International Standard

ISO 14687

Hydrogen fuel quality — Product specification

Qualité du carburant hydrogène — Spécification de produit

Second edition
2025-02

Reference number
ISO 14687:2025(en)

© ISO 2025



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms, definitions and abbreviations **1**
3.1 Terms and definitions 1
3.2 Abbreviated terms 3

4 Classification and application **3**
4.1 Classification 3
4.2 Application 3

5 Hydrogen quality requirements for PEM fuel cell road vehicle application **4**
5.1 Fuel quality specification 4
5.2 Analytical method 5
5.3 Sampling 6
5.4 Hydrogen quality control 6

6 Hydrogen and hydrogen-based fuel, quality requirements for PEM fuel cell stationary applications **6**
6.1 Fuel quality specification 6
6.2 Quality verification 8
6.2.1 General requirements 8
6.2.2 Analytical requirements of the qualification tests 8
6.2.3 Report results 8
6.3 Sampling 8
6.3.1 Sample size 8
6.3.2 Selection of the sampling point 8
6.3.3 Sampling procedure 8
6.3.4 Particulates in gaseous hydrogen 9

7 Hydrogen quality requirements for applications other than PEM fuel cell road vehicle and stationary applications **9**
7.1 Fuel quality specification 9
7.2 Quality verification 11
7.2.1 General requirements 11
7.2.2 Production qualification tests 11
7.3 Sampling 11
7.3.1 Sample size 11
7.3.2 Gaseous samples 11
7.3.3 Liquid samples (vaporized) 11

Annex A (informative) **Rationale for the selection of hydrogen impurities for PEM fuel cell road vehicle application** **12**

Annex B (informative) **Guidance on the selection of the boundary point for PEM fuel cell stationary applications** **15**

Annex C (informative) **Rationale for the selection of hydrogen impurities to be measured for PEM fuel cell stationary applications** **18**

Annex D (informative) **Pressure swing adsorption and applicability of CO as an indicator for PEM fuel cell stationary applications** **20**

Annex E (informative) **Grade A: Gaseous hydrogen for applications other than PEM fuel cell road vehicle and stationary applications — rationale for parameter selection and value specifications** **21**

Annex F (informative) **Hydrogen quality for internal combustion engine applications** **23**

© ISO 2025 – All rights reserved

Bibliography **27**

© ISO 2025 – All rights reserved

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 14687:2019), which has been technically revised.

The main changes are as follows:

— a new Grade of hydrogen quality for internal combustion engine (Grade F) applications has been added in Informative Annex F;

— rationale for each Grade D specification has been moved from ISO19880-8 to this document;

— each specification for each Grade has been modified reflecting recent research work and change in industrial needs.

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.

© ISO 2025 – All rights reserved

Introduction

In recent years, the landscape for using hydrogen as a fuel has changed significantly in response to its potential to contribute to the reduction of greenhouse gas emissions. This shift is influenced by challenges on both the hydrogen supply side, such as production technologies and supply chain infrastructure, and also the hydrogen energy usage side, including advancements in fuel cell and combustion technology. To address these changing conditions, the hydrogen fuel specifications in this document have been updated.

The hydrogen fuel specifications for proton exchange membrane (PEM) fuel cell applications in this document are primarily based on research, development and data on the following items [2][3][4][5][6][7][8][9][10][11][12][13][14]:

— PEM fuel cell catalyst and fuel cell tolerance to hydrogen fuel impurities;

— effects/mechanisms of impurities on fuel cell power systems and components;

— impurity detection and measurement techniques for laboratory, production and in-field operations;

— fuel cell vehicle demonstration and stationary fuel cell demonstration results.

Grade D and grade E in this document are intended to apply to PEM fuel cells for road vehicles and stationary appliances, respectively. These aim to facilitate the provision of hydrogen of reliable quality balanced with acceptable lower cost for the hydrogen fuel supply.

In addition, Grades F-1 and F-2 are newly specified in this edition to apply to hydrogen internal combustion engines for use in vehicular and stationary applications, respectively. The new Grades were placed in an informative annex (Annex F) to allow experience to be gained with this fuel quality prior to inclusion in the normative text.

While this document reflects the state-of-the-art at the date of its publication, the rapid development of quality requirements for hydrogen technology applications would necessitate future revisions in response to technological progress.

© ISO 2025 – All rights reserved

Hydrogen fuel quality — Product specification

1 Scope

This document specifies the minimum quality characteristics of hydrogen fuel as distributed for utilization in residential, commercial, industrial, vehicular and stationary applications.

This document is applicable to hydrogen fuelling applications, which are listed in Table 2.

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 19880-8, *Gaseous hydrogen — Fuelling stations — Part 8: Fuel Quality Control*

ISO 19880-9, *Gaseous hydrogen — Fuelling stations — Part 9: Sampling for fuel quality analysis*

ISO 21087, *Gas analysis — Analytical methods for hydrogen fuel — Proton exchange membrane (PEM) fuel cell applications for road vehicles*

3 Terms, definitions and abbreviations

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

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

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

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

3.1 Terms and definitions

3.1.1
boundary point
<proton exchange membrane *fuel cell* (3.1.7) for stationary applications> point between the *hydrogen fuel supply equipment* (3.1.13) and the PEM *fuel cell power system* (3.1.9) at which the quality characteristics of the hydrogen fuel are to be determined

3.1.2
constituent
component (or compound) found within a hydrogen fuel mixture

3.1.3
contaminant
impurity that adversely affects the components within the *fuel cell system* (3.1.8), the *fuel cell power system* (3.1.9) or the hydrogen storage system

Note 1 to entry: An adverse effect can be reversible or irreversible.

© ISO 2025 – All rights reserved