
**Hydrogen fuel — Product
specification —**

**Part 3:
Proton exchange membrane (PEM)
fuel cell applications for stationary
appliances**

Carburant hydrogène - Spécification de produit —

*Partie 3: Applications des piles à combustible à membrane à échange
de protons (PEM) pour appareils stationnaires*



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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 197, *Hydrogen technologies*.

ISO 14687 consists of the following parts, under the general title *Hydrogen fuel— Product specification*:

- *Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles*
- *Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*
- *Part 3: Proton exchange membrane (PEM) fuel cell applications for stationary appliances*

Introduction

This part of ISO 14687 provides an initial, albeit incomplete, basis for describing a common fuel to be used by proton exchange membrane (PEM) fuel cell applications for stationary appliances in the near term.

A large number of fuel cells are presently commercialized as power sources for stationary applications, such as distributed, supplementary, and back-up power generation and as stationary heat and power cogeneration systems. Most stationary fuel cells are equipped with a fuel processing system which converts fossil fuel to hydrogen-rich fuel composed primarily of hydrogen and carbon dioxide. Some of the stationary fuel cells use hydrogen fuel of high purity supplied through high pressure tanks or pipeline from a distant hydrogen production plant.

The purpose of this part of ISO 14687 is to establish an international standard of quality characteristics of hydrogen fuel for stationary fuel cells.

Types of fuel cells other than proton exchange membrane fuel cells (PEMFC), such as phosphoric acid fuel cell (PAFC), molten carbonate fuel cells (MCFC) and solid oxide fuel cells (SOFC), may require similar standards in future. Thus, it is anticipated that in the future PAFC, MCFC and SOFC hydrogen fuel quality requirements will be added as amendments to this part of ISO 14687.

This part of ISO 14687 is intended to consolidate the hydrogen fuel product specification needs anticipated by PEM fuel cell manufacturers and hydrogen fuel suppliers as both industries proceed toward achieving wide-spread commercialization. Monitoring hydrogen fuel quality is necessary because specific impurities will adversely affect the fuel cell power system. In addition, there may be performance implications in the fuel cell power system if certain non-hydrogen constituent levels are not controlled. Methods to monitor the hydrogen fuel quality that is delivered to these stationary appliances are addressed.

This part of ISO 14687 specifies one grade of hydrogen, Type I, grade E, with three categories for different target applications. Quality verification should be determined at the inlet point of a PEM fuel cell power system.

Since PEM fuel cell applications for stationary appliances and related technologies are developing rapidly, this part of ISO 14687 will be revised according to technological progress as necessary. Additionally, some of the impurity limits are dictated by current analytical capabilities, which are also in the process of development. Technical Committee ISO/TC 197, *Hydrogen technologies*, will monitor this technology trend. It is also noted that this part of ISO 14687 has been prepared to assist in the development of PEM fuel cell applications for stationary appliances and related technologies.

Further research and development efforts should focus on, but not be limited to:

- 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; and,
- Stationary fuel cell demonstration results.

Hydrogen fuel — Product specification —

Part 3:

Proton exchange membrane (PEM) fuel cell applications for stationary appliances

1 Scope

This part of ISO 14687 specifies the quality characteristics of hydrogen fuel in order to ensure uniformity of the hydrogen product for utilization in stationary proton exchange membrane (PEM) fuel cell power systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6142, *Gas analysis — Preparation of calibration gas mixtures — Gravimetric method*

ISO 6145 (all parts), *Gas analysis — Preparation of calibration gas mixtures using dynamic methods*

ISO 14687-1, *Hydrogen fuel — Product specification — Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles*

ISO 14687-2, *Hydrogen fuel — Product specification — Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*

IEC/TS 62282-1, *Fuel cell technologies — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14687-1, IEC/TS 62282-1 and the following apply.

3.1

boundary point

point between the hydrogen fuel supply equipment and the PEM fuel cell power system at which the quality characteristics of the hydrogen fuel are to be determined

3.2

constituent

component (or compound) found within a hydrogen fuel mixture

3.3

contaminant

impurity that adversely affects the component parts within the fuel cell power system or the hydrogen storage system

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