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

*Analyse des gaz — Méthodes analytiques pour carburant hydrogène  
— Applications utilisant des piles à combustible à membrane  
échangeuse de protons (MEP) pour véhicules routiers*



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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](http://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](http://www.iso.org/patents)).

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 158, *Gas analysis* in collaboration with Technical Committee ISO/TC 197, *Hydrogen technologies*.

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](http://www.iso.org/members.html).

## Introduction

The hydrogen supply infrastructure for fuel cell electric vehicles (FCEVs) requires specifications and an operational protocol for maintaining the quality of the hydrogen used to fuel the vehicles. To fulfil these requirements, several documents have been written: ISO 14687 which sets forth the quality specifications of hydrogen, and ISO 19880-8 which specifies the quality assurance and control protocol for ensuring them. There was still a need for developing a standard on analytical methods to measure the level of contaminants found in the gaseous hydrogen fuel. The development and validation of these analytical protocols is necessary in order to assure the hydrogen quality required by ISO 14687 for permeating commercialized FCEVs and hydrogen infrastructure in the market. This document sets criteria to validate the analytical methods used for the quality control at hydrogen distribution facilities.



# Gas analysis — Analytical methods for hydrogen fuel — Proton exchange membrane (PEM) fuel cell applications for road vehicles

## 1 Scope

This document specifies the validation protocol of analytical methods used for ensuring the quality of the gaseous hydrogen ( $H_2$ ) at hydrogen distribution bases and hydrogen fuelling stations for road vehicles using proton exchange membrane (PEM) fuel cells. It also gives recommendations on the calculation of an uncertainty budget for the amount fraction.

This document is established mainly for analysis done in laboratories after the sampling of hydrogen either at hydrogen distribution bases or at hydrogen refuelling stations. The specific requirements for on-line monitoring are not covered by this document.

This document gives a list of suitable analytical techniques used to measure each impurity in hydrogen, according to the specification of hydrogen grade D defined by ISO 14687:—<sup>1)</sup>.

Moreover, recommendations for keeping the integrity of the sample are also given in order to ensure the quality of the measurement. It also includes the requirements for reporting the analytical results.

## 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 14687:—, *Hydrogen fuel quality — Product specification*

## 3 Terms and definitions

No terms and definitions are listed in this document.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Symbols

$b$	absolute bias
$b(\%)$	relative bias in %
$k_Q$	multiplier used in calculating limit of quantification
$m$	number of replicate observations used during the validation of analytical method
$n$	number of replicate observations averaged when reporting results

1) Under preparation. Stage at the time of publication: ISO/DIS 14687:2018.