



# UL 62990-1

## STANDARD FOR SAFETY

Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases

ULNORM.COM : Click to view the full PDF of UL 62990-1 2023

[ULNORM.COM](https://www.ulnorm.com) : Click to view the full PDF of UL 62990-1 2023

UL Standard for Safety for Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases, UL 62990-1

First Edition, Dated February 3, 2023

### **Summary of Topics**

***Adoption of IEC 62990-1, Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases, (first edition and Corrigendum 1, issued by IEC June 2019) as a new IEC-based UL Standard, UL 62990-1 with US Differences.***

***As noted in the Commitment for Amendments statement located on the back side of the title page, UL and FM are committed to updating this harmonized standard jointly.***

The new requirements are substantially in accordance with Proposal(s) on this subject dated March 25, 2022 and September 9, 2022.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

ULNORM.COM : Click to view the full PDF of UL 62990-1 2023



**FM Approvals LLC**  
**ANSI/FM 62990-1-2023**  
**First Edition**



**ULSE Inc.**  
**UL 62990-1**  
**First Edition**

## **Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases**

February 3, 2023

*ULNORM.COM : Click to view the full PDF of UL 62990-1 2023*



**ANSI/UL 62990-1-2023**

## **Commitment for Amendments**

This standard is issued jointly by FM Approvals LLC and ULSE Inc.(UL). Comments or proposals for revisions on any part of the standard may be submitted to FM Approvals or UL at any time. FM and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

---

## **Copyright © 2023 FM Approvals LLC**

These materials are subject to copyright claims of IEC, ANSI and FM. All rights reserved. Not for resale. Printed in the United States of America. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of FM. All requests pertaining to this Standard should be submitted to FM.

The most recent designation of ANSI/FM 62990-1 as an American National Standard (ANSI) occurred on February 3, 2023.

---

## **Copyright © 2023 ULSE INC.**

Our Standards for Safety are copyrighted by ULSE Inc. Neither a printed nor electronic copy of a Standard should be altered in any way. All of our Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of ULSE Inc.

This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 62990-1 as an American National Standard (ANSI) occurred on February 3, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

To purchase UL Standards, visit UL's Standards Sales Site at <http://www.shopulstandards.com/HowToOrder.aspx> or call toll-free 1-888-853-3503.

---

**CONTENTS**

**PREFACE ..... 5**

**National Differences ..... 7**

**FOREWORD ..... 9**

**INTRODUCTION..... 11**

1 Scope ..... 13

    1DV.1 Modification of Clause 1, first paragraph as follows: ..... 13

    1ADV.1 Addition of the following: ..... 14

2 Normative references ..... 14

    2DV Modification of Clause 2 references as follows: ..... 14

3 Terms and definitions ..... 15

    3.5.9DV Modification of Clause 3.5.9 as follows: ..... 20

    3.5.10DV Modification of Clause 3.5.10 as follows: ..... 20

4 General requirements ..... 24

    4.1 Overview ..... 24

    4.2 Design ..... 24

    4.3 Labelling and marking ..... 32

    4.3DV.1 Modification of Clause 4.3 in accordance with the following: ..... 32

    4.3DV.2 Modification of Clause 4.3 item (f) as follows: ..... 33

    4.4 Instruction manual ..... 33

    4.4DV Modification of Clause 4.4 as follows: ..... 33

    4.4DV.1 Modification of Clause 4.4 items (b)(4) and (b)(5) to replace with the following and delete the NOTE following item (b)(4) ..... 34

    4.4DV.2 Modification of Clause 4.4 item (c)(4) to delete ..... 34

    4.4DV.3 Modification of Clause 4.4 to replace item (p) and it’s subitems (1) – (3) with the following: ..... 36

