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Gas cylinders — Gases and gas mixtures — Determination of toxicity for the selection of cylinder valve outlets

Bouteilles à gaz — Gaz et mélanges de gaz — Détermination de la toxicité pour le choix des raccords de sortie de robinets

Reference number
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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).

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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 ISO/TC 58 *Gas cylinders*, SC 2, *Cylinder fittings*.

This third edition cancels and replaces the second edition (ISO 10298:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The Scope and Clause 4 have been clarified.

— The terms and definitions in Clause 3 have been changed and, in particular, the reference to FTSC codes (that were in ISO 5145) was changed to ISO 14456.

— Some LC50 values have been updated.

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Introduction

ISO 5145 specifies the dimensions of different valve outlets for different compatible gas groups. These compatible gas groups are determined according to practical criteria defined in ISO 14456.

These criteria are based on certain physical, chemical, toxic and corrosive properties of the gases. In particular, the tissue corrosiveness is considered in this document.

The aim of this document is to assign for each gas a classification category that takes into account the toxicity by inhalation of the gas. For gas mixtures containing toxic components a calculation based on the method specified in the GHS is proposed.

Since the publication of the first edition of ISO 10298, this International Standard has been used for other purposes than the selection of cylinder valve outlets, e.g. providing toxicity data for the classification of gas and gas mixtures according to the international transport regulations and according to the classification of dangerous substances regulations, which since 2003 is under the umbrella of the Globally Harmonized System (GHS).

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Gas cylinders — Gases and gas mixtures — Determination of toxicity for the selection of cylinder valve outlets

1 Scope

This document lists the best available acute-toxicity data of gases taken from a search of the current literature to allow the classification of gases and gas mixtures for toxicity by inhalation.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
lethal concentration 50
LC_{50}
concentration of a substance in air exposure to which, for a specified length of time, it is expected to cause the death of 50 % of the entire defined experimental animal population after a defined time period

Note 1 to entry: See Annex A for the selection of this LC_{50} value.

3.2
toxicity level
level of toxicity of gases and gas mixtures

Note 1 to entry: In ISO 14456, the toxicity level is divided into three groups:

— Subdivision 1: non toxic [LC_{50} > 5 000 ppm (volume fraction)]

— Subdivision 2: toxic [200 ppm (volume fraction) < LC_{50} ≤ 5 000 ppm (volume fraction)]

— Subdivision 3: very toxic [LC_{50} ≤ 200 ppm (volume fraction)]

These subdivisions are sometimes used in transport regulations.

where

LC_{50} values correspond to 1 h exposure to gas;

ppm (volume fraction) indicates parts per million, by volume.

Note 2 to entry: In the GHS, the inhalation toxicity levels are:

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Category 1: Fatal if inhaled	0 ppm < LC_{50} ≤ 100 ppm (volume fraction)
Category 2: Fatal if inhaled	100 ppm (volume fraction) < LC_{50} ≤ 500 ppm (volume fraction)
Category 3: Toxic if inhaled	500 ppm (volume fraction) < LC_{50} ≤ 2 500 ppm (volume fraction)
Category 4: Harmful if inhaled	2 500 ppm (volume fraction) < LC_{50} ≤ 20 000 ppm (volume fraction)

Note 3 to entry: In GHS, the LC_{50} values correspond to 4 hours exposure. Consequently, the LC50 values given in Annex B (see 4.2.2) need to be divided by 2 (i.e. $\sqrt{4/1}$). The reasoning behind the division by 2 is given in A.2.

3.3
lethal dose 50
LD_{50}
amount of a material, given all at once, which causes the death of 50 % of a group of test animals

3.4
lethal concentration low value
LC_{LO}
lowest concentration of a substance in air, other than the LC_{50}, which was reported in the original reference paper as having caused death in humans or animals

4 Determination of toxicity

4.1 General

Toxicity may be determined through a test method (4.2) for gas mixtures where the data for the components exist, or through a calculation method (4.3).

For reasons of animal welfare, inhalation toxicity tests geared only for the classification of gas mixtures should be avoided if the toxicity of each of the components is available. In this case, toxicity is determined in accordance with 4.3.

4.2 Test method

4.2.1 Test procedure

When new toxicity data are being considered for inclusion in this document, an internationally recognized test method such as OECD TG 403[43] should be used.

NOTE For this document, LC_{50} is equivalent to 1 h exposure to albino rats.

4.2.2 Results for pure gases

The toxicity of pure gases is listed in Annex B, in which LC_{50} values correspond to 1 h exposure. Some of these values have been estimated in accordance with Annex A.

4.3 Calculation method

The LC_{50} value of a gas mixture is calculated using Formula 1:

$$LC_{50i} = \frac{1}{\sum_i \frac{C_i}{LC_{50}}} \quad (1)$$

where

C_i is the mole fraction of the *i*th toxic component present in the gas mixture;

LC_{50i} is the lethal concentration of the *i*th toxic component [LC_{50} < 5 000 ppm (by volume)].

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