INTERNATIONAL STANDARD

ISO 19880-8

First edition
2019-10

AMENDMENT 1
2021-08

Gaseous hydrogen — Fuelling stations —

Part 8: **Fuel quality control**

AMENDMENT 1: Alignment with Grade D of ISO 14687

Hydrogène gazeux — Stations de remplissage —

Partie 8: Contrôle qualité du carburant

AMENDEMENT 1: Alignement avec le Grade D de l'ISO 14687

Reference number
ISO 19880-8:2019/Amd.1:2021(E)

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).

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 TC 197, *Hydrogen technologies*.

A list of all parts in the ISO 19880 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.

Gaseous hydrogen — Fuelling stations —

Part 8:
Fuel quality control

AMENDMENT 1: Alignment with Grade D of ISO 14687

Clause 5, first paragraph

Replace the paragraph with the following:

> The quality requirements of hydrogen fuel dispensed to PEM fuel cells for road vehicles are listed in Grade D of ISO 14687.

8.4, first paragraph

Replace the paragraph with the following:

> It is necessary to evaluate the possible consequences on a fuel cell vehicle if any impurity exceeds the threshold value of ISO 14687 Grade D.

8.4, second paragraph

Replace the paragraph with the following:

> An estimation of the concentration above the ISO 14687 Grade D threshold values at which the severity increases (if applicable) is named “Level 1” and is given in column 5 for each impurity where the “severity class” is not already 4.

Table 4

Replace Table 4 with the following table:

Table 4 — Impact of impurities on fuel cell powertrain

Impurity		ISO 14687 Grade D threshold value[a] [µmol/mol]	Severity class (from ISO 14687 Grade D threshold value to Level 1)	Level 1 value [µmol/mol]	Severity class (greater than Level 1 threshold)
Total non-H_2 gases		300	UD [b]	UD [b]	4
Helium	He	300	UD [b]	UD [b]	4
Nitrogen	N_2	300	UD [b]	UD [b]	4
Argon	Ar	300	UD [b]	UD [b]	4
Oxygen	O_2	5	UD [c]	UD [c]	4
Carbon dioxide	CO_2	2	1	3	4
Carbon monoxide	CO	0,2	2-3[d]	1	4
Methane	CH_4	100	1	300	4
Water	H_2O	5	4	N/A	4
Total sulphur compounds	H_2S basis	0,004	4	N/A	4
Ammonia	NH_3	0,1	4	N/A	4
Total hydrocarbons except methane	CH_4 basis	2	1-4[d]	N/A	4
Formaldehyde	HCHO	0,2	2-3[d]	1	4
Formic acid	HCOOH	0,2	2-3[d]	1	4
Halogens		0,05	4	N/A	4
Maximum particulate concentration (liquid and solid) [e]		1 mg/kg	4	N/A	4

Key

UD: undetermined

N/A: not applicable

[a] The threshold value is according to hydrogen specification of Grade D of ISO 14687.

[b] The severity class (from ISO 14687 Grade D threshold value to Level 1) and Level 1 value for this impurity is undetermined because no specific study has been conducted yet in alignment with the new threshold value. It needs to be covered in the next edition of this document.

[c] The severity class (from ISO 14687 Grade D threshold value to Level 1) and Level 1 value for oxygen are undetermined because data are lacking to confirm those values. It needs to be covered in the next edition of this document.

[d] A higher value is to be considered for risk assessment approach until more specific data is available.

[e] Particulates are based upon mass density mg/kg.

A.15 first paragraph

Replace “ISO 14687-2” with “Grade D of ISO 14687” in the second last sentence.

Table B.1

Replace Table B.1 with the following table:

Table B.1 — Probability of occurrence for off-site SMR

Impurity	Threshold µmol/mol	Possible causes For the source studied	Typical barriers employed in this process	Probability with barriers
Inert gas N_2	300	Present in natural gas and syngas PSA malfunction	— PSA — Double analysis PSA outlet <100 µmol/mol	UD [a]
Inert gas Ar	300	Only ATR and POx present in O_2 typical 0,6 % in syngas from ATR	— PSA. Not sized to remove Ar. Ar content may be higher if H_2 comes from ATR, POX or feeds with high Ar content	UD [a]
O_2	5	Not present in syngas. O_2 is unstable in the condition of reforming and shift reactions. Combines with H_2, CO, and CH_4	— PSA cannot be used with significant O_2 content for safety reasons	0
CO_2	2	Present in syngas (%)	— PSA adsorption strength of MS, activated carbon, silicagel higher for CO_2 than CO. A CO content lower than 10µmol/mol insures a CO_2 content lower than 2 µmol/mol	0
CO	0,2	Normal operation below threshold. Occasional peaks at µmol/mol level	— Double analysis at the PSA outlet + trip if the CO>1-10 µmol/mol at PSA outlet	4
CH_4	100	Present in syngas at % level	— In most cases CO is sizing the PSA, therefore CO<10 µmol/mol ==> C H_4 < 100 µmol/mol depending on users' specification (Europe pipeline 2 µmol/mol).	2
H_2O	5	Syngas saturated in H_2O	— PSA adsorbed in alumina and MS adsorption strength higher than CO_2. A CO content lower than 10 µmol/mol insures a H_2O content lower than 5 µmol/mol.	0

Key

UD: undetermined

[a] The probability of occurrence for this impurity is undetermined because no specific study has been conducted yet.

