



**NSAI**  
Standards

Irish Standard  
I.S. EN 60079-29-3:2014

# Explosive atmospheres - Part 29-3: Gas detectors - Guidance on functional safety of fixed gas detection systems

**I.S. EN 60079-29-3:2014**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN 60079-29-3:2014

*Published:*

2014-06-20

*This document was published under the authority of the NSAI and comes into effect on:*

2014-07-18

ICS number:

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

**EN 60079-29-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2014

---

ICS 29.260.20

English Version

**Explosive atmospheres - Part 29-3: Gas detectors - Guidance on  
functional safety of fixed gas detection systems  
(IEC 60079-29-3:2014)**

Atmosphères explosives - Partie 29-3: Détecteurs de gaz -  
Recommandations relatives à la sécurité fonctionnelle des  
systèmes fixes de détection de gaz  
(CEI 60079-29-3:2014)

Explosionsfähige Atmosphäre - Teil 29-3: Gasmessgeräte -  
Leitfaden zur funktionalen Sicherheit von ortsfesten  
Gaswarnsystemen  
(IEC 60079-29-3:2014)

This European Standard was approved by CENELEC on 2014-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

---

## Foreword

The text of document 31/1105A/FDIS, future edition 1 of IEC 60079-29-3, prepared by IEC TC 31, Equipment for explosive atmospheres, was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60079-29-3:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-02-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-05-01

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

- IEC 60079-0, Explosive atmospheres – Part 0: Equipment – General requirements
- IEC 60079-29-1, Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases
- IEC 60079-29-2, Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen
- IEC 60079-29-4, Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## Endorsement notice

The text of the International Standard IEC 60079-29-3:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60079-1	NOTE	Harmonised as EN 60079-10-1.
IEC 61511-1	NOTE	Harmonised as EN 61511-1.
IEC 61511-2	NOTE	Harmonised as EN 61511-2.
IEC 61511-3	NOTE	Harmonised as EN 61511-3.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here:

[www.cenelec.eu](http://www.cenelec.eu)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-29-1 (mod)	-	Explosive atmospheres -- Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases	EN 60079-29-1	-
IEC 60079-29-2	2007	Explosive atmospheres -- Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen	+AA EN 60079-29-2	2007
IEC 60079-29-4 (mod)	-	Explosive atmospheres -- Part 29-4: Gas detectors - Performance requirements of open path detectors for flammable gases	+EN 60079-29-2:2007/corrigendum Dec. 2007 EN 60079-29-4	2007 -
IEC 61508	series	Functional safety of electrical/electronic/programmable electronic safety-related systems	+AA EN 61508	series

This page is intentionally left blank



**IEC 60079-29-3**

Edition 1.0 2014-03

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**



**Explosive atmospheres –  
Part 29-3: Gas detectors – Guidance on functional safety of fixed gas detection  
systems**

**Atmosphères explosives –  
Partie 29-3: Détecteurs de gaz – Recommandations relatives à la sécurité  
fonctionnelle des systèmes fixes de détection de gaz**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).





**IEC 60079-29-3**

Edition 1.0 2014-03

# **INTERNATIONAL STANDARD**

# **NORME INTERNATIONALE**



---

**Explosive atmospheres –  
Part 29-3: Gas detectors – Guidance on functional safety of fixed gas detection  
systems**

**Atmosphères explosives –  
Partie 29-3: Détecteurs de gaz – Recommandations relatives à la sécurité  
fonctionnelle des systèmes fixes de détection de gaz**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX



