii) any optical system that converts light into convergent beams with focal points within the hazardous area.

This document does not apply to:

1) laser equipment for EPL Mb, Gb or Gc and Db or Dc applications which complies with Class 1 limits in accordance with IEC 60825-1; or

NOTE 2 The referenced Class 1 limits are those that involve emission limits below 15 mW measured at a distance from the optical radiation source in accordance with IEC 60825-1, with this measured distance reflected in the Ex application. The Class 1 limit values are not considered suitable for igniting an explosive atmosphere.

NOTE 3 Compliance with Class 1 limits is typically documented in the form of a datasheet or user manual provided by the manufacturer of the light source.

2) Single or multiple optical fibre cables not part of optical fibre equipment if the cables:

a) comply with the relevant industrial standards, along with additional protective means, for example robust cabling, conduit or raceway (for EPL Gb, Db, Mb, Gc or Dc); or

b) comply with the relevant industrial standards (for EPL Gc or Dc).; or

3) Optical radiation sources as defined in i) to iii) above where the optical radiation is fully contained in an enclosure complying with one of the following Types of Protection suitable for the EPL, or the minimum ingress protection rating specified:

a) flameproof "d" enclosures (IEC 60079-1); or

NOTE 4 A flameproof “d” enclosure is suitable because an ignition due to optical radiation in combination with absorbers inside the enclosure is contained.

b) pressurized "p" enclosures (IEC 60079-2); or

NOTE 5 A pressurized “p” enclosure is suitable because there is protection against ingress of an explosive atmosphere.

c) restricted breathing “nR” enclosure (IEC 60079-15); or

NOTE 6 A restricted breathing “nR” enclosure is suitable because there is protection against ingress of an explosive atmosphere.

d) dust protection "t" enclosures" (IEC 60079-31); or

NOTE 7 A dust protection “t” enclosure is suitable because there is protection against ingress of an explosive dust atmosphere.

e) an enclosure that provides a minimum ingress protection of IP 6X and where no internal absorbers are to be expected and complying with “Tests of enclosures” in IEC 60079-0.

NOTE 8 An enclosure of a minimum ingress protection of IP 6X and complying with “Tests of enclosures” in IEC 60079-0 is suitable because there is protection against the ingress of absorbers. It is anticipated that when the enclosures are opened, entrance of any absorbers is avoided.

This document does not cover ignition by ultraviolet radiation and by absorption of the radiation in the explosive mixture itself. Explosive absorbers or absorbers that contain their own oxidizer as well as catalytic absorbers are also outside the scope of this document.

This document supplements and modifies the general requirements of IEC 60079-0. Where a requirement of this document conflicts with a requirement of IEC 60079-0, the requirement of this document takes precedence.

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, *International Electrotechnical Vocabulary*

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

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

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

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

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

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/