



ISO/TC 197
Hydrogen technologies

Email of secretary: jim.ferrero@bnq.qc.ca
Secretariat: SCC (Canada)

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Progress Report of WG27

Revision of ISO 14687; Hydrogen fuel quality--Product specification

**ISO/TC197/Plenary Meeting
December 7, 2017 in Foshan, China**

**Yasuo Takagi(TG1)
Osamu Tajima(TG2)
Co-Convener ISO/TC197/WG27**



Task assigned to WG27 (TG1 and TG2)

1. Consolidate the existing three standards on hydrogen quality: ISO 14687-1, -2 and -3, into one document, incorporating the revision for PEM FCV and PEM stationary appliances.

**NOTE: 14687-2(2012) PEM FC for vehicle applications
14687-3(2014) PEM FC for stationary appliances
14687-1(1999) Other than PEM fuel cell road vehicle and stationary applications**

2. Revision of the standards to respond to the technology improvement in hydrogen, FC and analytical methods

3. Work divided

- TG1: PEM FC for vehicle applications**
- TG2: PEM FC for stationary applications**



Task assigned to WG27 (TG1 and TG2)

4. Enhanced relationship between relevant standards

- **ISO 19880-1, Gaseous hydrogen — Fueling stations — Part 1: General requirements**
- **ISO 19880-8, Gaseous hydrogen — Fueling stations — Part 8: Fuel Quality Control**
- **ISO 21087, Hydrogen fuel — Analytical methods**



Milestones for publishing ISO 14687

Target dates

	PEM for Road Vehicle Application	PEM for Stationary Appliances	H2 for Oher Application
2015-10-15	New Project registered		
2016-11-07	Revised WD circulated		
2017-05-13	CD Disapproved		
2017-10-10	CD2 Approved unanimously		
2017-12	DIS to be registered		
2018-12	IS to be published		

Meetings held:

- 2015-12-02: Kick-off meeting in Torrance CA, USA
- 2016-02-23: 2nd meeting in Fukuoka, Japan (TG1)
- 2016-06-28: 3rd meeting in Munich, Germany (TG1&2)
- 2016-12-06: 4th meeting in Amsterdam, Netherlands
- 2017-05-29: 5th meeting in Seoul, Korea
- 2017-11-14: 6th meeting in Torrance CA, USA
- 2018-09: 7th meeting for DIS comments review (Location: TBD)



Major changes in the DIS draft from ISO14687-2 in road vehicle application(extracted)

The modification of specifications of contaminants in Table 2

Constituents (assay)	Type I, Type II
	Grade D
Total hydrocarbons except methane ^b	2 µmol/mol
Methane (CH₄)	100 µmol/mol
Nitrogen (N ₂)	→300 µmol/mol
Argon (Ar)	→300 µmol/mol
Formaldehyde (HCHO) ^c	0.01→0,2 µmol/mol
Total halogenated compounds ^d →Halogenated compounds ^e (Halogen ion equivalent)	0,05 µmol/mol
Maximum particulate concentration ^{f, g}	1 mg/kg

b Total hydrocarbons **except methane** include **oxygenated organic species**. Total hydrocarbons except methane shall be measured on a C1 equivalent (µmolC/mol).

c **Sum of measured CO, HCHO and HCOOH shall not exceed 0.2 µmol/mol.**

f Particulate includes solid and liquid particulates **including oil mist**. Large particulates can cause issues with vehicle components and should be limited by using filter as specified in **ISO19880-1 and ISO19880-8. No visible oil shall be found in fuel at a nozzle.**



Major changes to be included in the DIS draft Fuel quality specification for PEM fuel cell stationary applications. (Table 3) — (1/2)

- Type I, grade E, Category 1 (High efficiency/ low power)
- Type I, grade E, Category 2 (High power)
- Type I, grade E, Category 3 (High efficiency/ high power)

Constituents (assay)	Type I, grade E		
	Category 1	Category 2	Category 3
Hydrogen fuel index ^a (minimum mole fraction)	50 %	50 %	99,9 %
Total non-hydrogen gases (maximum mole fraction)	50 %	50 %	0,1%
Water (H ₂ O) ^b	Non-condensing at all ambient conditions	Non-condensing at all ambient conditions	Non-condensing at all ambient conditions
Maximum concentration of individual contaminants ^c			
Total hydrocarbons except methane ^d (C ₁ equivalent)	10 µmol/mol	2 µmol/mol	2 µmol/mol
Methane (CH₄)	5 %	1 %	100 µmol/mol
Oxygen (O ₂)	200 µmol/mol	200 µmol/mol	50 µmol/mol



Major changes to be included in the DIS draft Fuel quality specification for PEM fuel cell stationary applications. (Table 3) — (2/2)

Sum of nitrogen (N ₂), argon (Ar) and helium (He) (mole fraction)	50 %	50 %	0,1 %
Carbon dioxide (CO ₂)	Included in total non-hydrogen gases	Included in total non-hydrogen gases	2 µmol/mol
Carbon monoxide (CO)	10 µmol/mol	10 µmol/mol	0,2 µmol/mol ^e
Total sulfur compounds ^f (S1 equivalent)	0,004 µmol/mol	0,004 µmol/mol	0,004 µmol/mol
Formaldehyde (HCHO)	3,0 µmol/mol	0,01 → 0,2 µmol/mol	0,01 → 0,2 µmol/mol ^e
Formic acid (HCOOH)	10 µmol/mol	0,2 µmol/mol	0,2 µmol/mol ^e
Ammonia (NH ₃)	0,1 µmol/mol	0,1 µmol/mol	0,1 µmol/mol
Halogenated compounds ^g (Halogen ion equivalent)	0,05 µmol/mol	0,05 µmol/mol	0,05 µmol/mol
Maximum particulate concentration	1 mg/kg	1 mg/kg	1 mg/kg
Maximum particle diameter	75 µm	75 µm	75 µm

^e Sum of measured CO, HCHO, and HCOOH shall not exceed 0.2 µmol/mol.



Proposed timeframe change

36 months Normal Timeframe



48 months Expended Timeframe



Thank you for your attention