---

ICS 29.260.20

ISBN 978-2-8322-1496-1

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	10
2 Normative references .....	11
3 Terms and definitions .....	11
4 Requirements .....	13
4.1 General.....	13
4.2 Demand rate .....	13
5 Gas detection unique features .....	13
5.1 Objective .....	13
5.2 Features .....	14
5.2.1 General .....	14
5.2.2 Sensor location.....	14
5.2.3 Sensor filter elements (passive).....	14
5.2.4 Sensor filter elements (active) .....	14
5.2.5 Sensor principles .....	14
5.2.6 Poisoning and adverse chemical reaction .....	15
5.2.7 ppm.hr or %vol.hr lifetime .....	15
5.2.8 Negative gas readings .....	15
5.2.9 Hazard and risk analysis.....	15
5.2.10 Preventative effectiveness or mitigation effectiveness .....	16
5.2.11 Cross sensitivities.....	16
5.2.12 Special states .....	16
5.2.13 Metrological performance standards .....	16
5.2.14 Fault signal handling.....	16
5.2.15 Over-range indication .....	16
5.2.16 Surrogate calibration .....	16
5.2.17 Maximum/minimum alarm set points .....	17
6 Functional safety management .....	17
6.1 Objective .....	17
6.2 Requirements .....	17
6.3 Competence .....	18
7 General requirements .....	19
7.1 Objective .....	19
7.2 Requirements .....	19
7.2.1 General .....	19
7.2.2 Safety and non safety functions .....	19
7.2.3 Safety functions of different integrity targets .....	19
7.2.4 Behaviour under dangerous failure conditions.....	19
7.2.5 Behaviour under safe failure conditions .....	20
7.2.6 Behaviour under special state conditions .....	20
7.2.7 Power supply .....	21
7.2.8 Gas detector .....	21
7.2.9 Gas detection control unit (logic solver) .....	21
7.2.10 Final element (actuator).....	22
7.2.11 Visual indication .....	22

	7.2.12	Switching outputs .....	22
	7.2.13	Protocol outputs .....	24
	7.2.14	Protocol inputs.....	24
	7.2.15	System architecture, PFD and PFH values .....	24
8	Gas detection unique requirements .....		24
	8.1	Objectives.....	24
	8.2	Requirements .....	25
	8.2.1	Introduction to gas sampling .....	25
	8.2.2	Gas sampling.....	25
	8.2.3	Gas multiplexer .....	26
	8.2.4	Gas multiplexer control system .....	27
	8.2.5	Conditioning of measured gas .....	27
	8.2.6	Gas sampling by diffusion mode .....	28
	8.2.7	Automatic calibration and adjustment.....	28
	8.2.8	Automatic calibration and adjustment control system .....	29
9	Alternative control units (logic solvers) .....		30
	9.1	Objectives.....	30
	9.2	Requirements .....	30
	9.2.1	Performance (metrological).....	30
	9.2.2	Programming of logic.....	30
10	Factory acceptance testing.....		30
	10.1	Objectives.....	30
	10.2	Requirements .....	30
	10.2.1	Planning .....	30
	10.2.2	Execution .....	31
11	Installation and commissioning .....		31
	11.1	Objectives.....	31
	11.2	Requirements .....	32
	11.2.1	Planning .....	32
	11.2.2	Execution .....	32
12	System validation .....		33
	12.1	Objectives.....	33
	12.2	Requirements .....	33
	12.2.1	Planning .....	33
	12.2.2	Execution .....	33
13	Operation and maintenance.....		34
	13.1	Objectives.....	34
	13.2	Requirements .....	34
	13.2.1	Planning .....	34
	13.2.2	Execution .....	34
14	System modification .....		35
	14.1	Objectives.....	35
	14.2	Requirements .....	35
	14.2.1	Planning .....	35
	14.2.2	Execution .....	35
15	System decommissioning .....		36
	15.1	Objectives.....	36
	15.2	Requirements .....	36

