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Gas cylinders — Compatibility of cylinder and valve materials with gas contents —

Part 2: Non-metallic materials

Bouteilles à gaz — Compatibilité des matériaux des bouteilles et des robinets avec les contenus gazeux —

Partie 2: Matériaux non métalliques

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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).

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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 23, *Transportable gas cylinders,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 11114-2:2013), which has been technically revised. The main changes compared with the previous edition are as follows:

— new materials were added in Table 1;

— Table 2, dedicated to the compatibility for liners, was added.

A list of all parts in the ISO 11114 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document provides guidance on the compatibility of non-metallic materials used for gas cylinders and gas cylinder valves with the gas contents of the cylinder. Compatibility of metallic materials is covered in ISO 11114-1.

Non-metallic materials are very often used for the construction of gas cylinder valves as seals, e.g. O-ring, gland packing, seats or as lubrication products to avoid friction. They are also commonly used to ensure sealing of the valve/cylinder connection. For gas cylinders, they are sometimes used as an internal coating or as a liner for composite materials.

Non-metallic materials not in contact with the gas are not covered by this document.

This document is based on current international experience and knowledge. Some data are derived from experience involving a mixture of the gas concerned with a dilutant, where no data for single component gases were available.

This document has been written so that it is suitable to be referenced in the UN Model Regulations[7].

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Gas cylinders — Compatibility of cylinder and valve materials with gas contents —

Part 2: Non-metallic materials

1 Scope

This document gives guidance on the selection and evaluation of compatibility between non-metallic materials for gas cylinders and valves and the gas contents. It is also applicable to tubes, pressure drums and bundles of cylinders.

This document covers composite and laminated materials used for gas cylinders. It does not include ceramics, glasses and adhesives.

This document considers the influence of the gas in changing the material and mechanical properties (e.g. chemical reaction or change in physical state). The basic properties of the materials, such as mechanical properties required for design purposes (normally available from the materials supplier), are not considered. Other aspects, such as quality of delivered gas, are not considered.

The compatibility data given are related to single component gases but can be applicable to gas mixtures.

This document does not apply to cryogenic fluids (this is covered in ISO 21010).

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.

ISO 10286, *Gas cylinders — Vocabulary*

ISO 10297, *Gas cylinders — Cylinder valves — Specification and type testing*

ISO 11114-3, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 3: Autogenous ignition test for non-metallic materials in oxygen atmosphere*

ISO 15001, *Anaesthetic and respiratory equipment — Compatibility with oxygen*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10286 and the following apply.

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

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

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

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3.1
competent person
person who has the necessary technical knowledge, qualification, experience and authority to assess and approve materials for use with gases and to define any special conditions of use that are necessary

[SOURCE: ISO 11114-1:2020, 3.1, modified — "qualification" has been added to the definition.]

3.2
acceptable
satisfactory material/gas combination, under normal conditions of use, provided that any indicated non-compatibility risks are taken into account

Note 1 to entry: Normal conditions of use are defined in Clause 5.

Note 2 to entry: Non-compatibility risks are provided in Table 1.

3.3
not acceptable
unsafe material/single gas combination, under normal conditions of use

Note 1 to entry: For gas mixtures, special conditions can apply.

Note 2 to entry: Normal conditions of use are defined in Clause 5.

3.4
dynamic sealing
non-metallic material used, in normal operation, to provide a pressure seal between two surfaces that have relative motion to each other

4 Materials

4.1 General

Non-metallic materials shall be suitable for the intended service. They are suitable if their compatibility is stated as acceptable in Table 1, and Table 2 for the cylinder liners, or the necessary properties have been proved by tests or long and safe experience to the satisfaction of a competent person.

NOTE When plastic liner materials are used, it is necessary to use metallic bosses. For compatibility of metallic bosses, see ISO 11114-1.

If coated materials are used, the suitability of the combination shall be assessed and approved if all technical aspects have been considered and validated by a competent person. These technical aspects include, but are not limited to, compatibility of the coating material with the intended gas, durability of the coating during all its intended use and gas permeability through it.

4.2 Type of materials

The most commonly used non-metallic materials for gas cylinders and cylinder valves can be grouped as follows:

— plastics;

— elastomers;

— fluid lubricants.

NOTE 1 Solid lubricants are sometimes used, e.g. MoS_2.

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