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Ships and marine technology — Specifications for gas detectors intended for use on board ships —

Part 1: Portable gas detectors for atmosphere testing of enclosed spaces

Navires et technologie maritime — Spécifications pour les détecteurs de gaz destinés à être utilisés à bord des navires —

Partie 1: Détecteurs de gaz portables pour les essais atmosphériques des espaces clos

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Specification of portable gas detectors for atmosphere testing of enclosed spaces **2**
4.1 General requirements 2
4.1.1 Gases required to be measured 2
4.1.2 Method of measurement 3
4.1.3 Basic performance 3
4.1.4 Portability 4
4.2 Sensitivities, indications, and alarms 4
4.3 Robustness and electrical safety 4
4.4 Marking and manual 4
4.4.1 Marking 4
4.4.2 Instruction manual 5
4.4.3 Testing 5

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Lifesaving and fire protection*.

This first edition of ISO 19891-1 cancels and replaces ISO/PAS 19891-1:2016, which has been technically revised.

A list of all the parts in the ISO 19891 series, can be found on the ISO website.

Introduction

This document specifies performance, gases to be measured, tolerances for gas measurement, and testing requirements of portable gas detectors used for testing of the atmosphere in enclosed spaces onboard ships prior to entry into those spaces, as required by SOLAS regulation XI-1/7 “Atmosphere testing instrument for enclosed spaces”.

This document specifies the characteristics that portable gas detectors should be assessed against items such as: which gases can be measured, sensitivities, indications, alarm levels, protection against shock, temperature and water ingress, and additional requirements for spaces or areas where a risk of explosion exists.

This document specifies the marine environmental conditions in which portable gas detectors are expected to be used.

This document does not define differences between gases and vapours, nor does it give technical detail on calculations and methodology for explosive limits and operational exposure levels. The intent of this document is to simplify the subject to the essentials and use references for the actual scientific standards if more detailed explanations are required.

Portable gas detectors conforming to this document should only be used onboard ships in accordance with IMO requirements and procedures.

This document does not provide a specification on how to use portable gas detectors, or how to enter enclosed spaces.

Ships and marine technology — Specifications for gas detectors intended for use on board ships —

Part 1: Portable gas detectors for atmosphere testing of enclosed spaces

1 Scope

This document provides specifications on performance, gases to be measured, sensitivities, indications, alarm levels, protection against shock, temperature and water ingress, and testing requirements of portable gas detectors used for atmosphere testing of enclosed spaces onboard ships prior to entry into those spaces.

This document specifies suitable portable gas detectors for compliance with SOLAS regulation XI-1/7 "Atmosphere testing instrument for enclosed spaces", and may be used for deciding whether portable gas detectors available on the market are suitable for compliance with these SOLAS requirements.

NOTE 1 SOLAS regulation XI-1/7 requires appropriate portable atmosphere testing instrument or instruments to be carried onboard ships, by 1 July 2016. The SOLAS regulation requires, as a minimum, the appropriate portable atmosphere testing instrument or instruments to be capable of measuring concentrations of oxygen, flammable gases or vapours, hydrogen sulphide and carbon monoxide prior to entry into enclosed spaces.

For the purpose of measurement of concentrations of flammable gases or vapours, this document specifies the flammable gas as either "methane" or "propane and butane", and requires clear marking of types of flammable gases which can be measured by the portable gas detectors. Flammable vapours/gases which are not marked cannot be measured or detected by the portable gas detector.

NOTE 2 Iso-butane is an alternative calibration gas of portable gas detectors in measuring propane and butane.

This document does not give any indication of toxicity of the flammable gases.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 60092-504, *Electrical installations in ships — Part 504: Special features — Control and instrumentation*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60533, *Electrical and electronic installations in ships — Electromagnetic compatibility*

IMO Resolution A.1050(27), *Revised recommendations for entering enclosed spaces aboard ships, Annex, section 7 Testing the atmosphere*

SOLAS regulation XI-1/7, *Atmosphere testing instrument for enclosed spaces*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
enclosed space
space which has any of the following characteristics:

a) limited openings for entry and exit;

b) inadequate ventilation;

c) is not designed for continuous worker occupancy,

and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, cargo pump-rooms, cargo compressor rooms, cofferdams, chain lockers, void spaces, duct keels, inter-barrier spaces, boilers, engine crankcases, engine scavenge air receivers, sewage tanks, and adjacent connected spaces

Note 1 to entry: See IMO resolution A.1050(27).