15.2.1	Planning .....	36
15.2.2	Execution .....	36
16	Documentation .....	37
16.1	Objectives .....	37
16.2	Requirements .....	37
Annex A	(informative) Typical Applications .....	38
A.1	Typical diffusion applications .....	39
A.1.1	Application 1 .....	39
A.1.2	Application 2 .....	40
A.1.3	Application 3 .....	40
A.1.4	Application 4 .....	40
A.2	Typical sampling applications .....	41
A.2.1	Point to Point sampling .....	41
A.2.2	Multi-stream sampling .....	42
Annex B	(informative) Cross references between standards .....	43
Annex C	(informative) Transformation of requirements .....	44
C.1	General .....	44
C.2	SIL capability 1 .....	44
C.2.1	Characteristic .....	44
C.2.2	Transformation .....	44
C.3	SIL capability 2 .....	44
C.3.1	Characteristic .....	44
C.3.2	Transformation .....	45
C.4	SIL capability 3 .....	45
C.4.1	Characteristic .....	45
C.4.2	Transformation .....	45
Bibliography	.....	46
Figure 1	– Gas Detection System Architecture .....	8
Figure 2	– Related Safety Instrumented System Standards .....	10
Figure A.1	– Gas detection safety loops .....	39
Figure A.2	– Typical gas detector aspiration configurations .....	41
Figure B.1	– Cross references between standards .....	43
Table 1	– Typical Job Descriptions and Most Relevant Clauses .....	9
Table 2	– Demand for Functional Safety Management (see IEC 61508-1) .....	18

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**EXPLOSIVE ATMOSPHERES –****Part 29-3: Gas detectors – Guidance on  
functional safety of fixed gas detection systems**

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60079-29-3 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

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

- IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*
- IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*
- IEC 60079-29-2, *Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*
- IEC 60079-29-4, *Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases*

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

FDIS	Report on voting
31/1105A/FDIS	31/1117/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: *Explosive atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

Fixed gas detection systems have been used for many years to perform safety instrumented functions. Like any instrumented system, a fixed gas detection system commonly comprises of a single or multiple gas detector input(s), a control unit and a single or multiple final element(s) or output(s). Additional peripheral equipment may be incorporated into a fixed gas detection system e.g. a gas sampling system or a gas conditioning system. If a fixed gas detection system, including any relevant peripheral equipment is to be effectively used for safety instrumented functions, it is essential that the total system achieves certain minimum standards and performance levels.

It is important to understand that the number of sensing points and their appropriate location, their redundancy, the management of regular maintenance, specifically response checking or calibration, and other gas detection specific features (such as design of gas sampling systems) are all likely to have a far greater effect on the integrity of the overall Safety Instrumented System (SIS) than the required Safety Integrity Level (SIL) or SIL-capability of any of the individual functional units. This, however, does not exclude the requirement for each Safety Instrumented Function (SIF) to have a stand-alone functional integrity.

This international standard addresses the minimum standards and performance levels of a fixed gas detection system which is based on the use of electrical, electronic or programmable electronic systems (E/E/PES) for any application where there is either a risk reduction target stated or if the gas detection system is used as an additional safe guarding system.

This international standard does not apply to portable gas detectors or fixed gas detection systems when there is no risk reduction target stated. However, this standard could be used as a best practice document for such devices or systems.

The expression 'gas detection system' within this international standard is generic and applies to standalone fixed gas detectors, which might have their own internal alarm trip levels and switching outputs up to complex standalone fixed gas detection systems (Annex A – Typical Applications).

This international standard takes into consideration the possible complexity of the supply chain which a gas detection manufacturer, seller or system integrator might encounter which includes, but is not limited to:

- the use of standalone gas detectors which are integrated into an overall safety system by a gas detection equipment manufacturer, seller or system integrator (or equivalent)
- the design and use of fixed gas detection sub-systems, including any associated and/or peripheral gas detection equipment which are integrated into an overall safety system by a gas detection equipment manufacturer, seller or system integrator (or equivalent)
- the design and use of a complete fixed gas detection system, including associated and/or peripheral gas detection equipment which is the overall safety system

NOTE 1 IEC 61508 Parts 1, 2 and 3 cover the design of the stand-alone gas detector, control unit or final element. Guidance on the design of peripheral equipment is included within this international standard.

