AS/NZS 60079.28:2007
IEC 60079-28, Ed. 1.0 (2006)

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 19 February 2007 and on behalf of the Council of Standards New Zealand on 6 April 2007.
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The following are represented on Committee EL-014:

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Australian/New Zealand Standard™

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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.

The objective of this Standard is to explain the potential ignition hazard from equipment using optical radiation intended for use in explosive gas atmospheres.

This Standard is identical with, and has been reproduced from IEC 60079-28, Ed. 1.0 (2006), *Explosive atmospheres – Part 28: Protection of equipment and transmission systems using optical radiation*.

A number of footnotes have been added to correct minor typographical and grammatical errors.

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

(a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.

(b) In the source text 'IEC 60079-28' should read 'AS/NZS 60079.28'.

(c) A full point should be substituted for a comma when referring to a decimal marker.

The terms 'normative' and 'informative' are used 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. Often the installation is inside or close to potentially explosive atmospheres, and 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 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.

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 at the focus of a strong beam, producing plasma and a shock wave both eventually acting as the 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.

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.

This standard details the integrated system used to control the ignition hazard from equipment using optical radiation in hazardous locations.

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

1 Scope

This part of IEC 60079 explains the potential ignition hazard from equipment using optical radiation intended for use in explosive gas atmospheres. It also covers equipment, which itself is located outside but its emitted optical radiation enters such atmospheres. It describes precautions and requirements to be taken when using optical radiation transmitting equipment in explosive gas atmospheres. It also outlines a test method, which can be used to verify a beam is not ignition capable under selected test conditions, if the optical limit values cannot be guaranteed by assessment or beam strength measurement.

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

NOTE 1 See items 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 willll take precedence.

NOTE 2 Although one should be aware of ignition mechanism* b) and c) explained in the introduction, 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 B).

NOTE 3 Safety requirements to reduce human exposure hazards from fibre optic communication systems are found in IEC 60825-2:2000†.

NOTE 4 Types of protection "op is", "op pr", and "op sh" can provide equipment protection levels (EPL) Ga, Gb, or Gc. For further information, see Annex E.

* The word ‘mechanism’ should read ‘mechanisms; typographical error in IEC 60079-28, Ed. 1.0(2006).

† sequence of words in NOTE 3 is not appropriate; it should read: ‘safety requirements to reduce hazards to humans, from exposure to radiation from figure optic communication systems, are found in IEC 60825-2:2000’.

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