



**International
Standard**

ISO 13984

**Liquid hydrogen — Land vehicle
fuelling protocol**

*Hydrogène liquide — Protocole des systèmes de remplissage pour
véhicules terrestres*

**Second edition
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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 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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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 197, *Hydrogen technologies*.

This second edition cancels and replaces the first edition (ISO 13984:1999), which has been technically revised.

The main changes are as follows:

- updated scope;
- updated normative references and definitions;
- alignment with common ISO 19880-1 requirements;
- technical requirements moved to annexes;
- introduction of fuelling process and protocol details;
- addition of supporting annexes.

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.

Introduction

While the focus of this document is liquid hydrogen fuelling protocols, some technical requirements for the dispensing system and the fuelling station are also included. This is done to ensure:

- a) the fuelling protocols can be implemented safely and with adequate equipment;
- b) the content of the previous edition of this document (ISO 13984:1999) has been reviewed and adapted when relevant.

This document has been prepared in coordination with the revision of ISO 13985¹⁾. The fuelling protocols described in this document and the liquid hydrogen storage systems built according to ISO 13985 are thus intended to work together.

1) Stage at the time of publication: ISO/DIS 13985:2025.

Liquid hydrogen — Land vehicle fuelling protocol

1 Scope

This document specifies fuelling protocols for liquid hydrogen (LH₂), defining the minimum design, installation and operation requirements for a safe, as well as fast, efficient and interoperable hydrogen transfer from the fuelling station to the vehicle fuel system.

This document applies to land vehicles of all types equipped with a liquid hydrogen storage system in accordance with ISO 13985. The protocols described in this document are currently limited to vehicles with storage system total internal volume equal to or comprised between 0,6 m³ and 4 m³. The requirements specified in this document are also applicable to further hydrogen applications, however, further specific requirements that can be necessary for the safe operation of such fuelling are not addressed in this document.

This document specifies the requirements for liquid hydrogen fuelling and dispensing systems, fuelling station - vehicle interface and vehicle storage system in order to minimise the risk of fire, explosion or any other hydrogen adverse effects to an acceptable level, especially during and after the fuelling process.

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 7369, *Pipework — Metal hoses and hose assemblies — Vocabulary*

ISO 10286, *Gas cylinders — Vocabulary*

ISO 10893-4, *Non-destructive testing of steel tubes — Part 4: Liquid penetrant inspection of seamless and welded steel tubes for the detection of surface imperfections*

ISO 10893-6, *Non-destructive testing of steel tubes — Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections*

ISO 10893-7, *Non-destructive testing of steel tubes — Part 7: Digital radiographic testing of the weld seam of welded steel tubes for the detection of imperfections*

ISO 10893-8, *Non-destructive testing of steel tubes — Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections*

ISO 10893-10, *Non-destructive testing of steel tubes — Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections*

ISO 11484, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

ISO/DIS 13985:2025, *Liquid hydrogen — Land vehicle fuel tanks*

ISO 14687, *Hydrogen fuel quality — Product specification*

ISO 17636 (all parts), *Non destructive testing of welds — Radiographic testing*

ISO 19880-1:2020, *Gaseous hydrogen — Fuelling stations — Part 1: General requirements*

ISO 21013-1, *Cryogenic vessels — Pressure-relief accessories for cryogenic service — Part 1: Reclosable pressure-relief valves*

ISO 21013-2, *Cryogenic vessels — Pressure-relief accessories for cryogenic service — Part 2: Non-reclosable pressure-relief devices*

ISO 21013-3, *Cryogenic vessels – Pressure-relief accessories for cryogenic service — Part 3: Sizing and capacity determination*

IEC 60079-14, *Explosive atmospheres - Part 14: Electrical installations design, selection and erection*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7369 and ISO 10286 and the following 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 ambient temperature

unregulated temperature of the air

3.2 backgas

gaseous hydrogen flowing back from the vehicle to the *fuelling station* (3.19) during the *fuelling process* (3.17)

3.3 breakaway device

device on the *fuelling hose* (3.15) that disconnects the hose from the *dispenser* (3.7) or the vehicle when a tension, load, stress or displacement limit is exceeded and blocks the flow of hydrogen from the dispenser, e.g. if the vehicle moves away with the fuelling hose connected to the vehicle

3.4 check-valve

valve which allows fluid to flow in only one direction

3.5 control valve

valve electronically or pneumatically controlled that enables and disables the hydrogen flow

Note 1 to entry: The control system provides necessary inputs and signals to the valve.

3.6 connector

matching parts (such as male and female parts) that can be put together to form a “connection” which permits the transfer of fluids, electric power, or control signals

[SOURCE: ISO 19880-1:2020, 3.12, modified — Notes to entry have been removed.]

3.7 dispenser

equipment in the *dispensing system* (3.9), including the *dispenser cabinet(s)* (3.8) and support structure, that is physically located in the fuelling area

Note 1 to entry: The hydrogen dispenser typically includes, as a minimum, the *fuelling assembly* (3.14), required temperature and pressure instrumentation, filters, and the user interface to conduct vehicle fuelling.

Note 2 to entry: The manufacturer of the hydrogen dispenser can elect to include additional equipment in the dispenser, including the possibility of all equipment in the dispensing system.

[SOURCE: ISO 19880-1:2020, 3.13]