AS/NZS 60079.28:2016
IEC 60079-28, Ed. 2.0 (2015)

AS/NZS 60079.28:2016

Australian/New Zealand Standard™

Explosive atmospheres

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

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-014, Equipment for Explosive Atmospheres. It was approved on behalf of the Council of Standards Australia on 9 March 2016 and by the Standards New Zealand Approval Board on 20 April 2016.
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The following are represented on Committee EL-014:

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Australian Petroleum Production and Exploration Association
Australian Pipelines and Gas Association
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This Standard was issued in draft form for comment as DR AS/NZS 60079.28:2015.

Australian/New Zealand Standard™

Explosive atmospheres

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

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-014, Equipment for Explosive Atmospheres, to supersede AS/NZS 60079.28:2007.

The objective of this Standard is to specify the requirements, testing and marking of equipment emitting optical radiation intended for use in explosive atmospheres. It also covers equipment located outside the explosive atmosphere or protected by a type of protection listed in IEC 60079-0, but which generates optical radiation that is intended to enter an explosive atmosphere. It covers Groups I, II and III, and EPLs Ga, Gb, Gc, Da, Db, Dc, Ma and Mb. The objective of the revision is to adopt the current edition of IEC 60079-28.

The particular requirements of this Standard supplement the general requirements specified in AS/NZS 60079.0. This Standard is intended to be read in conjunction with AS/NZS 60079.0.

This Standard is identical with, and has been reproduced from IEC 60079-28, Ed. 2.0 (2015), *Explosive atmospheres*, Part 28: *Protection of equipment and transmission systems using optical radiation*.

As this Standard is reproduced from an International Standard, the following applies:

(a) In the source text ‘this part of IEC 60079’ should read ‘this Australian/New Zealand standard’.

(b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard		*Australian/New Zealand Standard*	
IEC		AS/NZS	
60079	Explosive atmospheres	60079	Explosive atmospheres
60079-0	Part 0: Equipment—General requirements	60079.0	Part 0: Equipment—General requirements
60079-11	Part 11: Equipment protection by intrinsic safety “i”	60079.11	Part 11: Equipment protection by intrinsic safety ‘i’
60079-15	Part 15: Equipment protection by type of protection “n”	60079.15	Part 15: Equipment protection by type of protection ‘n’
60825	Safety of laser products	60825	Safety of laser products
60825-2	Part 2: Safety of optical fibre communication systems (OFCS)	60825.2	Part 2: Safety of optical fibre communication systems (OFCS)

Only normative references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

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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. Where the installation is inside or close to explosive atmospheres, 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.

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,

b) Control of ignition hazards from equipment using optical radiation in explosive atmospheres.

This standard is related to the integrated system used to control the ignition hazard from equipment using optical radiation in explosive atmospheres.

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AUSTRALIAN/NEW ZEALAND STANDARD

Explosive atmospheres

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

1 Scope

This part of IEC 60079 specifies the requirements, testing and marking of equipment emitting optical radiation intended for use in explosive atmospheres. It also covers equipment located outside the explosive atmosphere or protected by a Type of Protection listed in IEC 60079-0, but which generates optical radiation that is intended to enter an explosive atmosphere. It covers Groups I, II and III, and EPLs Ga, Gb, Gc, Da, Db, Dc, Ma and Mb.

This standard 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 standard 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 standard.

This standard specifies requirements for equipment intended for use under atmospheric conditions.

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

This standard applies to optical fibre equipment and optical equipment, including LED and laser equipment, with the exception of the equipment detailed below:

1) Non-array divergent LEDs used for example to show equipment status or backlight function.
2) All luminaires (fixed, portable or transportable), hand lights and caplights; intended to be supplied by mains (with or without galvanic isolation) or powered by batteries:
   – with continuous divergent light sources (for all EPLs),
   – with LED light sources (for EPL Gc or Dc only).

   NOTE 2 Continuous divergent LED light sources for other than EPL Gc or Dc are not excluded from the standard due to the uncertainty of potential ignition concerns regarding high irradiance.
3) Optical radiation sources for EPL Mb, Gb or Gc and Db or Dc applications which comply with Class 1 limits in accordance with IEC 60825-1.

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