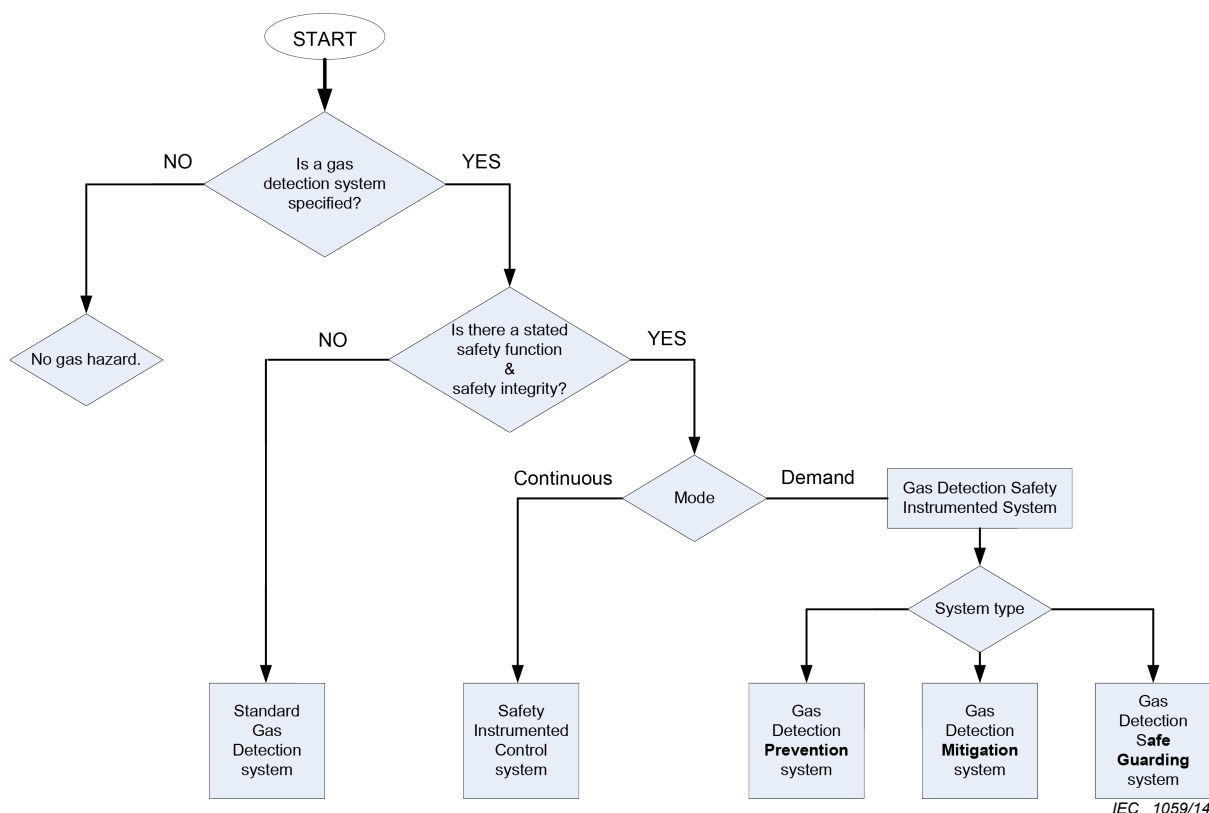
Before this international standard can be applied, it is important to understand and categorise the application of the fixed gas detection system. The three main applications are:

- as a prevention system – the total system or an individual instrumented control loop has a safety function and safety integrity clearly defined.
- as a mitigation system – the total system or an individual instrumented control loop has a safety function and safety integrity clearly defined.
- as an additional safe guarding system – this covers those fixed gas detection systems or individual instrumented control loops which operate in parallel (secondary) to an

instrumented safety system, where the demand on the fixed gas detection system or individual instrumented control loop is only when the primary instrumented safety system fails or another layer of protection fails.

