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Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes —

Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners

Bouteilles à gaz — Conception, construction et essais des tubes et bouteilles à gaz rechargeables en matériau composite —

Partie 2: Tubes et bouteilles à gaz entièrement bobinés en matériau composite renforcés de fibres et d'une contenance allant jusqu'à 450 l avec liners métalliques structuraux

Reference number
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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).

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

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*, Subcommittee SC 3, *Cylinder design*.

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.

This third edition cancels and replaces the second edition (ISO 11119-2:2012), which has been technically revised. It also incorporates the Amendment ISO 11119-2:2012/Amd.1:2014.

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

— References updated.

— 7.1.3 Minimum fibre stress ratios added.

— 8.5.8 Drop Test. Addition of new alternative test for cylinders up to and including 50 l water capacity with dedicated compressed gas service. Addition of alternative impact test for tubes 150 l and above.

— 8.5.10 Fire resistance test. Changes to the procedure to make the test more consistent. Adding a criteria for tubes above 150 l to be tested for 5 min.

— 8.5.12 Torque Test is now only required for taper threads.

A list of all parts in the ISO 11119 series can be found on the ISO website.

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Introduction

The purpose of this document is to provide a specification for the design, manufacture, inspection and testing of cylinders for worldwide usage. The objective is to balance design and economic efficiency against international acceptance and universal utility.

This document aims to eliminate the concern about climate, duplicate inspection and restrictions currently existing because of lack of definitive International Standards and is not to be construed as reflecting on the suitability of the practice of any nation or region.

This document has been written so that it is suitable to be referenced in the UN Model Regulations[1].

This document addresses the general requirements on design, construction and initial inspection and testing of pressure receptacles of the *Recommendations on the transport of dangerous goods: Model regulations* developed by the United Nations[15].

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Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes —

Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners

1 Scope

This document specifies minimum requirements for the material, design, construction and workmanship, manufacturing processes, examination and testing at time of manufacture for:

— type 3 fully wrapped cylinders or tubes with a load-sharing metal liner and composite reinforcement on both the cylindrical portion and the dome ends;

— water capacities up to 450 l;

— storage and conveyance of compressed or liquefied gases;

— cylinders and tubes with composite reinforcement of carbon fibre, aramid fibre or glass fibre (or a mixture thereof) within a matrix;

— a minimum design life of 15 years.

This document does not address the design, fitting, and performance of removable protective sleeves.

This document does not apply to cylinders with welded liners.

NOTE 1 References to cylinders in this document include composite tubes if appropriate.

NOTE 2 ISO 11439 applies to cylinders intended for use as fuel containers on natural gas vehicles and ISO 11623 covers periodic inspection and re-testing of composite cylinders.

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 3341, *Textile glass — Yarns — Determination of breaking force and breaking elongation*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 7225, *Gas cylinders — Precautionary labels*

ISO 7866, *Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing*

ISO 9809-1, *Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa*

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ISO 9809-2, *Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1 100 MPa*

ISO 9809-3, *Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes*

ISO 9809-4, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa*

ISO 10286, *Gas cylinders — Terminology*

ISO 10618, *Carbon fibre — Determination of tensile properties of resin-impregnated yarn*

ISO 11114-1, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials*

ISO 11114-4, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 4: Test methods for selecting steels resistant to hydrogen embrittlement*

ISO 13341, *Gas cylinders — Fitting of valves to gas cylinders*

ISO 13769, *Gas cylinders — Stamp marking*

ISO 14130, *Fibre-reinforced plastic composites — Determination of apparent interlaminar shear strength by short-beam method*

ASTM D7269, *Standard test methods for tensile testing of aramid yarns*

ASTM E1356–08, *Standard Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry*

3 Terms and definitions

For the purposes of this document, the terms and definitions 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/

3.1
aramid fibre
continuous filaments of aramid laid up in tow form

3.2
autofrettage
pressure application procedure which strains the metal liner past its yield point sufficient to cause permanent plastic deformation, and results in the liner having compressive stresses and the fibres having tensile stresses when at zero internal gauge pressure

3.3
batch
set of homogeneous items or material

Note 1 to entry: The number of items in a batch can vary according to the context in which the term is used.

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