5 Test methods ..... 37

    5.1 General ..... 37

    5.2 General requirements for tests ..... 37

    5.3 Normal conditions for test ..... 40

    5.4 Tests ..... 42

6 Uncertainty of measurement and lower limit of measurement for type HM equipment ..... 62

    6.1 General ..... 62

    6.2 Method of calculation of uncertainty of measurement ..... 62

    6.3 Method of calculation of lower limit of measurement ..... 69

    6.4 Acceptance criteria ..... 70

    6.5 Relation between uncertainty and accuracy ..... 70

**Annex A (normative) Gas specific performance requirements**

**Annex B (informative) Determination of time of response and time of recovery**

B.1 Aspirated equipment ..... 73

    B.1.1 Test rig ..... 73

    B.1.2 Equipment without internal pump ..... 73

    B.1.3 Equipment with internal pump ..... 73

B.2 Equipment that samples by diffusion ..... 74

    B.2.1 Calibration mask method ..... 74

    B.2.2 Diffusion or flow methods ..... 74

**Bibliography**

BIBDV Modification of Bibliography to add the following: .....77

*ULNORM.COM : Click to view the full PDF of UL 62990-1 2023*

## PREFACE

This is the harmonized FM and UL standard for Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases. It is the first edition of FM 62990-1 and the first edition of UL 62990-1.

This harmonized standard is based on IEC Publication 62990-1: first edition, Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases, issued June 2019 and corrigendum 1. IEC publication 62990-1 is copyrighted by the IEC.

This harmonized standard was prepared by FM Approvals LLC (FM) and ULSE Inc. (UL).

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

### Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

### Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an identical standard for FM and UL.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the FM and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

### Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

## IEC Copyright

For FM, the text, figures, and tables of International Electrotechnical Commission Publication 62990-1, Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases, copyright 2019, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

These materials are subject to copyright claims of IEC and UL. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of UL. All requests pertaining to the Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases UL 62990-1 Standard should be submitted to UL.

The following people served as members of STP 9200 and participated in the review of this standard:

| NAME          | COMPANY                      |
|---------------|------------------------------|
| *J. Miller    | MSA Innovation LLC           |
| F. AlSahan    | Saudi Aramco                 |
| R. Chalmers   | Industrial Scientific Corp.  |
| J. Chin       | CSA Group                    |
| M. Coppler    | LabTest Certification Inc.   |
| G. Edwards    | Det-Tronics                  |
| G. Garcha     | Gurinder Garcha Consulting   |
| C. Gestler    | MSA Innovation LLC           |
| W. Lawrence   | FM Approvals                 |
| S. Henney     | FM Approvals LLC             |
| M. Marrington | Index                        |
| D. Mills      | UL Solutions                 |
| B. Saxinger   | BW Technologies by Honeywell |
| D. Schedler   | Rosemount Inc.               |
| J. Schenayder | Dooley Tackaberry Inc.       |
| R. Seitz      | ARTECH Engineering           |
| M. Shaw       | Sensor Resource Inc.         |
| J. Thomason   | Omni Industrial Systems Inc. |
| L. Vlaga      | General Monitors             |
| D. Wechsler   | American Chemistry Council   |

\* Non-voting member

## National Differences

National Differences from the text of International Electrotechnical Commission (IEC) Publication 62990-1, Workplace Atmospheres – Part 1: Gas Detectors – Performance Requirements of Detectors for Toxic Gases, copyright 2019, are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**D1** – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2** – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

**DC** – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE** – These are National Differences based on **editorial comments or corrections**.

**DR** – These are National Differences based on the **national regulatory requirements**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

**Addition / Add** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

**Deletion / Delete** - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

**Modification / Modify** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

No Text on This Page

[ULNORM.COM](https://ULNORM.COM) : Click to view the full PDF of UL 62990-1 2023

## FOREWORD

### INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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

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

A list of all parts in the ISO/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.

**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.**

ULNORM.COM : Click to view the full PDF of UL 62990-1 2023

## INTRODUCTION

This part of ISO/IEC 62990 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 IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*.

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

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

**101.DV DR Modification of Introduction, fifth, sixth and seventh paragraphs as follows:**

**Replace “IEC 60079-29” with “UL 60079-29”.**

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

No Text on This Page

[ULNORM.COM](https://ULNORM.COM) : Click to view the full PDF of UL 62990-1 2023