3.2
portable gas detector
device to measure gas or vapour concentrations in the atmosphere and which is portable to be carried onboard in order to comply with SOLAS regulation XI-1/7, other than a personal gas detector that is intended to be carried by an individual whilst inside the enclosed space

Note 1 to entry: In this document, portable gas detector means a “transportable gas detector” or a “portable gas detector” as specified in IEC 60079–29–1.

3.3
external replaceable module
external plug-in sensor which can be directly plugged into a base or via short cable connection

4 Specification of portable gas detectors for atmosphere testing of enclosed spaces

4.1 General requirements

4.1.1 Gases required to be measured

A portable gas detector shall clearly indicate gases which are measured by the detector.

A portable gas detector shall only measure gases which are calibrated or which are covered by the cross sensitivity.

Portable gas detectors and sensors shall be selected depending on measuring method and application in accordance with the requirements of IEC 60079-29-2.

In order to comply with SOLAS regulation XI-1/7, a portable gas detector or detectors shall be carried onboard ships for measuring concentrations of oxygen, flammable gases or vapours, hydrogen sulphide and carbon monoxide in enclosed spaces without entry into the spaces.

Flammable gases or vapours are represented either by methane or propane/butane. Measurement of other flammable gases or vapours is not required, in general, for the purpose of SOLAS regulation XI-1/7 unless specifically required by a flag State Administration.

Measurement of toxic gases other than hydrogen sulphide and carbon monoxide may be required by a flag State Administration.

Measurement of other gases may be required based on results of risk assessments for entry into enclosed spaces according to IMO resolution A.1050 (27).

NOTE Detection of other gases can be required by the other SOLAS regulations and relevant codes, e.g. chapter II-2 of SOLAS, the IBC Code and/or the IMSBC Code.

4.1.2 Method of measurement

A portable gas detector shall be capable of sampling, detecting and measuring the gas or gases in enclosed spaces without entry into the spaces and without interference from the atmosphere or other characteristics of the intervening space(s).

When a suction hose or other means are used for the sampling from outside of enclosed spaces, the portable gas detector shall conform to the requirements for response time in IEC 60079-29-1.

In practice, these specifications can be in conformance by a suitable suction hose or a suitable length of electric cables or wireless data transfer connecting head (sensor) and body (instrument). Other techniques such as light beams may be permitted unless they are not blocked or interfered with by the intervening spaces — either its atmosphere, environment or structure.

4.1.3 Basic performance

When a portable gas detector is designed for detecting and measuring multiple gases, the detection and measurement of the gases shall be done by either permanently installed sensors for each gas or several gases, or by external replaceable modules for each gas, or by a combination of both.

In case external replaceable modules are used:

a) gas(es) measured by the replaceable module shall be clearly indicated on the module;

b) a clear description on the procedures for mounting and dismounting of the replaceable module shall be provided in the instruction manual;

c) unique identifiers of individual replaceable modules shall be included in the documentation.

If a portable gas detector cannot measure all at once all types of the gases to which the portable gas detector is approved, for instance, if it has three slots for continuously monitoring gas modules but is approved for more than three types of gases, the types of gases to be measured shall be clearly indicated on the portable gas detector and identified in the manual of the portable gas detector. Regardless of whether the portable gas detector uses permanently installed sensors, external replaceable modules, or by a combination of both, the detector, when in use, shall clearly indicate the types of gases for which it is set up to measure.

A portable gas detector shall, upon activation, perform a self-test which indicates that the portable gas detector is functioning correctly. A response check by using real test gases, prior to the use of the portable gas detector, shall be carried out if it is required by the instruction manual.

A portable gas detector shall be provided with clearly defined re-calibration procedures which are carried out by the manufacturer. If the portable gas detector is fitted with an alarm or shutdown function that activates if the manufacturer's calibration interval is exceeded, this should not stop the portable gas detector from functioning during actual use and the portable gas detector should not restart once the alarm or function has been activated.