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UN Regulation No. 120

## **Proposal for a new Supplement to the 02 series of amendments to UN Regulation No. 120 (Uniform provisions concerning the approval of internal combustion engines to be installed in agricultural and forestry tractors and in non-road mobile machinery, with regard to the measurement of the net power, net torque and specific fuel consumption)**

The text reproduced below was prepared by the experts from the European Association of Internal Combustion Engine Manufacturers (EUROMOT). This document aims at permitting the use of hydrogen (H<sub>2</sub>) as fuel for approval of internal combustion engines to be installed in agricultural and forestry tractors and in non-road mobile machinery, with regard to the measurement of the net power, net torque and specific fuel consumption. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

### **I. Proposal**

*Paragraph 5.2.3., amend to read:*

“5.2.3. The testing of an engine type or engine family shall be carried out by using the following reference fuels or fuel combinations described in Annex 7, as appropriate:

- (a) Diesel;
- (b) Petrol;
- (c) Petrol/oil mixture, for two stroke SI engines;
- (d) Natural gas/bio methane;
- (e) Liquid petroleum gas (LPG);
- (f) Ethanol;
- (g) Hydrogen**

The engine type or engine family shall, in addition, meet the requirements set out in paragraph 5.1.1. in respect of any other specified fuels, fuel mixtures or fuel emulsions included by a manufacturer in an application for type- approval and described in Annex 1 to this Regulation.”

*Annex 1 -Appendix A1 Paragraph 2.8.1., amend to read:*

“2.8.1. Fuel Type <sup>1</sup>: Diesel (non-road gas-oil)/Ethanol for dedicated compression ignition engines (ED95)/Petrol (E10)/ Ethanol (E85)/(Natural gas/Biomethane)/Liquid Petroleum Gas (LPG) / **Hydrogen**”

*Annex 1 -Appendix A1 Paragraph 3.14.1., amend to read:*

“3.14.1.	Fuel: LPG /NG-H/NG-L /NG-HL/LNG/Fuel specific LNG/ <b>Hydrogen</b> ”						
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*Annex 2 -Paragraph 2.8.1., amend to read:*

“2.8.1. Fuel Type(s): Diesel (non-road gas-oil)/Ethanol for dedicated compression ignition engines (ED95)/Petrol (E10)/ Ethanol (E85)/(Natural gas/Biomethane)/Liquid Petroleum Gas (LPG) <sup>2</sup> / **Hydrogen**”

*Annex 2 Appendix A.1 -Template for Test Report A.1.3, insert new paragraph to read:*

**4.4.5 Gaseous Fuel - Hydrogen”**

**4.4.5.1 Make**.....

**4.4.5.2 Type**.....

**4.4.5.3 Grade**..... ”

*Annex 5 Paragraph 2.3.6., amend to read:*

“2.3.6. Fuel type

- (a) Diesel (non-road gas-oil);
- (b) Ethanol for dedicated compression ignition engines (ED95);
- (c) Petrol (E10);
- (d) Ethanol (E85);
- (e) Natural gas/Biomethane:
  - (i) Universal fuel — high calorific fuel (H-gas) and low calorific fuel (L-gas);
  - (ii) Restricted fuel — high calorific fuel (H-gas);
  - (iii) Restricted fuel — low calorific fuel (L-gas);
  - (iv) Fuel specific (LNG);
- (f) Liquid Petroleum Gas (LPG);
- (g) **Hydrogen**”

*Annex 7 insert new paragraph 3.3., to read:*

**2.3 Type: Hydrogen**

<i>Parameter<sup>1</sup></i>	<i>Unit</i>	<i>Limits</i>	<i>Test method</i>
Minimum mole fraction of Hydrogen <sup>2</sup>	%	99,97	ISO 21087:2019
Total non-hydrogen gases (maximum)	µmol/mol	300	ISO 21087:2019
Maximum individual contaminant concentrations:			
Water	µmol/mol	5	ISO 21087:2019
Total hydrocarbons except methane <sup>3</sup>	µmol/mol	2	ISO 21087:2019

Methane (CH <sub>4</sub> )	μmol/mol	100	ISO 21087:2019
Oxygen (O <sub>2</sub> )	μmol/mol	5	ISO 21087:2019
Helium (He)	μmol/mol	300	ISO 21087:2019
Nitrogen (N <sub>2</sub> )	μmol/mol	300	ISO 21087:2019
Argon (Ar)	μmol/mol	300	ISO 21087:2019
Carbon dioxide (CO <sub>2</sub> )	μmol/mol	2	ISO 21087:2019
Carbon monoxide (CO) <sup>4</sup>	μmol/mol	0,2	ISO 21087:2019
Total sulphur compounds (s1 equivalent) <sup>5</sup>	μmol/mol	0,004	ISO 21087:2019
Formaldehyde <sup>4</sup>	μmol/mol	0,2	ISO 21087:2019
Formic acid <sup>4</sup>	μmol/mol	0,2	ISO 21087:2019
Ammonia (NH <sub>3</sub> )	μmol/mol	0,1	ISO 21087:2019
Halogenated compounds (Halogen ion equivalent) <sup>6</sup>	μmol/mol	0,05	ISO 21087:2019
Maximum particulate concentration <sup>7</sup>	mg/kg	1	ISO 21087:2019

#### Notes

<sup>1</sup> For the constituents that are additive, such as total hydrocarbons and total sulphur compounds, the sum of the constituents shall be less than or equal to the acceptable limit.

<sup>2</sup> The hydrogen fuel index is determined by subtracting the "total non-hydrogen gases" in this table, expressed in mole percent, from 100 mole percent.

<sup>3</sup> Total hydrocarbons except methane include oxygenated organic species. Total hydrocarbons except methane shall be measured on a C1 equivalent (μmol/mol).

<sup>4</sup> The sum of measured CO, HCHO and HCOOH shall not exceed 0,2 μmol/mol.

<sup>5</sup> As a minimum, total sulphur compounds include H<sub>2</sub>S, COS, CS<sub>2</sub> and mercaptans, which are typically found in natural gas.

<sup>6</sup> All halogenated compounds which could potentially be in the hydrogen gas [for example, hydrogen chloride (HCl) and organic chlorides (R-Cl)] should be determined by the hydrogen quality control plan discussed in ISO 19880-8. Halogenated compounds shall be measured on a halogen ion equivalent (μmol/mol).

<sup>7</sup> Particulate includes solid and liquid particulates comprises of oil mist. Large particulates can cause issues with vehicle components and should be limited by using filter as specified in ISO 19880-1. No visible oil shall be found in fuel at a nozzle.