



BSI Standards Publication

Workplace atmospheres

Part 1: Gas detectors — Performance requirements of detectors for toxic gases

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN IEC 62990-1:2022+A11:2022. It is derived from IEC 62990-1:2019, incorporating corrigendum December 2019. It supersedes BS IEC 62990-1:2019, which will be withdrawn on 12 December 2023.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum December 2019 is indicated in the text by $\boxed{\text{AC}_1}$ $\langle \text{AC}_1 \rangle$.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by $\boxed{\text{A}_{11}}$ $\langle \text{A}_{11} \rangle$.

The UK participation in its preparation was entrusted to Technical Committee EXL/31, Equipment for explosive atmospheres.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 20238 0

ICS 29.260.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2019.

Amendments/corrigenda issued since publication

Date	Text affected
31 January 2020	Implementation of IEC corrigendum December 2019
31 March 2023	Implementation of CENELEC amendment A11:2022

This is a preview of "BS EN IEC 62990-1:20...". Click here to purchase the full version from the ANSI store.

EUROPÄISCHE NORM

October 2022

ICS 29.260.20

Supersedes EN 45544-1:2015; EN 45544-3:2015;
EN 45544-2:2015

English Version

Workplace atmospheres - Part 1: Gas detectors - Performance
requirements of detectors for toxic gases
(IEC 62990-1:2019 + COR1:2019)

Atmosphères des lieux de travail - Partie 1: Détecteurs de
gaz - Exigences d'aptitude à la fonction des détecteurs de
gaz toxiques
(IEC 62990-1:2019 + COR1:2019)

Arbeitsplatzatmosphäre - Teil 1: Gasmessgeräte -
Anforderungen an das Betriebsverhalten von Geräten für
die Messung toxischer Gase
(IEC 62990-1:2019 + COR1:2019)

This European Standard was approved by CENELEC on 2022-08-17. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

European foreword

This document (EN IEC 62990-1:2022) consists of the text of IEC 62990-1:2019 and IEC 62990-1:2019/COR1:2019 prepared by IEC/TC 31 "Equipment for explosive atmospheres" in cooperation with ISO/TC 146 "Air quality, sub-committee 2: Workplace atmospheres".

The following dates are fixed:

- latest date by which this document has to be (dop) 2023-08-27 implemented at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards (dow) 2025-08-27 conflicting with this document have to be withdrawn

This document, together with EN IEC 62990-1/A11:2022, supersedes EN 45544-1:2015, EN 45544-2:2015 and EN 45544-3:2015.

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62990-1:2019 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 60079-29-1	NOTE	Harmonized as EN 60079-29-1
IEC 60079-29-2	NOTE	Harmonized as EN 60079-29-2
IEC 60079-29-3	NOTE	Harmonized as EN 60079-29-3
IEC 60079-29-4	NOTE	Harmonized as EN 60079-29-4
ISO 6145-1	NOTE	Harmonized as EN ISO 6145-1
ISO 6145-4	NOTE	Harmonized as EN ISO 6145-4
ISO 6145-5	NOTE	Harmonized as EN ISO 6145-5
ISO 6145-6	NOTE	Harmonized as EN ISO 6145-6
ISO 6145-7	NOTE	Harmonized as EN ISO 6145-7
ISO 6145-9	NOTE	Harmonized as EN ISO 6145-9
ISO 6145-10	NOTE	Harmonized as EN ISO 6145-10
ISO 20581	NOTE	Harmonized as EN 482

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

European foreword to Amendment A11

This document (EN IEC 62990-1:2022/A11:2022) has been prepared by CLC/SC 31-9, "Electrical apparatus for the detection and measurement of combustible gases to be used in industrial and commercial potentially explosive atmospheres", of CLC/TC 31, "Electrical apparatus for potentially explosive atmospheres".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-08-27
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2025-08-27

This document contains common modifications to EN IEC 62990-1:2022.

This document, together with EN IEC 62990-1:2022, supersedes EN 45544-1:2015, EN 45544-2:2015 and EN 45544-3:2015.

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62990-1:2019 and IEC 62990-1/COR1:2019 are prefixed "Z".

