



Approval Standard for Toxic Gas and Oxygen Depletion Detectors

Class Number 6340

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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INTRODUCTION

1.1 Purpose

- 1.1.1 This standard describes FM Approvals requirements for toxic gas and oxygen depletion gas detection instruments.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

1.2 Scope

- 1.2.1 This standard contains the basic requirements for the construction and testing of toxic gas and oxygen depletion gas detection instruments. Instruments used to detect flammable (explosive) concentrations of toxic gas(es) when the LEL exceeds the TLV are excluded.
- 1.2.2 For apparatus used for sensing the presence of multiple gases that are both toxic and combustible, this document applies only to the portion sensing the presence of toxic gas or vapor.

Note: Some gases may be both toxic and flammable, and even though the concentrations required to reach the flammable limit are typically many times greater than the toxic levels, consideration of the gas detector method of protection for hazardous locations should be made when using toxic gas detectors in locations where flammable gases may be present.

- 1.2.3 This standard does not address gas monitoring or monitoring apparatus of the laboratory or scientific type used for analysis or measurement, apparatus used for process control and process monitoring purposes, or apparatus used for residential purposes.
- 1.2.4 The user should be aware of environmental effects on both the instrument and the toxic gas. The effects are not intended to be evaluated by this Standard.

1.2.5 Toxic Gases (for gases listed in ANSI/ISA-92.00.01-2010)

Note: The 2010 edition is considered to be the minimum requirements. A later edition is permitted to be used once published.

- 1.2.5.1 Toxic gas detectors for the detection of the gases listed in ANSI/ISA-92.00.01 shall comply with the requirements of this standard and all applicable requirements in ANSI/ISA-92.00.01 including acceptance criteria as defined within Annex A of ANSI/ISA-92.00.01.

1.2.6 Toxic Gases (for gases not listed in ANSI/ISA-92.00.01-2010)

- 1.2.6.1 Toxic gas detectors for the detection of the gases not listed in ANSI/ISA-92.00.01-2010 shall comply with the requirements of this standard and all applicable requirements in ANSI/ISA-92.00.01-2010 with acceptance criteria defined as the manufacturer's claimed performance for each gas type. The performance parameters shall be clearly identified within the manufacturer's instruction manual. The performance parameters of each gas shall include all of the following:
 - (a) the gas name and common formula
 - (b) range(s) (for multiple ranges performance parameters shall be stated for each range)

- (c) accuracy (to be in the format: “ $\pm$ xx ppm or $\pm$ xx % of reading whichever is greater”)
- (d) Response Time (T20), Response Time (T50), Response Time (T90), Recovery Time (T10). Response and Recovery time shall be of Final Value (seconds), where Final Value = value after stabilization.
- (e) Temperature range over which the stated accuracy applies.

1.2.7 Oxygen Depletion

- 1.2.7.1** Gas detectors for the detection of oxygen levels below 21% by volume shall comply with the requirements of this standard and all applicable requirements in ANSI/ISA-92.04.01-1996.

Note: The 1996 edition is considered to be the minimum requirements. A later edition is permitted to be used once published.

1.2.8 Common Low Concentration Gases

- 1.2.8.1** For a gas detector which measures a gas that is also combustible, this standard is applicable for ranges from ppm level up to 3% of the lower flammable limit. For example, hydrogen – with an LEL of 4%v/v (40,000 ppm) shall be tested as a toxic gas up to a concentration of 1200 ppm. Measurement levels above 1200 ppm shall be tested as a combustible gas.

1.3 Basis for Requirements

- 1.3.1** The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, and loss control specialists was also considered.
- 1.3.2** The requirements of this standard reflect tests and practices used to examine characteristics of toxic and oxygen depletion gas detectors for the purpose of obtaining FM Approval. These requirements are intended primarily as guides, and strict conformity is not always mandatory. Toxic and oxygen depletion gas detectors having characteristics not anticipated by this standard may be Approved if performance equal or superior to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, gas detectors which do meet all the requirements identified in this standard may not be Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1** Examination and tests on production samples shall be performed to evaluate
- (a) the suitability of the product;
 - (b) the performance of the product as specified by the manufacturer and required by FM Approvals; and as far as practical, the durability and reliability of the product.
- 1.4.2** An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. These examinations may be repeated as part of FM Approvals' product follow-up program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- (a) production or availability of the product as currently FM Approved;
- (b) the continued use of acceptable quality assurance procedures;
- (c) satisfactory field experience;
- (d) compliance with the terms stipulated in the Approval report and Master Agreement;
- (e) Satisfactory re-examination of production samples for continued conformity to requirements; and satisfactory Surveillance Audits conducted as part of FM Approvals' product follow-up program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

1.6 Effective Date

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval.

The effective date of this Standard is January 1, 2020 for compliance with all requirements.

1.7 System of Units

Where units of measurement are expressed in U.S. customary units, they are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. Conversions are in accordance with ANSI/IEEE/ASTM SI-10. Where units of measurement are expressed in SI units, no US customary units are provided.

1.8 Applicable Documents

The following standards, test methods, and practices are referenced in this standard:

ANSI/ISA-92.00.01, Performance Requirements for Toxic Gas Detectors, Approved 13 January 2011

ANSI/ISA-92.04.01, Part I, Performance Requirements for Instruments Used to Detect Oxygen-Deficient/Oxygen-Enriched Atmospheres

FM Approvals Standard 3600, "General Requirements for Electrical Equipment"

1.9 Definitions

For purposes of this standard, the definitions within ANSI/ISA-92.00.01 and ANSI/ISA-92.04.01, Part I apply, including the following additional terms:

Aspirated Apparatus

An apparatus which samples the atmosphere by drawing it to the sensor, for example by means of a hand operated or electric pump.

Dead Space

An actual or potential area within a chamber where the gas is stagnant (not mixing and/or still)

Fault Signal

An audible, visible, or other type of output providing, directly or indirectly, a warning or indication that the apparatus is not working satisfactorily.

Zero Indication (excluding oxygen gas detector)

The indication given by properly adjusted apparatus when exposed to clean air in normal operating conditions.

Special State

All states of the apparatus other than those in which monitoring of gas concentration takes place, for example warm-up, calibration mode or fault condition.

Transmitter

Stand-alone gas detection apparatus for use with separate control units includes apparatus that provide a conditioned electronic signal or output indication intended to be used with stand-alone control units, separate signal processing, data acquisition, central monitoring or other similar systems which typically process information from various locations and sources including, but not limited to, gas detection instrumentation.

2 GENERAL INFORMATION

2.1 Approval Application Requirements

To apply for an Approval examination, the manufacturer, or its authorized representative, should submit a request to

Manager, Electrical Systems
FM Approvals
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062
U.S.A.

The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- (a) A completed Application/Request for Quote form.
- (b) A complete list of all models, types, sizes, and options for the products or services being submitted for Approval consideration;
- (c) General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance manuals, and
- (d) The number and location of manufacturing facilities.
- (e) All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.