E/ECE/324
E/ECE/TRANS/505 } Rev.1/Add.95/Amend.1

24 April 1997

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*/

(Revision 2, including the amendments entered into force on 16 October 1995)

Addendum 95: Regulation No. 96

Amendment 1

Supplement 1 to the original version of the Regulation - Date of entry into force: 5 March 1997

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF COMPRESSION-IGNITION (C.I.) ENGINES TO BE INSTALLED IN AGRICULTURAL AND FORESTRY TRACTORS WITH REGARD TO THE EMISSIONS OF POLLUTANTS BY THE ENGINE

UNITED NATIONS

---

*/ Former title 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.

GE.97-21210

Paragraph 2.13.2., add at the end the following chemical component symbol:

".....
PTFE Polytetrafluoroethylene"

Annex 1A, insert a new item 5.1.3. with its respective footnote 5/, to read:

"5.1.3. Density at 15°C 5/: . . . . . .

Footnote 5/: Only to be indicated where the value was higher than foreseen in the table in annex 5 in combination with its Note 10."

Annex B,

Paragraphs 1.3. to 1.8., amend to read:

"1.3. Individual cylinder displacement:

engines to be within a total spread of 15 per cent, number of cylinders for engines with after-treatment device

1.4. Method of air aspiration:

naturally aspirated
pressure charged

1.5. Combustion chamber type/design:

pre-chamber
swirl chamber
open chamber

1.6. Valve and porting - configuration, size and number:

cylinder head
cylinder wall
crankcase

1.7. Fuel system:

pump-line-injector
in-line pump
distributor pump
single element
unit injector

1.8. Miscellaneous features:

exhaust gas recirculation
water injection/emulsion
air injection
charge cooling system

Exhaust after-treatment

oxydation catalyst
reduction catalyst
thermal reactor
particulates trap"

Annex 4,

Paragraph 3.4., amend the last sentence of the first paragraph to read:

"..... If the dilution air is not filtered, measurements at a minimum of three points, after the starting, before the stopping, and at a point near the middle of the cycle, are required, and the values averaged."

Paragraph 3.4., amend the last sentence of the third paragraph to read:

"..... For partial flow dilution systems with single filter method, the mass flow ...."

Paragraph 3.6.6., amend the end of the second subparagraph to read:

"... the carbon and oxygen balance method (see annex 4, appendix 1, paragraph 1.2.3.). ...."

Annex 4 - Appendix 1,

Paragraph 1.5.1.1., amend to read:

"... velocity between 35 and 80 cm/s. ....."

Annex 4 - Appendix 2,

Paragraph 1.4., add at the end of the first subparagraph the following two sentences:

".... The maximum allowable leakage rate on the vacuum side shall be 0.5 per cent of the in-use flow rate for the portion of the system being checked.

The analyzer flows and bypass flows may be used to estimate the in-use flow rates.
....."

Annex 4 - Appendix 3,

Paragraph 1.2., amend to read:

".... conditioned for at least one hour, but not more than 80 hours, and ...."

Paragraph 1.3.2., amend to read:

"....

For the raw exhaust gas:

$$K_{w,r,1} = \left(1 - F_{FH} \times \frac{G_{FUEL}}{G_{AIRD}}\right) - K_{w2}$$

or:

$$K_{w,r,2} = \left(\frac{1}{1 + 1.88 \times 0.005 \times (\%CO[dry] + \%CO_2[dry])}\right) - K_{w2}$$

For the diluted exhaust gas:

$$K_{w,e,1} = \left(1 - \frac{1.88 \times CO_2\%(wet)}{200}\right) - K_{w1}$$

or:

$$K_{w,e,2} = \left(1 + \frac{1 - K_{w1}}{1 + \frac{1.88 \times CO_2\%(dry)}{200}}\right)$$

F_{FH} may be calculated by:

$$F_{FH} = \frac{1.969}{\left(1 + \frac{G_{FUEL}}{G_{AIRW}}\right)}$$

For the dilution air:

....."

Paragraph 1.3.3., delete the last four lines of this paragraph including the formula for calculation of K_H for diesel engines with intermediate air cooler.

Paragraph 1.3.4., add a reference to footnote 1/ to the sub-headings to read: (a) For the raw exhaust gas 1/ and (b) For the dilute exhaust gas 1/ and insert the following footnote 1/ to read:

"1/ In the case of NO_x, the NO_x concentration (NO_xconc or NO_xconc$_2$) has to be multiplied by K_{HNOx} (humidity correction factor for NO_x quoted in the previous paragraph 1.3.3.) as follows: K_{HNOx} x conc or K_{HNOx} x conc$_2$."

Paragraph 1.3.5., amend to read:

"....
The specific emission (g/kWh) of individual gas shall be calculated ...."

Paragraph 1.4.2.1., amend to read:

"....
where r corresponds to the ratio of the cross sectional areas of the isokinetic probe A_T and the exhaust pipe A_{Ti}"
....."

Paragraph 1.4.5., amend to read as follows and add a new footnote 2/ to read:

"1.4.5. Calculation of the specific emissions

The specific emission of particulates PT (g/kWh) shall be calculated in the following way 2/:
....."

"2/ The particulate mass flow rate PT_{mass} has to be multiplied by K_p (humidity correction factor for particulates quoted in paragraph 1.4.1.)."

Annex 5 (Technical Characteristics of Reference Fuel),

Table, column "Limits and Units", insert a reference to a new "Note 10" for "Density at 15°C" behind the max. value, to read: "max. 845 kg/m^3 (10)".

Table, column "Test Method", insert a reference to a new "Note 11" for "Ash content", behind the method reference, to read: "ASTM D482 (11)".

Note 9, amend to read:

"Note 9: To be kept under constant review in the light of trends in the markets. For the purpose of the initial approval of an engine on request of the applicant, a 0.05 per cent mass sulphur minimum is permissible, in which case the measured particulate level must be corrected upward to the average value that is nominally specified for fuel sulphur content (0.15 per cent mass) per the equation below:

$$PT_{adj} = PT + [SFC \times 0.0917 \times (NSLF - FSF)]$$

where: PT_{adj} = adjusted PT value (g/kWh)
PT = measured weighted specific emissions value for particulate emission (g/kWh)
SFC = weighted specific fuel consumption (g/kWh) calculated according to the formula as below
NSLF = average of the nominal specification of sulphur content mass fraction (i.e. 0.15 per cent/100)
FSF = fuel sulphur content mass fraction (per cent/100)

Equation for the calculation of the weighted specific fuel consumption:

$$SFC = \frac{\sum_{i=1}^{n} G_{FUEL,i} \times WF_i}{\sum_{i=1}^{n} P_i \times WF_i} \qquad \text{where:} \quad P_i = P_{m,i} + P_{AE,i}$$

For the purpose of conformity of production assessments in accordance with paragraph 7.4.2., the requirements must be met using reference fuel which complies with the minimum/maximum level of 0.1/0.2 per cent mass."

Insert a new Note 10, to read:

"Note 10: Higher values are permitted up to 855 kg/m^3, in which case the density of the reference fuel used is to be reported. For the purpose of conformity of production assessments in accordance with paragraph 7.4.2., the requirements must be met using reference fuel which complies with the minimum/maximum level of 835/845 kg/m^3".

Note 10 (former), renumber as Note 12.

Insert a new Note 11, to read:

"Note 11: To be replaced by EN/ISO 6245 with effect of the date of implementation."

_____