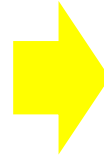


Amendment proposals on FCHV

1. Hydrogen for fuel cell vehicles

2. Correction of Hydrogen lines



GTR15
AMD#5

3. Unit (kg/100km → km / kg)



UNR
WLTP

prepared by JAPAN

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1. Hydrogen for fuel cell vehicles

PROPOSAL : exempt analysis of the specific contaminations according to production process

Justification : some of contaminations have few chance to be observed according to production process. Analysis of non-observed contaminations just waste valuable resources.

How to determine the exempted contaminations : ISO/DIS 19880-8:2017 or other relevant documents describe the quality control methods of each production process including the contaminations to be checked. In other words, non-listed contaminations are exempted from analysis.

6. Fuels for fuel cells

6.1. Compressed hydrogen gas for fuel cell vehicles

Table A3/18

Hydrogen for fuel cell vehicles

Characteristics	Units	Limits		Test Method
		Minimum	Maximum	
Hydrogen fuel index ^(a)	% mole	99.97		
Total non-hydrogen gases	µmol/mol		300	
Maximum concentration of individual contaminants				
Water (H ₂ O)	µmol/mol		5	e
Total hydrocarbons ^(b) (Methane basis)	µmol/mol		2	e
Oxygen (O ₂)	µmol/mol		5	e
Helium (He)	µmol/mol		300	e
Total Nitrogen (N ₂) and Argon (Ar) ^(b)	µmol/mol		100	e
Carbon dioxide (CO ₂)	µmol/mol		2	e
Carbon monoxide (CO)	µmol/mol		0.2	e
Total sulfur compounds ^(c) (H ₂ S basis)	µmol/mol		0.004	e
Formaldehyde (HCHO)	µmol/mol		0.01	e
Formic acid (HCOOH)	µmol/mol		0.2	e
Ammonia (NH ₃)	µmol/mol		0.1	e
Total halogenated compounds ^(d) (Halogenate ion basis)	µmol/mol		0.05	e

For the constituents that are additive, such as total hydrocarbons and total sulfur compounds, the sum of the constituents are to be less than or equal to the acceptable limit.

^(a) The hydrogen fuel index is determined by subtracting the “total non-hydrogen gases” in this table, expressed in mole per cent, from 100 mole per cent.

^(b) Total hydrocarbons include oxygenated organic species. Total hydrocarbons shall be measured on a carbon basis (µmolC/mol). Total hydrocarbons may exceed 2 µmol/mol due only to the presence of methane, in which case the summation of methane, nitrogen and argon shall not exceed 100 µmol/mol.

^(c) As a minimum, total sulphur compounds include H₂S, COS, CS₂ and mercaptans, which are typically found in natural gas.

^(d) Total halogenated compounds include, for example, hydrogen bromide (HBr), hydrogen chloride (HCl), chlorine (Cl₂), and organic halides (R-X).

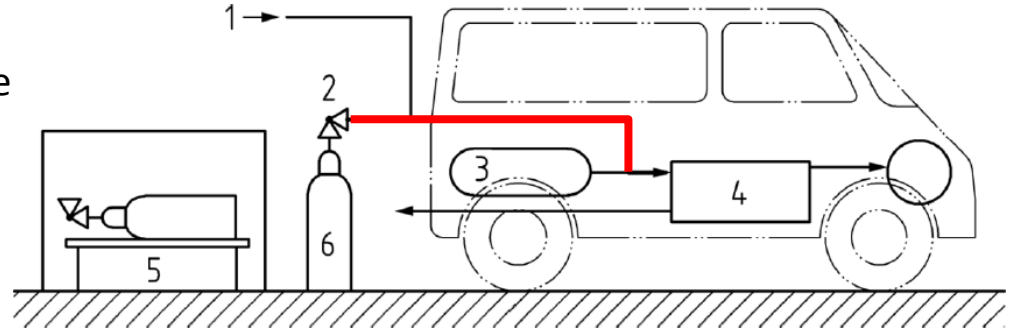
^(e) Test method shall be documented.

2. Correction of Hydrogen lines

PROPOSAL : in case of gravimetric method, correction of non-consumed Hydrogen **in red line** should be allowed to obtain more accurate results. This correction can be done with either actual measurement or calculation (**density * length * inner diameter**)

Justification : pressure and temperature inside the hydrogen tank differ before and after testing. This causes weight difference in red line which is not reflected to weight change of hydrogen tank during testing.

Figure A8.App7/1
Example of instrumentation



3. Unit

PROPOSAL : incorporate km/kg unit when transpose to UN-R (ICE/HEV also need to have km/L unit in UN-R)