This is a preview of "BS EN IEC 62990-1:20...". Click here to purchase the full version from the ANSI store.

(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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
-	-	Electromagnetic compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen	EN 50270	-
-	-	Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies	EN 50271	2018
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	EN 60079-0	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-

 A11

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	8
3 Terms and definitions	8
4 General requirements	16
4.1 Overview.....	16
4.2 Design	17
4.2.1 General	17
4.2.2 Indicating devices	17
4.2.3 Alarm signal	19
4.2.4 Fault signals	19
4.2.5 Adjustments.....	20
4.2.6 Battery-powered equipment	20
4.2.7 Gas detection transmitter for use with separate gas detection control units	20
4.2.8 Separate gas detection control units for use with gas detection transmitter(s).....	21
4.2.9 Software-controlled equipment	21
4.3 Labelling and marking.....	22
4.4 Instruction manual	23
5 Test methods.....	25
5.1 General.....	25
5.2 General requirements for tests.....	26
5.2.1 Samples and sequence of tests	26
5.2.2 Preparation of equipment before each test.....	27
5.2.3 Mask for calibration and test.....	28
5.3 Normal conditions for test	28
5.3.1 General	28
5.3.2 Test gas(es)	28
5.3.3 Flow rate for test gases	28
5.3.4 Power supply.....	29
5.3.5 Temperature.....	29
5.3.6 Pressure.....	29
5.3.7 Humidity	29
5.3.8 Acclimation time	29
5.3.9 Orientation.....	29
5.3.10 Communications options.....	29
5.3.11 Gas detection equipment as part of systems.....	30
5.4 Tests	30
5.4.1 General	30
5.4.2 Unpowered storage	30
5.4.3 Measurement of deviations	31
5.4.4 Mechanical tests.....	31
5.4.5 Environmental tests	33
5.4.6 Performance tests	36
5.4.7 Electrical tests.....	41

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

5.4.8	Stability	44
5.4.9	Fault signal tests	45
5.4.10	Software controlled equipment.....	46
5.4.11	Protection against water	46
6	Uncertainty of measurement and lower limit of measurement for type HM equipment	47
6.1	General.....	47
6.2	Method of calculation of uncertainty of measurement	47
6.2.1	Basic concept.....	47
6.2.2	Sources of uncertainty.....	48
6.2.3	Calculation of relative expanded uncertainty.....	53
6.3	Method of calculation of lower limit of measurement	54
6.4	Acceptance criteria	55
6.4.1	Uncertainty of measurement.....	55
6.4.2	Lower limit of measurement.....	55
6.5	Relation between uncertainty and accuracy	55
Annex A	(normative) Gas specific performance requirements	56
Annex B	(informative) Determination of time of response and time of recovery	57
B.1	Aspirated equipment	57
B.1.1	Test rig	57
B.1.2	Equipment without internal pump	57
B.1.3	Equipment with internal pump.....	57
B.2	Equipment that samples by diffusion	58
B.2.1	Calibration mask method	58
B.2.2	Diffusion or flow methods	58
Bibliography	60
Figure 1	– Relationship between indication range and measuring range	14
Figure 2	– Warm-up time in clean air (typical)	15
Figure 3	– Warm-up time in standard test gas (typical)	15
Figure 4	– Example of zero uncertainty.....	16
Figure B.1	– Schematic example of test rig for use with aspirated equipment.....	58
Figure B.2	– Schematic example of test chamber for diffusion method.....	59
Figure B.3	– Schematic example of test chamber for flow method.....	59
Table 1	– Factors to be considered in the expanded uncertainty estimate	48
Table A.1	– Gas specific performance requirements	56

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

WORKPLACE ATMOSPHERES –

Part 1: Gas detectors – Performance requirements of detectors for toxic gases

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 62990-1 has been prepared by Joint Working Group (JWG) 45 of IEC technical committee 31: Equipment for explosive atmospheres in cooperation with ISO technical committee 146: Air quality, sub-committee 2: Workplace atmospheres.

It is published as a dual logo standard.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
31/1463/FDIS	31/1480/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62990 series, published under the general title *Workplace atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

The contents of the corrigendum of December 2019 have been included in this copy.

