

## საქართველოს სტანდარტი

---

ფეთქებადსაშიში გარემო-ნაწილი 29-3: აირ-დეტექტორები-  
სახელმძღვანელო არააქროლადი გაზის აღმოჩენის სისტემების ფუნქციური  
უსაფრთხოებისათვის (იეკ 60079-29-3:2014)

საქართველოს სტანდარტებისა და  
მეტროლოგიის ეროვნული სააგენტო  
თბილისი

სსტ ენ 60079-29-3:2014/2017

### საინფორმაციო მონაცემები

1 დამტკიცებულია და შემოღებულია სამოქმედოდ საქართველოს სტანდარტებისა და მეტროლოგიის ეროვნული სააგენტოს 2017 წლის 28 სექტემბრის № 65 და 2017 წლის 27 ივნისის № 47 განკარგულებებით

2 მიღებულია თავფურცლის თარგმნის მეთოდით სტანდარტიზაციის ევროპული კომიტეტის სტანდარტი ენ 60079-29-3:2014 „ ფეთქებადსაშიში გარემო-ნაწილი 29-3: აირ-დეტექტორები-სახელმძღვანელო არააქროლადი გაზის აღმოჩენის სისტემების ფუნქციური უსაფრთხოებისათვის იეკ 60079-29-3:2014”

### 3 პირველად

4 რეგისტრირებულია საქართველოს სტანდარტებისა და მეტროლოგიის ეროვნული სააგენტოს რეესტრში: 2017 წლის 28 სექტემბერი №268-1.3-011740

აკრძალულია ამ სტანდარტის გადაცემა მესამე პირებისათვის ან/და მისი სხვა ფორმით გავრცელება

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

საინფორმაციო ნაწილი. სრული ტექსტის სახასიათო შეიძინეთ სტანდარტი.

# 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.**

საინფორმაციო ნაწილი. სრული ტექსტის სანახავად შეიძინეთ სტანდარტი.



## 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