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Gaseous hydrogen — Land vehicle fuel containers

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Foreword

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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 document 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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This document was prepared by Technical Committee TC 197, *Hydrogen technologies*.

This second edition cancels and replaces the first edition (ISO 19881:2018), which has been technically revised.

The main changes are as follows:

— harmonization with UN GTR 13 Phase 2 with focused modifications to the fire test;

— fire test pre-test conditions included as Annex material.

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

The purpose of this document is to promote the implementation of hydrogen powered land vehicles through the creation of performance-based testing requirements for compressed hydrogen fuel containers. The successful commercialization of hydrogen land vehicle technologies requires standards pertaining to fuelling stations, vehicle fuel system components and the global homologation of standards requirements for technologies with the same end use. This will allow manufacturers to achieve economies of scale in production through the ability to manufacture one product for global use.

This document is based on the CSA Standard ANSI/HGV 2-2014 and UN GTR No. 13.

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Gaseous hydrogen — Land vehicle fuel containers

1 Scope

This document specifies requirements for the material, design, manufacture, marking and testing of serially produced, refillable containers intended only for the storage of compressed hydrogen gas for land vehicle operation. These containers:

a) are permanently attached to the vehicle;

b) have a capacity of up to 1 000 l water capacity;

c) have a nominal working pressure that does not exceed 70 MPa.

This document is applicable only to fuel containers containing gaseous hydrogen according to ISO 14687 for fuel cell and internal combustion engine land vehicles. This document specifies requirements for hydrogen fuel containers acceptable for use on-board the following types of land vehicles: light-duty vehicles, heavy-duty vehicles and industrial powered trucks, such as forklifts and other material handling vehicles. Requirements for other types of land vehicles such as rail, off-road, etc., can be derived with due consideration of appropriate service conditions.

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

ISO 7866:2012, *Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing*

ISO 9809-1:2019, *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*

ISO 9809-2:2019, *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 11363-1, *Gas cylinders — 17E and 25E taper threads for connection of valves to gas cylinders — Part 1: Specifications*

ISO 11439:2013, *Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles*

ISO 11926-1, *Connections for general use and fluid power — Ports and stud ends with ISO 725 threads and O-ring sealing — Part 1: Ports with O-ring seal in truncated housing*

ISO 19882, *Gaseous hydrogen — Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers*

ASTM D638, *Standard Test Method for Tensile Properties of Plastics*

ASTM D2344/D2344M, *Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates*

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ASTM D3359, *Standard Test Methods for Rating Adhesion by Tape Test*

ASTM D3418, *Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry*

ASTM D4138, *Standard Practices for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross Sectioning Means*

ASTM D7091, *Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals*

ASTM E8/E8M, *Standard Test Methods for Tension Testing of Metallic Materials*

ASTM E23, *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*

ASTM G154, *Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Materials*

CGA C-1-2009, *Methods for Pressure Testing Compressed Gas Cylinders and Tubes*

ECE/TRANS/180/Add.13/Amend.1 UN GTR No. 13, UN Global Technical Regulation on Hydrogen and Fuel Cell Vehicles

SAE J2579, *Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles*

SAE J2601, *Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles*

3 Terms and definitions

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

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

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

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

3.1
autofrettage
pressure application procedure, used in manufacturing composite containers with metal *liners* (3.15), which strains the *liner* (3.15) past its yield point sufficiently to cause permanent plastic deformation that results in the *liner* (3.15) having residual compressive stresses and the fibres having residual tensile stresses at zero internal pressure

3.2
burst pressure
highest pressure reached in a container during a burst test

3.3
composite
filament and resin system

3.4
compressed hydrogen storage system
CHSS
system designed to store compressed hydrogen fuel for a hydrogen-fuelled vehicle, composed of a container, container attachments (if any), and all primary closure devices required to isolate the stored hydrogen from the remainder of the fuel system and the environment

3.5
container category
unique class of containers that are intended for a specific usage

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