IEC 60079-29-2

Edition 1.0 2007-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Explosive atmospheres –
Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen

Atmosphères explosives –
Partie 29-2: Détecteurs de gaz – Sélection, installation, utilisation et maintenance des détecteurs de gaz inflammables et d'oxygène

IEC 60079-29-2:2007

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EXPLOSIVE ATMOSPHERES –

Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen

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.
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International Standard IEC 60079-29-2 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This first edition of IEC 60079-29-2 cancels and replaces the first edition of IEC 61779-6:1999 and constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- Introduction was modified to provide a reference table for application of the particular document sections to specific job related functions.
- Clause 4 (Basic information on the properties, behaviour, and detection of gases and vapours) was added for user guidance on characteristics of gases and vapours.

– Clause 5 (Measuring principles), Clause 6 (Selection of apparatus), Clause 7 (Behaviour of gas releases), Clause 8 (Design and installation of fixed gas detection systems), Clause 9 (Use of portable and transportable flammable gas detection apparatus), Clause 10 (Training of operational personnel), and Clause 11 (Maintenance, routine procedures and general administrative control) were modified to reflect the text from EN 50073 and Chapter 14 of SAI Global Limited publication HB13.
– Annex A (Flammable limits (LFL and UFL) of certain flammable gases and vapours) was removed and replaced by a detailed review of Measuring Principles.
– Annex B (Environmental parameters) was added to provide a summary of the minimum required environmental parameters for gas detection apparatus.

This part of IEC 60079-29 is to be used in conjunction with the following standards:

– IEC 60079-0, Electrical apparatus for explosive gas atmospheres – Part 0: General requirements

– IEC 60079-29-1, Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases.

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

FDIS	Report on voting
31/696/FDIS	31/712/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 of the IEC 60079 series, under the general title: *Explosives atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

INTRODUCTION

Flammable gas detection apparatus may be used whenever there is the possibility of a hazard to life or property caused by the accumulation of a flammable gas-air mixture. Such apparatus can provide a means of reducing the hazard by detecting the presence of a flammable gas and issuing suitable audible or visual warnings. Gas detectors may also be used to initiate precautionary steps (for example plant shutdown, evacuation, and operation of fire extinguishing procedures).

Apparatus may be used to monitor a gas atmosphere below the lower flammable limit in circumstances where accumulation of gas may result in a concentration of the gas/air mixture to potentially explosive levels. Performance requirements for gas detecting apparatus for such purposes are set out in IEC 60079-29-1.

However performance capability alone cannot ensure that the use of such apparatus will properly safeguard life or property where flammable gases may be present. The level of safety obtained depends heavily upon correct selection, installation, calibration and periodic maintenance of the apparatus, combined with knowledge of the limitations of the detection technique required. This cannot be achieved without responsible informed management.

An additional hazard to life is the toxicity of some gases and of the vapours of all liquids except water. It is not generally appreciated that all flammable vapours are potentially toxic at concentration levels which are very small fractions of their respective lower flammable limits. Apparatus covered by the IEC 60079-29-1 is not specifically intended for toxic protection, and additional personal protection precautions will normally be needed where personnel could be exposed to toxic vapours.

Portable apparatus covered by the IEC 60079-29-1 and the IEC 60079-29-2 commonly have additional detectors for specific toxic gases and also for oxygen deficiency. Users are cautioned that even mild oxygen deficiency may be due to toxic concentrations of some other gas or vapour, which may not be detectable or adequately detected by the apparatus in use.

General requirements for the handbook or manual of any particular flammable gas detection apparatus are specified in IEC 60079-29-1. This standard provides some necessary background knowledge on the points mentioned above.

This standard has been specifically written to cover all the functions necessary to go from the need for gas detection all the way through ongoing maintenance of a successful gas detection operation. Different clauses are appropriate for different tasks within this range of operations. Each clause has been written as stand-alone as far as practicable. This meant that some information is repeated in different clauses but with a different emphasis.

The following table gives a broad suggestion as to the most relevant clauses to the typically tasks to be performed.

	Definitions	Basic information properties of gas and vapours	Measuring principles	Selection of apparatus	Behaviour of gas releases	Design and installation of fixed gas detection systems	Use of portable and transportable flammable gas detection apparatus	Training of operational personnel	Maintenance, routines procedures General administrative control	Measuring principles (full detail) (normative)	Environmental parameters (informative)
Function (Clause)	3	4	5	6	7	8	9	10	11	Annex A	Annex B
Authorities	+	+++	+++	+	+	-	-	-	+	-	-
General management	+	+++	+++	+	+	-	-	+	+	-	+
Selection	+++	+++	+	+++	+++	+	++	-	+	+++	+++
Design engineering / management	+++	+++	+	+++	+++	+++	-	-	-	+++	+++
Installation engineering / management	+++	+++	+	++	+++	+++	-	-	-	+++	+++
Installation, technical	++	+++	++	++	++	++	-	-	-	+	++
Commissioning	+++	+++	++	+	++	+++	-	++	+	-	-
Operations management	++	+++	++	+	+	++	++	+++	+++	+	+++
Operation training	+++	+++	+	+	+	+++	+++	+++	+++	+++	+++
Servicing / Calibration	+++	+++	-	-	-	++	++	+	+++	++	++
Repair	++	+++	++	-	-	+	+	+	+++	++	-

"**+++**" Essential
"**++**" Advisable
"**+**" Useful
"-" Not applicable

NOTE It should be noted that Clause 5 is a simplified version of Annex A.

