EXPLOSIVE ATMOSPHERES –

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

1 Scope

This standard ~~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.

NOTE 1 Throughout this standard, reference is made to equipment protection levels (EPLs) as a means to determine the applicability of requirements (see ISA 60079-0 for the definition of EPLs). While NFPA 70 (NEC) does not preclude marking of the equipment protection level (EPL), the concept of a risk assessment to establish the selection of equipment for specific areas based on the assigned EPL for the specific area is not currently recognized. Therefore, when applying this standard, the EPL designations shown are to be understood as meaning equipment suitable for a Zone classification as follows:

EPL Designation	Zone classification
Ga	Class I, Zone 0
Gb	Class I, Zone 1
Gc	Class I, Zone 2

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 2~~1~~ See items a) and d) of the introduction.

This standard applies to optical fibre equipment and optical equipment, including LED and laser equipment, other than as detailed below:

- Non-array indicator LEDs used to show equipment status (such as standard panel-mount indicator LEDs).
- Luminaires with divergent light sources.
- Optical radiation sources for Gc applications which comply with Class I limits in accordance with US Code of Federal Regulations, 21 CFR Part 1040.
- Optical radiation sources for Gb or Gc applications which comply with Class 1 limits in accordance with IEC 60825-1.

NOTE 3 Class I limit evaluations in accordance with US Code of Federal Regulations, 21 CFR Part 1040 are based on normal operating conditions. Class 1 limit evaluations in accordance with IEC 60825-1 are based on normal operating and single fault conditions.

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 ANSI/ISA-~~IEC~~ 60079-0. Where a requirement of this standard conflicts with a requirement of ANSI/ISA-~~IEC~~ 60079-0, the requirement of this standard will take precedence.

NOTE 4~~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 5~~3~~ Safety requirements to reduce human exposure hazards from fibre optic communication systems are found in IEC 60825-2:~~2000~~.

NOTE 6~~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.

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.

ANSI/ISA-~~IEC~~ 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

ANSI/ISA-~~IEC~~ 60079-0, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

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

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

IEC 60825-1, *Safety of Laser Products – Part 1: Equipment Classification and Requirements*

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

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511 (all parts), *Functional safety – Safety instrumented systems for the process industry sector*