IEC 60079-28

Edition 2.0 2015-05
REDLINE VERSION

INTERNATIONAL STANDARD

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

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IEC 60079-28:2015-05 RLV(en)

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IEC 60079-28
Edition 2.0 2015-05

EXPLOSIVE ATMOSPHERES –

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

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

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The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
31/1496/DISH	31/1508/RVDISH

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

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Interpretation sheet to the 6th paragraph of the Scope of IEC 60079-28:2015 (Edition 2)

Various interpretations are being made by IECEx ExCB -and ExTL staff regarding the consideration of the risk of ignition from optical sources, and the applicability of IEC 60079-28 in the context of Subclause 6.6.4 of IEC 60079-0:2017. In addition to assistance provided to date on IECEx Decision Sheet DS2018/004, the Liaison with IECEx has indicated that an interpretation sheet addressing the applicability of IEC 60079-28 is required to clarify which equipment that falls into the scope and what does not.

This interpretation is made available for Edition 2 of this standard due to the current use of that standard by manufacturers, conformity assessment schemes and national bodies by means of this “Interpretation Sheet” as follows:

IEC 60079-28:2015-05/ISH1:2019-10(en)

ICS 29.260.20

Details of interpretation:

IEC 60079-28:2015 (Edition 2: Protection of equipment and transmission systems using optical radiation

Interpretation of the 6th paragraph of the Scope:

Question: The 6th paragraph including the items 1) to 5) describes the equipment excepted from the Scope of this standard. The understanding of the listed exceptions is ambiguous. Therefore, it is possible that IEC 60079-28 is not applied in all situations where it is relevant. In addition, the potential confusion can be compounded by the wording of the exceptions.

When should the requirements of IEC 60079-28 be applied to Ex Equipment, including Equipment assemblies and Ex Components that include an optical radiation source based on Subclause 6.6.4 “Lasers, luminaries, and other non-divergent continuous wave optical sources” in IEC 60079-0:2017 (Edition 7)?

Interpretation:

This standard applies to

i) laser equipment; and

ii) optical fibre equipment; and

iii) any other convergent light sources or beams where light is focussed in one single point within the hazardous area.

NOTE 2 Some optical elements such as lenses and reflectors are able to convert divergent light into a convergent beam.

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This standard 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 3 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.

2) divergent light sources or beams where light is not focussed within the hazardous area; or

3) 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, e.g. 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

4) 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 followings 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.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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EXPLOSIVE ATMOSPHERES –

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

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60079-28 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This second edition cancels and replaces the first edition, published in 2006, and constitutes a technical revision.

The significance of the changes between IEC 60079-28, Edition 2.0 (2015) and IEC 60079-28, Edition 1.0 (2006), is as listed below:

Significance of changes with respect to IEC 60079-28:2006

		Type		
Significant Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Scope: Expansion to include Group III and EPLs Da, Db and Dc	1		x	
Scope: Clarification and list of exclusions for optical radiation sources	1		x	
Normative references: Deletion of IEC 60079-10, and addition of IEC 60050-426 and 60050-731	2	x		
Terms and definitions: Some definitions not used in the standard deleted. New definitions added.	3	x		
General requirements: Introduction of an ignition hazard assessment moved to 4, statement for presence of absorbers added, Explanation of EPLs deleted	4	x		
Table 1: EPLs versus protection types moved from 5.5 to 5.1, table modified and extended	5.1	x	x	
Structure of Table 2 changed and extended explanation in the notes, but with the same limit values	5.2.2.1	x		
Table 3 for Group III added	5.2.2.1		x	
Table 4 replaces Figure 1 for better application	5.2.2.1	x		
Detailed requirements for the measurement of optical power added	5.2.2.2		x	
Detailed requirements for the measurement of optical irradiance added	5.2.2.3		x	
Requirements for the assessment of optical pulses for Group II much more detailed	5.2.3.1 5.2.3.2 5.2.3.3 5.2.3.4	x		
Requirements for the assessment of optical pulses for Group I and Group III added	5.2.3.5		x	
Ignition tests: Notes 1 and 2 added	5.2.4	x		
Over-power/energy fault protection: Title changed and wording modified for clarity	5.2.5	x		
Radiation inside optical fibre or cable: requirements added, e.g. pull test	5.3.2			C1
Radiation inside enclosures: IP 6X enclosures, “p” or “t” enclosures added	5.3.3		x	
Optical system with interlock “op sh” Table 3 deleted, Figure 1 with interlock cutoff delay times added	5.4		x	
Type verifications and tests: structure changed (editorial, without changing the requirements)	6	x		
Marking: markings required by IEC 60079-0 deleted. Examples of marking: example with combination of op is with other types of protection added	7	x		

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		Type		
Significant Changes	**Clause**	**Minor and editorial changes**	**Extension**	**Major technical changes**
Ignition hazard assessment: Flow chart in Figure C.1 modified for better understanding	Annex C	x		
Old Annex E (Introduction of EPLs) deleted. New Annex E provides a flow chart for the assessment of pulses according to 5.2.3	Annex E	x		
Relevant IEC-Standards moved to Clause 2	Formerly Annex F	x		

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 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 For the protection concept "protected radiation op pr" some requirements like a pull test for optical fibres or cables have been added.

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

FDIS	Report on voting
31/1178/FDIS	31/1193/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.

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

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- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the interpretation sheet of November 2019 have been included in this copy.

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INTRODUCTION

Optical equipment in the form of lamps, lasers, LEDs, optical fibers etc. is increasingly used for communications, surveying, sensing and measurement. In material processing, optical radiation of high irradiance is used. ~~Often~~ Where the installation is inside or close to ~~potentially~~ explosive atmospheres, ~~and~~ the radiation from such equipment may 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 standard. Although one should be aware of ignition mechanism b) and c) explained above, they are not addressed in this standard due to the very special situation with ultraviolet radiation and with the absorption properties of most gases (see Annex A).

This standard describes precautions and requirements to be taken when using optical radiation transmitting equipment in explosive gas or dust atmospheres. It also outlines a test method, which can be used in special cases to verify that a beam is not ignition capable under selected test conditions, if the optical limit values cannot be guaranteed by assessment or beam strength measurement.

There is equipment outside the scope of this standard because the optical radiation associated with this equipment 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.

~~Optical equipment is used in most cases in conjunction with electrical equipment, for which clear and detailed requirements and standards for use in potentially explosive atmospheres exist. One purpose of this standard is to inform industry about potential ignition hazards associated with the use of optical systems in hazardous locations as defined in IEC 60079-10 and the adequate protection methods.~~

In most cases the optical equipment is associated with electrical equipment and where the electrical equipment is located in a hazardous area then other parts of the IEC 60079 series will also apply. This standard provides guidance for:

a) Ignition hazards associated with optical systems in explosive atmospheres as defined in IEC 60079-10-1 and IEC 60079-10-2, and,