This standard makes recommendations how to establish maintenance and calibration intervals. In certain countries there are general or industry-specific regulations that are mandatory and those shall be followed as a minimum requirement.

EXPLOSIVE ATMOSPHERES –

Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen

1 Scope

This part of IEC 60079-29 gives guidance on, and recommended practice for, the selection, installation, safe use and maintenance of electrically operated group II apparatus intended for use in industrial and commercial safety applications for the detection and measurement of flammable gases complying with the requirements of IEC 60079-29-1.

This standard is applicable for oxygen measurement for the purpose of inertisation where explosion protection is provided by the exclusion of oxygen instead of measuring the combustible gases or vapours present.

This standard is a compilation of practical knowledge to assist the user, and applies to apparatus, instruments and systems that indicate the presence of a flammable or potentially explosive mixture of gas or vapour with air by using an electrical signal from a gas sensor to produce a meter reading, to activate a visual or audible pre-set alarm or other device, or any combination of these.

Such apparatus may be used as a means of reducing the risk whenever there is the possibility of a risk to life or property specifically due to the accumulation of a combustible gas-air mixture, by providing such warnings. It may also be used to initiate specific safety precautions (e.g. plant shutdown, evacuation, fire extinguishing procedures).

This standard is applicable to all new permanent installations and, where reasonably practicable, to existing permanent installations. It is also applicable to temporary installations, whether new or existing.

Similarly it is applicable to the safe use of portable or transportable apparatus, irrespective of the age or complexity of such apparatus. Since much modern apparatus of this type also includes oxygen deficiency detection and/or specific toxic gas sensors, some additional guidance is given for these topics.

NOTE When in classified areas, the apparatus should be so installed and used that it is not capable of itself igniting a combustible gas-air mixture. It should therefore comply with the requirements of IEC 60079-10.

For the purposes of this standard, except where specifically stated otherwise, flammable gases shall include flammable vapours.

This standard applies only to group II apparatus (i.e. apparatus intended for use in industrial and commercial safety applications, involving areas classified in accordance with IEC 60079-10).

For the purposes of this standard, apparatus includes

a) fixed apparatus;

b) transportable apparatus; and

c) portable apparatus.

This standard is not intended to cover, but may provide useful information, for the following:

a) apparatus intended only for the detection of non-flammable toxic gases;
b) apparatus of laboratory or scientific type intended only for analysis or measurement purposes;
c) apparatus intended for underground mining applications (group I apparatus);
d) apparatus intended only for process control applications;
e) apparatus intended for applications in explosives processing and manufacture;
f) apparatus intended for the detection of a potentially flammable atmosphere resulting from dust or mist in air;
g) open path apparatus not used for point measurement.

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.

IEC 60050-426, *International Electrotechnical Vocabulary (IEV) – Chapter 426: Electrical apparatus for explosive atmospheres*

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*

IEC 60079-20, *Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus*

IEC 60079-29-1, *Explosive atmosphere – Part 29-1: Gas detectors – Performance requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050(426) and IEC 60079-0, as well as the following apply. Also, since this is intended as a stand-alone standard, certain definitions within IEC 60079-29-1 are repeated below for the convenience of the reader.

3.1
alarm setpoint
fixed or adjustable setting of the apparatus that is intended to pre-set the level of concentration at which the apparatus will automatically initiate an indication, alarm or other output function

3.2
ambient air
the normal atmosphere surrounding the apparatus

3.3
aspirated apparatus
apparatus that samples the gas by drawing it to the gas sensor – for example by means of a hand-operated or electric pump

3.4
catalytic sensor
sensor, the operation of which depends upon the oxidation of gases on an electrically heated catalytic element

3.5
clean air
air that is free of flammable gases and interfering or contaminating substances

3.6
concentration
the amount of the gas or vapour of interest in a specified amount of the background gas or air, expressed in suitable units

NOTE Typical units include volume fraction (v/v) (see 3.57); molar (moles per mole – m/m); percentage of the LFL of a particular substance; parts per million by volume (ppm); parts per billion by volume (ppb).

3.7
continuous duty apparatus
gas detecting apparatus that is powered for long periods of time, but may have either continuous or intermittent sensing

3.8
continuous or quasi-continuous sensing
mode of operation in which power is applied continuously to the sensing element and readings are taken continuously or at regular and frequent intervals

3.9
diffusion apparatus
apparatus in which the transfer of gas from the atmosphere to the gas sensor takes place by random molecular movement, i.e. under conditions in which there is no aspirated flow

3.10
dose
the total amount of substance absorbed or trapped, proportional to the concentration and the duration of exposure

3.11
drift
variation in the apparatus indication with time at any fixed gas volume fraction (including clean air) under constant ambient conditions

3.12
electrochemical sensor
sensor, the operation of which depends upon changes of the electrical parameters of electrodes placed in an electrolyte due to redox reactions of the gas on the surface of the electrodes

3.13
explosion protected apparatus
apparatus incorporating a type of protection covered by the IEC 60079 series of standards

3.14
explosive gas atmosphere
mixture with air, under normal atmospheric conditions, of flammable substances in the form of gas or vapour, in which, after ignition, permits self-sustaining flame propagation