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.

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

INTRODUCTION

This part of A11 EN 62990 A11 specifies general requirements for construction, testing and performance of equipment intended to measure the concentration of toxic gas and vapour in workplace atmospheres and other industrial and commercial applications. The performance requirements are intended to apply under environmental conditions present at the site of operation. However, because a wide range of environmental conditions are encountered in practise, this document specifies requirements that have to be fulfilled by equipment when tested under prescribed laboratory conditions.

This document applies to the following types of equipment: Health Monitoring (HM) and Safety Monitoring (SM). For a given measurement task of Type HM equipment the range over which the requirements must be met depends on the occupational exposure limit value. However, for most toxic gases and vapours the occupational exposure limit values have not been harmonized at the international level. Therefore, it was decided to use a reference value instead of the occupational exposure limit value for the performance tests. The list of reference values is given in Annex A. The reference values chosen are equal to or close to the occupational exposure limit values used in different countries but are intended to be used only for type testing equipment without any legal implications.

Electrical equipment used for the direct detection and direct concentration measurement of toxic gases and vapours generate readings in clean air (nominally zero), which vary with environmental conditions and time. This document therefore includes test methods and requirements for acceptable variations in measured values at application of zero gas and of defined test gases.

For gas detection equipment including additional function for detecting flammable gas and/or oxygen, consideration should be given to the relevant standards.

General requirements for construction, testing and performance of gas detectors for flammable gases and vapours are set out in A11 EN 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases* A11 .

General requirements for construction, testing and performance of open path detectors for flammable gases are set out in A11 EN 60079-29-4, *Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases* A11 .

Guidance for the selection, installation, use and maintenance of gas detecting equipment is set out in A11 EN 60079-29-2: *Explosive atmospheres – Part 29-2, Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen* A11 .

Guidance for functional safety of fixed gas detection systems is set out in A11 EN 60079-29-3: *Explosive atmospheres – Part 29-3, Gas detectors – Guidance on functional safety of fixed gas detection systems* A11 .

This is a preview of "BS EN IEC 62990-1:20...". [Click here to purchase the full version from the ANSI store.](#)

WORKPLACE ATMOSPHERES –

Part 1: Gas detectors – Performance requirements of detectors for toxic gases

1 Scope

This part of A11 EN 62990 A11 specifies general requirements for design, function and performance, and describes the test methods that apply to portable, transportable, and fixed equipment for the detection and concentration measurement of toxic gases and vapours in workplace atmospheres and other industrial and commercial applications.

This document is applicable to continuously sensing equipment whose primary purpose is to provide an indication, alarm and/or other output function the purpose of which is to indicate the presence of a toxic gas or vapour in the atmosphere and in some cases to initiate automatic or manual protective action(s). It is applicable to equipment in which the sensor generates an electrical signal when gas is present.

This document applies to two types of equipment:

- Type HM (Health Monitoring) 'occupational exposure' equipment:
For occupational exposure measurement, the performance requirements are focused on uncertainty of measurement of gas concentrations in the region of Occupational Exposure Limit Values (OELV). The upper limit of measurement will be defined by the manufacturer in accordance with 4.2.1.
- Type SM (Safety Monitoring) 'general gas detection' equipment:
For general gas detection applications (e.g. safety warning, leak detection), the performance requirements are focused on alarm signalling. The upper limit of measurement will be defined by the manufacturer according to the intended use of the equipment.

In general, the requirements for accuracy will be higher for Type HM equipment than for Type SM equipment. The same equipment may meet the requirements of both Type HM and Type SM.

For equipment used for sensing the presence of multiple gases this document applies only to the detection of toxic gas or vapour.

This document is not applicable to equipment:

- with samplers and concentrators such as sorbents or paper tape having an irreversible indication;
- used for the measurement of gases and vapours related to the risk of explosion;
- used for the measurement of oxygen;
- used only in laboratories for analysis or measurement;
- used only for process measurement purposes;
- used in the domestic environment;
- used in environmental air pollution monitoring;
- used for open-path (line of sight) area gas measurement;
- used for ventilation control in car parks or tunnels.