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## Economic Commission for Europe

Inland Transport Committee

### World Forum for Harmonization of Vehicle Regulations

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Item 14.2.2. of the provisional agenda

**Consideration and vote by AC.3 of draft UN GTRs  
and/or draft amendments to established UN GTRs, if any  
Proposal for amendments to a UN GTR**

### Technical report on the development of Amendment 4 to UN GTR No. 4 (WHDC)

#### Submitted by the Working Party on Pollution and Energy\*

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its eighty-second session (ECE/TRANS/WP.29/GRPE/82) and is based on ECE/TRANS/WP.29/GRPE/2021/7 as amended by Annex V of the session report. It is a Technical report on the development of Amendment 4 to UN GTR No. 4 (WHDC). It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Executive Committee (AC.3) of the 1998 Agreement for consideration at its June 2021 sessions.

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\* In accordance with the programme of work of the Inland Transport Committee for 2021 as outlined in proposed programme budget for 2021 (A/75/6 (part V sect. 20) para 20.51), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



# **Technical report on the development of Amendment 4 to UN GTR No. 4 on World-wide harmonized Heavy Duty Certification procedure (WHDC)**

## **I. Mandate**

1. Amendment 4 to UN GTR No. 4 was developed by the representative from Japan to correct errors found in several formulas. The Executive Committee (AC.3) of the 1998 Agreement adopted the authorisation to develop GTR No. 4 at its November 2007 session (ECE/TRANS/WP.29/AC.3/20).

## **II. Objectives**

2. Paragraph 7.8.8. Table 4

Each condition in Table 4 is not determined based on all the conditions, but needs to be determined based on individual conditions. In other words, it is necessary to modify it to "or" instead of "and" that connects the conditions.

3. Paragraph 8.1.1.

In equations (15) and (16), the coefficient to be referenced is incorrect. That is, the volume of exhaust gas added by combustion in a wet state needs to be expressed not by  $k_f$  but by  $k_{f,w}$ .

4. Paragraph 8.4.2.3. and 8.4.2.4.

In equations (38) and (39), all the calculation equations after Sigma need to be performed in Sigma. Therefore, parentheses are added to calculations after sigma.

5. Paragraph 8.5.1.4.

In the dimension of the volume flow equation, the coefficient  $A_0$  must be divided by 60. Similarly, the coefficient  $A_0$  must be 0.005692 in the standard conditions (273K, 101.3kPa). In addition, the unit of the SSV throat diameter  $d_V$  must be (mm).

6. Paragraph 8.5.2.3.1.

Equation (59) needs to be multiplied by 1/1000 to adjust the number of digits. The number of digits is correctly adjusted in the equations (40) and (41), and the number of digits is similarly adjusted in the equation (59).

7. Paragraph 8.6.1.

In the text, the equation to be referenced is incorrect. It is equation (60) that needs to be referenced.

8. Paragraph 9.5.4.1.

The discharge coefficient of the SSV needs to be correlated with the SSV mass flow rate calculation formula. Therefore, the coefficient  $A_0$  divided by 60 is added. In addition, the unit of the SSV throat diameter  $d_V$  must be (mm).

Reynolds number must be multiplied by 60. The coefficient  $A_1$  must be 27.43831 in the standard state (273K, 101.3kPa). In addition, the coefficient  $A_1$  needs (kg) when converted to SI units.

9. Annex 3, paragraph 1.3.

In Figure 9, raw exhaust gas sampling probe is represented by "SP1", whereas "SP" is indicated in the text. Therefore, it is necessary correctly set "SP1" in the text.

10. Annex 3, paragraph 2.1.

In the text, the flow controller is represented by "FC1", whereas in Figure 12, it is "FC2". Therefore, it is necessary to correctly set "FC1" in Figure 12.

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11. Annex 3, paragraph 2.5.

In Figure 16 and Figure 17, the sample flow controller is represented as "FC2", whereas in the text, it is "FC3". Therefore, it is necessary correctly set "FC2" in the text.

12. Annex 4.2.

In equation (100), it is correct that the square root of the standard error is included up to the denominator. It was corrected in UN GTR No.4 Amendment 1 – Corrigendum 1, but was not reflected when UN GTR No. 4 Amendment 3 was issued. Therefore, it is necessary to reflect correctly.

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