Table B.1 *(continued)*

Impurity	Threshold µmol/mol	Possible causes For the source studied	Typical barriers employed in this process	Probability with barriers
TS	0,004	TS from natural gas	— Desulphuration upstream reformer (typical values: normal < 10 ppb, maximum < 20 ppb, guarantee < 50 ppb) — Typical dilution factor 2,5 (1 mole natural gas produces 2,5 mole H_2) — Pre-reformer catalyst poisoning by sulphur is irreversible. Sulphur trapped at this stage. In case of breakthrough, process condition cannot be achieved — Reformer catalyst poisoning by sulphur is irreversible. Sulphur trapped at this stage. In case of breakthrough, process condition cannot be achieved — Shift catalyst poisoning by sulphur is irreversible. Sulphur trapped at this stage. In case of breakthrough, process condition cannot be achieved — PSA adsorption of H_2S before CO, CO_2, species — H_2S adsorption in pipe and vessels. Strong affinity with steel	0
NH_3	0,1	Traces present in syngas	— PSA adsorption strength of alumina and molecular sieve higher than CO. A CO content lower than 10µmol/mol insures a NH_3 content lower than 0,1 µmol/mol	0
THC	2	Traces of C2+ after reforming reaction	— PSA C2 C3, C4, C5+adsorbed by activated carbon layer. A CO content lower than 10 µmol/mol insures a THC (CH_4 excluded) content lower than 2 µmol/mol	0
HCHO	0,2	May be present in syngas. essentially liquid	— PSA. Formaldehyde adsorption strength of alumina and molecular sieve higher than CO. A CO content lower than 10 µmol/mol insures a HCHO content lower than 0,1 µmol/mol. To guarantee 0,01 µmol/mol would require more experience of measuring at those levels	UD [a]
HCOOH	0,2	May be present in syngas essentially liquid	— PSA. Formic adsorption strength of alumina and molecular sieve higher than CO. A CO content lower than 10 µmol/mol insures a HCOOH content lower than 0,2 µmol/mol	0

Key

UD: undetermined

a The probability of occurrence for this impurity is undetermined because no specific study has been conducted yet.

Table B.1 *(continued)*

Impurity	Threshold µmol/mol	Possible causes For the source studied	Typical barriers employed in this process	Probability with barriers
Halogens	0,05	Present in natural gas	— Any Cl present in natural gas would be stopped by HDS — Pre-reformer catalyst poisoning by Cl irreversible Cl trapped at this stage. If breakthrough, process condition cannot be achieved — Reformer catalyst poisoning by Cl irreversible. Cl trapped at this stage I break through, process condition cannot be achieved — Shift catalyst poisoning by Cl irreversible. Cl trapped at this stage. I break through, process condition cannot be achieved — PSA adsorption of Cl before CO, CO_2, species	0
He	300	Not present in natural gas in N Europe (<10 µmol/mol). Passes through the whole process. Dilution factor 2,5		0

Key

UD: undetermined

[a] The probability of occurrence for this impurity is undetermined because no specific study has been conducted yet.

Table B.2

Replace Table B.2 with the following table:

Table B.2 — Probability of occurrence for pipeline

Impurity	Threshold µmol/mol	Causes possible For the item studied	Typical barriers employed in this process	Probability with barriers
Inert gas N_2	300	Air intake if some areas are at negative pressure From seal gas or purge gas Wrong purging after maintenance	Inlet pressure PSL trip on compressors	UD [a]
Inert gas Ar	300	No potential	1 % Ar in the air. 100 µmol/mol would mean 1 % air in the pipe Never been observed	UD [a]
O_2	5	Air intake if some areas are at negative pressure	Inlet pressure PSL trip on compressors	1
CO_2	2	From Air: CO_2 at 400 µmol/mol in the air	2 µmol/mol of C O_2 would mean 0,5 % air in the pipe Never been observed	0
CO	0,2	No potential		0
CH_4	100	No potential		0
H_2O	5	Wrong drying after pressure hydraulic test	H_2 > 40 bar ==> leak from H_2O to H_2 unlikely during operation.	0
TS	0,004	No potential		0
NH_3	0,1	No potential		0
THC	2	No potential		0
HCHO	0,2	No potential		UD [a]
HCOOH	0,2	No potential		0
Halogens	0,05	From cleaning material after maintenance		1
He	300	No potential		0

Key

UD: undetermined

[a] The probability of occurrence for this impurity is undetermined because no specific study has been conducted yet. It needs to be covered in the next edition of this document.

Table B.3

Replace Table B.3 with the following table:

Table B.3 — Probability of occurrence for fuelling station to be source of impurities

Impurity	Threshold µmol/mol	Causes possible For the source studied	Existing barriers	Probability
Inert gas N_2	300	N_2 purging operation, air intake during normal operation or maintenance		UD [a]
Inert gas Ar	300	Air intake during normal operation or maintenance	1 % Ar in the air. 100 µmol/mol would mean 1 % air in the fuelling station Never been observed	UD [a]
O_2	5	Air intake during normal operation or maintenance		2
CO_2	2	Air intake during normal operation or maintenance	2 µmol/mol CO_2 would mean 0,5 % air in the fuelling station. Never been observed	0
CO	0,2	No potential at fuelling station level		0
CH_4	100	No potential at fuelling station level		0
H_2O	5	Maintenance, leaks from compressor exchangers, improper pressure vessel drying after periodic inspection, H_2O coming from the vent in case of check valve malfunction, depending on fuelling station/compressor technology		2
TS	0,004	Materials gaskets, valve seats and tubing	Material specifications	1
NH_3	0,1	No potential		0
THC	2	Oil carryover from compressor (depending on compressor technology)		2
HCHO	0,2	No potential		UD [a]
HCOOH	0,2	No potential		0
Halogens	0,05	From degreasing material		1
He	300	No potential at fuelling station level	If pure He is not used for maintenance	0

Key

UD: undetermined

[a] The probability of occurrence for this impurity is undetermined because no specific study has been conducted yet. It will be covered in the next edition of this document.

Table B.4

Replace Table B.4 with the following table: