

29 August 2022

Agreement

Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations*

(Revision 3, including the amendments which entered into force on 14 September 2017)

Addendum 48 – UN Regulation No. 49

Revision 5 - Amendment 8

Supplement 11 to the 05 series of amendments – Date of entry into force: 22 June 2022

Uniform provisions concerning the measures to be taken against the emission of gaseous and particulate pollutants from compression-ignition engines and positive ignition engines for use in vehicles

This document is meant purely as documentation tool. The authentic and legal binding text is: ECE/TRANS/WP.29/2021/129.



UNITED NATIONS

* Former titles of the Agreement:
Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958 (original version);
Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, done at Geneva on 5 October 1995 (Revision 2).



Annex 4B

Paragraph 8.2., amend to read:

"8.2. NOx correction for humidity

As the NOx emission depends on ambient air conditions, the NOx concentration shall be corrected for humidity with the factors given in paragraph 8.2.1. or 8.2.2. The intake air humidity H_a may be derived from relative humidity measurement, dew point measurement, vapour pressure measurement or dry/wet bulb measurement using generally accepted equations.

For all humidity calculations (for example H_a , H_d) using generally accepted equations the saturation vapour pressure is required. For calculating the saturation vapour pressure which is in general a function of the temperature (at the humidity measurement point) the equation D.15 specified in Annex D to ISO Standard 8178-4:2020 should be used."

Paragraph 9.2.; amend to read:

"9.2. Linearity requirements

.....

Table 7

Linearity requirements of instruments and measurement systems

Measurement system	$\chi_{min} \times (a1 - 1) + a0/$	Slope $a1$	Standard error SEE	Coefficient of Determination r^2
Engine speed	≤ 0.05 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Engine torque	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Fuel flow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Airflow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Exhaust gas flow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Diluent flow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Diluted exhaust gas flow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Sample flow	≤ 1 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Gas analyzers	≤ 0.5 % max	0.99 - 1.01	≤ 1 % max	≥ 0.998
Gas dividers	≤ 0.5 % max	0.98 - 1.02	≤ 2 % max	≥ 0.990
Temperatures	≤ 1 % max	0.99 - 1.01	≤ 1 % max	≥ 0.998
Pressures	≤ 1 % max	0.99 - 1.01	≤ 1 % max	≥ 0.998
PM balance	≤ 1 % max	0.99 - 1.01	≤ 1 % max	≥ 0.998
Humidity measurement device	≤ 2 % max.	0.98 - 1.02	≤ 2 %	≥ 0.95

"

Annex 4A, Appendix 1

Paragraph 5.3., amend to read:

"5.3. NOx correction for humidity and temperature

As the NOx emission depends on ambient air conditions, the NOx concentration shall be corrected for ambient air temperature and humidity with the factors given in the following formulae. The factors are valid in the range between 0 and 25 g/kg dry air.

(a) For compression ignition engines:

$$k_{h,D} = \frac{1}{1 - 0.0182 \times (H_a - 10.71) + 0.0045 \times (T_a - 298)}$$

With:

T_a = temperature of the intake air, K

H_a = humidity of the intake air, g water per kg dry air

Where:

H_a may be derived from relative humidity measurement, dewpoint measurement, vapour pressure measurement or dry/wet bulb measurement using the generally accepted formulae.

(b) For spark ignition engines

$$k_{h,G} = 0.6272 + 44.030 \times 10^{-3} \times H_a - 0.862 \times 10^{-3} \times H_a^2$$

Where:

H_a may be derived from relative humidity measurement, dew point measurement, vapour pressure measurement or dry/wet bulb measurement using the generally accepted formulae.

For all humidity calculations (for example H_a, H_d) using generally accepted equations the saturation vapour pressure is required. For calculating the saturation vapour pressure which is in general a function of the temperature (at the humidity measurement point) the equation D.15 specified in Annex D to ISO Standard 8178-4:2020 should be used."

Annex 4A. Appendix 5

Paragraph 1.2.1., amend to read:

"1.2.1. Pure gas

.....

Hydrogen mixture (FID burner fuel)

(40 ± 1 per cent hydrogen, balance helium or alternatively nitrogen)

(Contamination ≤ 1 ppm C1, ≤ 400 ppm CO₂)"

Paragraph 1.7.2., amend to read:

"1.7.2. Calibration

The CLD and the HCLD shall be calibrated in the most common operating range following the manufacturer's specifications using zero and span gas (the NO content of which shall amount to about 80 per cent of the operating range and the NO₂ concentration of the gas mixture to less than 5 per cent of the NO concentration). With the ozonator deactivated, the NO_x analyzer shall be in the NO mode so that the span gas does not pass through the converter. The indicated concentration has to be recorded."

Paragraph 1.7.8., amend to read:

"1.7.8. NO_x mode

Keeping NO_x mode with the ozonator deactivated, the flow of oxygen or synthetic air is also shut off. The NO_x reading of the analyzer shall not deviate by more than ±5 per cent from the value measured according to paragraph 1.7.2. (the analyzer is in the NO_x mode)."