Under no circumstances should the use of an additional safeguarding gas detection system contribute to the Hardware Fault Tolerance (HFT) declaration for the instrumented safety system.

A fixed gas detection system, as shown in Figure 1, may operate several times per year subject to the application, therefore this international standard accepts that the demand rate associated with 'on demand' (low demand) should be specified in the safety requirements (e.g. a reference could be "> 1/yr but <10/yr").



**Figure 1 – Gas Detection System Architecture**

To assist with the possible complexity and unique requirements associated with fixed gas detection systems, a fixed gas detection system may be broken down into functional units. Each functional unit can vary in complexity; a functional unit may be a simple gas detector or a combination of components which form peripheral equipment. Each functional unit is independently assessed against this international standard and/or IEC 61508 during the initial design phase of the functional unit, thus allowing safety data to be contributed to a functional unit.

NOTE 2 Basic elements of a sub-system/system (e.g. a gas detector, logic controller/solver, etc.) are designed as a product in compliance with IEC 61508 Parts 1, 2 and 3.

Each functional unit is then assembled in line with this international standard to deliver a complete fixed gas detection system. It is not necessary to re-assess individual functional units when they are used in a different configuration – it is only necessary to evaluate the combination of functional units.



This international standard is based on the safety lifecycle model detailed in IEC 61508, but adds additional and supportive information to assist with particular phases of this typical safety lifecycle.

This international standard specifies those requirements under ‘Functional Safety Management’ which all persons or companies who are involved in the supply chain of a fixed gas detection system should comply with.

NOTE 3 Functional Safety Management applies to all stages of the safety lifecycle irrespective of the product, subsystem, system supply or service being supplied.

For this document, the SIL capability excludes consideration of gas detection coverage or the transport of gas or vapour to the measuring point – IEC 60079-29-2 is pertinent to these two subjects.

Table 1 gives a broad suggestion as to the most relevant clauses to the typical tasks to be performed.

**Table 1 – Typical Job Descriptions and Most Relevant Clauses**

Applies to	Definitions	Conformance to this International standard	Gas detection unique features	Functional safety management	General requirements	Gas detection unique requirements	Alternative control units (logic solvers)	Factory acceptance testing	Installation and commissioning	System validation (SAT)	Operation and maintenance	System modification	System de-commissioning	Documentation
Clause	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Consultant		+++		+++										
Contractor		+++		+++										
Vendor		+++		+++										
System Integrator		+++		+++										
Manufacturer		+++		+++										
NOTE Each category above will have personnel in several of the categories below.														
General management	+	+	+		+	+	+	+	+	+	++	++	+	+
Design engineering / management	+++	+	+++		+++	+++	+++	+	+	+	++	+++	++	++
System engineer / management	+++	+	+++		+++	+++	+++	+++	++	++	+	+++	++	++
Installation engineering / management	++	+	++		+	++	+	+	+++	++	+	++	++	++
Commissioning engineer / management	++	+	++		++	++	+	+	+++	++	+	++	++	++
Service engineer / management	++	+	++		++	++	+	+	++	++	+++	+++	+++	++
Quality engineer / management	++	+	+++		+++	+++	+	+++	++	+++	+	++	+	+++
Training officers	+++	+	+++		+++	+++	++	+	+	+	+++	+	+	++
Operation & maintenance	+	+	++		+	++	+	++	+	+++	+++	+++	+++	+++
“+++” Most appropriate      “++” Advisable      “+” Useful The end-user, regulator and certification authorities need to be familiar with the entire family of IEC 61508 standards. NOTE See Annex B for guidance on the life cycle of gas detection.														

## EXPLOSIVE ATMOSPHERES –

### Part 29-3: Gas detectors – Guidance on functional safety of fixed gas detection systems

#### 1 Scope

This International standard gives guidance for the design and implementation of a fixed gas detection system, including associated and/or peripheral gas detection equipment, for the detection of flammable gases/vapours and Oxygen when used in a safety-related application in accordance with IEC 61508 and IEC 61511. This International standard also applies to the detection of toxic gases.

