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Gaseous hydrogen — Fuelling protocols for hydrogen-fuelled vehicles —

Part 1: Design and development process for fuelling protocols

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Foreword

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

A list of all parts in the ISO 19885 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 is intended to identify and describe requirements for the design and development of hydrogen dispenser fuelling protocols and address issues with current protocols with regard to their acceptance and thoroughness of verification as well as the safe implementation in dispenser systems.

This document is intended to coordinate with the ISO 19880 series with regard to road vehicles and, at the same time, address a more general need with the regard to fuelling a far broader range of vehicles. This document can help to address technical details of the fuelling process and will allow ISO 19880-1 to be streamlined and focus on basic requirements of the fuelling station.

This document is expected to be the first part in a series dealing with fuelling protocols for a broad range of vehicle applications.

Additionally, the requirements for the development process in this document are robust and can be considered for extension to other container-fuelling applications in the future.

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Gaseous hydrogen — Fuelling protocols for hydrogen-fuelled vehicles —

Part 1:
Design and development process for fuelling protocols

1 Scope

This document addresses the design and development of fuelling protocols for compressed hydrogen gas dispensing to vehicles with compressed hydrogen storage of fuel.

The document does not address dispensing of compressed hydrogen gas to vehicles with hydride-based hydrogen storage systems as well as the dispensing of liquefied or cryo-compressed hydrogen.

This document is intended to be used for a wide range of applications including, but not limited to, the following:

— light, medium, and heavy-duty road vehicles,

— motor bicycles and tricycles, carts, and trailers,

— off-road vehicles,

— fork-lift and other industrial trucks,

— rail locomotives and powered cars,

— airplanes and drones, and

— maritime ships, boats, and barges.

This document applies to a wide spectrum of development situations ranging from companies developing a fuelling protocol for their specific products or applications to standards development organizations (SDOs) developing a consensus-based fuelling protocol for a broad segment of the industrial or commercial market. Additionally, combinations between the two extremes are possible, where, for example, companies start design and development as a way of defining a proposal for new work by an SDO to complete development and publish the document as a consensus-based standard (including technical justification for compliance to this document).

This document defines requirements for the design and development of the fuelling protocols. These requirements can be integrated into the existing design and development processes to ensure that the fuelling protocol is fully verified and that the generated documentation is sufficient for the proper implementation and safe use of the fuelling protocols in dispensing systems for the targeted application.

In addition to addressing the design and development of fuelling protocols for general applications, Annex A provides specific requirements and information relative to fuelling protocols for road vehicles at public fuelling stations based on ISO 19880-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all 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.

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ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 17268, *Gaseous hydrogen land vehicle refuelling connection devices, 2020*

ISO 19880 (all parts), *Gaseous hydrogen — Fuelling stations*

ISO 19881, *Gaseous hydrogen — Land vehicle fuel containers*

ISO/SAE 21434, *Road vehicles — Cybersecurity engineering*

ISO 26262, *Road vehicles — Functional safety*

IEC 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

IEC 61508, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511, *Functional safety – Safety instrumented systems for the process industry sector*

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic, and programmable electronic control systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19880-1 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
basic process control system
BPCS
system which responds to input signals from the process, its associated equipment, other programmable systems and/or an operator and generates output signals causing the process and its associated equipment to operate in the desired manner

Note 1 to entry: a *BPCS* does not perform any safety-instrumented functions with a claimed SIL ≥ 1.

[SOURCE: IEC 61511:2004, 3.2.3]

3.2
compressed hydrogen storage system
CHSS
system designed to store compressed hydrogen fuel for a hydrogen-fuelled road 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

Note 1 to entry: The above definition is specific to hydrogen road vehicles where the CHSS has one (and only one) container with dedicated primary closures devices. See A.3.

Note 2 to entry: Hydrogen road vehicles typically have more than one CHSS. See *vehicle fuel system* (3.27).

Note 3 to entry: The CHSS can also include actuators, sensors, and electronics as deemed necessary by the vehicle manufacturer.

[SOURCE: ECE/TRANS/180/Add.13/Amend.1 UN GTR No. 13, UN Global Technical Regulation on Hydrogen and Fuel Cell Vehicles: 2023, 3.6]

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