Other parts of this international standard and pertinent local, national and international standards separately specify the performance requirements of a gas detector and a gas detection control unit (logic solver). These standards are commonly known as Metrological Performance Standards and are concerned with the accuracy of the measured value, the overall system performance, but not the device or system integrity with respect to the safety function. This international standard applies to the integrity of the safety function.

NOTE In certain jurisdictions, it can be a requirement for a Certification Body to certify the performance of equipment for the measurement of flammable gases, vapours, toxic gases and/or Oxygen used in life safety applications.

This international standard sets out safety-related considerations of fixed gas detection systems, including associated and/or peripheral gas detection equipment in terms of the framework and philosophy of IEC 61508, and introduces the particular requirements demanded by a fixed gas detection system as shown in Figure 2.

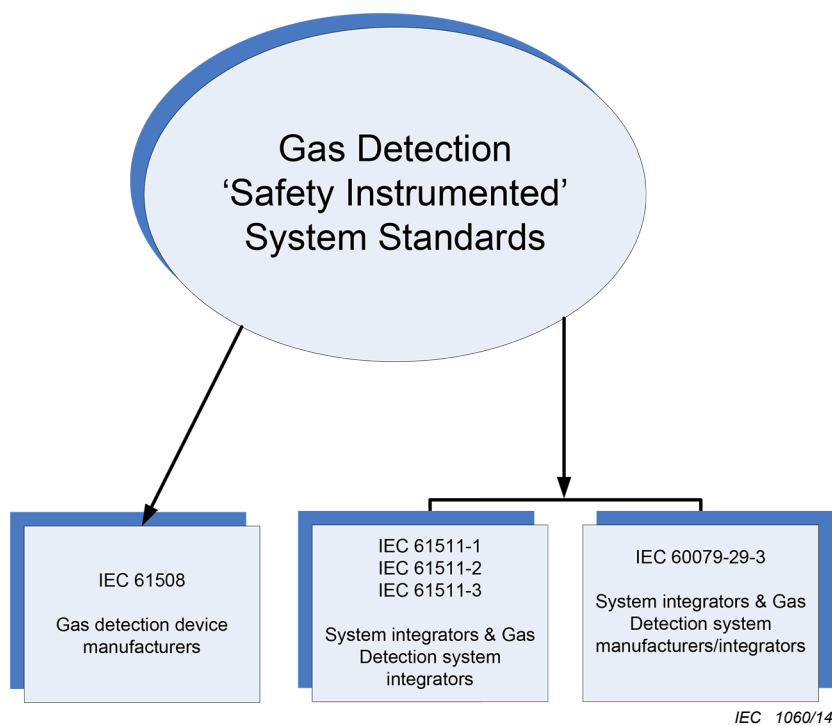


Figure 2 – Related Safety Instrumented System Standards

This international standard does not consider the Safety Integrity Level SIL 4. SIL 4 is assumed to be unrealistic to be achieved for gas detection systems.

NOTE 3 It is rare for any risk study to determine a Safety Integrity higher than SIL 2 for a fixed gas detection system.

This international standard is applicable for fixed gas detection systems, which might consist of the following hardware functional units

- Gas sensor/transmitter
- Gas detection control unit (logic solver)
- Gas sampling (single and multiplexed streams)
- Gas conditioning
- Automatic gas calibration and adjustment
- Output module (if not part of the control unit)

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60079-29-2:2007, *Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

IEC 60079-29-4, *Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases*

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

IEC 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*

IEC 61508-2, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*

IEC 61508-3, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **additional safe guarding system**

fixed gas detection system or individual instrumented control loops which operate in parallel (secondary) to an instrumented safety system, where the demand on the fixed gas detection system or individual instrumented control loop is only when the primary instrumented safety system fails or another layer of protection fails

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-