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Working Party on Pollution and Energy

Eighty-ninth session
Geneva, 30 May–2 June 2023

Report of the Working Party on Pollution and Energy (GRPE) on its eighty-ninth session

Contents

I. Attendance

1. The Working Party on Pollution and Energy (GRPE) held its eighty-ninth session from 30 May to 2 June 2023, with André Rijnders (Netherlands) as Chair and Duncan Kay (United Kingdom of Great Britain and Northern Ireland) as Vice-Chair. Experts from the following countries participated in the work following Rule 1(a) of the Rules of Procedure of the World Forum for Harmonization of Vehicle Regulations (WP.29) (TRANS/WP.29/690, as amended): Australia, Canada, China, France, Germany, India, Italy, Japan, Netherlands, Norway, Republic of Korea, Russian Federation, South Africa, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland (UK), United States of America. Experts from the European Commission (EC) also participated. Experts from the following non-governmental organizations (NGOs) took part in the session: American Automotive Policy Council (AAPC), Association for Emissions Control by Catalyst (AECC), European Association for Electromobility (AVERE), European Association of Automobile Suppliers (CLEPA/MEMA/JAPIA), European Association of Internal Combustion Engine Manufacturers (EUROMOT), International Motorcycle Manufacturers Association (IMMA), International Motor Vehicle Inspection Committee (CITA), and International Organization of Motor Vehicle Manufacturers (OICA).

II. Adoption of the agenda (agenda item 1)

Documentation: ECE/TRANS/WP.29/GRPE/2023/15
Informal documents GRPE-89-01-Rev.1, GRPE-89-02, GRPE-89-03 and GRPE-89-04

2. Mr. Rijnders, Chair of GRPE, opened the meeting and welcomed the participants.

3. GRPE adopted the provisional agenda of the eighty-ninth session (ECE/TRANS/WP.29/GRPE/2023/15), as updated and consolidated in GRPE-89-01-Rev.1, and GRPE-89-03 as a tentative running order.

4. The secretariat also briefly introduced GRPE-89-02, showing the schedule of meetings held in conjunction with this session of GRPE.

5. The informal documents distributed before and during the GRPE session are listed in Annex I. Annex II lists the informal meetings held in conjunction with this GRPE session. Annex III lists active Informal Working Groups (IWGs) of GRPE, task forces and subgroups, giving details on their Chairs, Secretaries and the end of their mandates.

6. The secretariat introduced GRPE-89-04, announcing details for the next GRPE sessions. He informed GRPE the corresponding deadline for the submission of official documents would therefore be Tuesday 17 October 2023.

III. Report on the last session of the World Forum for Harmonization of Vehicle Regulations (WP.29) (agenda item 2)

Documentation: ECE/TRANS/WP.29/1171
Informal documents GRPE-89-05, GRPE-89-06, GRPE-89-28 and GRPE-89-39

7. The secretariat introduced GRPE-89-05 and reported about relevant items discussed during the 189th sessions of the World Forum for Harmonization of Vehicle Regulations (WP.29). He referred to ECE/TRANS/WP.29/1171 for further details.

8. He also introduced highlights from the last session of the Inland Transport Committee, where ITC requested feedback and inputs from working parties on the draft outline for a forthcoming ITC climate change mitigation strategy (GRPE-89-06). He finally introduced the activities already performed in the recent past by GRPE on the topic (GRPE-89-28). The Chair added climate change mitigation is a key topic for GRPE and highlighted the need to

deliver on the ITC request. He proposed to create an informal task force to draft the GRPE contribution to the ITC climate change mitigation strategy outline as well as the biennial report.

9. The representative of OICA, not speaking on behalf of the organization, gave reflexions at the technical level, where GRPE has a strong pedigree, and he encouraged brainstorming on the potential to separate consideration of air quality and GHG topics, which is often tackled differently in different jurisdictions.

10. The representative of CLEPA said that climate change mitigation considerations needed to move towards overall lifecycle assessment, beyond tailpipe and use phase only. He noted that a more holistic view would also be needed to also include corporate level engagement, cross border adjustment mechanisms and other trade issues. He said air quality was the key topic in the seventies, and lifecycle assessments (LCA) represented the new future framework for international regulatory framework.

11. The representative of the United States of America clarified that if a LCA methodology is developed, all lifecycle phases (extraction, production, use and dismantling) should be included to inform rule making appropriately.

12. The representative of Germany agreed climate change mitigation was an important challenge, and that he was looking forward to seeing the development of the LCA activities undertaken by GPRE and the IWG on A-LCA.

13. The secretariat introduced GPRE-89-39 on draft ideas to be considered as part of the inputs to the ITC climate change mitigation strategy, that could serve as a basis for further reflexion.

14. The representative of the US wondered if fuel economy considerations should also include energy efficiency for other types of powertrains. The secretariat confirmed indeed energy efficiency would be a more appropriate term.

15. The Chair proposed the creation of a GRPE informal task force on ITC climate change mitigation strategy and invited stakeholders to inform the secretariat about their willingness to contribute and participate. GRPE agreed to the creation of such task force to deliver on the ITC requests to contribute to the ITC climate mitigation strategy.

16. The representative of IMMA stated their commitment to contribute to the new task force proposed by the Chair. He hoped that the ambitious strategy document would include an explanation of the realities in the different regions with a technology neutral and multi-pathway approach towards carbon neutrality. The multi pathway approach should support progressive improvements and ensure affordability of the decarbonization strategies.

17. The Chair briefly explained the next steps and the planning of the GRPE informal task force on ITC climate change mitigation strategy and informed GRPE would have the chance to comment of the draft proposal from the task force over a written procedure to be launched before the summer break.

IV. Light vehicles (agenda item 3)

A. UN Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption), 103 (Replacement pollution control devices) and 154 (Worldwide Light duty Test Procedure (WLTP))

Documentation: ECE/TRANS/WP.29/GRPE/2023/16,
ECE/TRANS/WP.29/GRPE/2023/17,
Informal documents GRPE-89-15, GRPE-89-16-Rev.1, GRPE-89-17-Rev.1, GRPE-89-19, GRPE-89-20-Rev.1 and GRPE-89-22

18. The representative from Japan introduced ECE/TRANS/WP.29/GRPE/2023/16, amended by GRPE-89-16 and ECE/TRANS/WP.29/GRPE/2023/17, amended by GRPE-89-17.

19. The representative from OICA thanked the good collaboration between all involved parties and regretted the premature discontinuation of the IWG on WLTP. He also raised some concerns about the use of utility factors for OVC-HEVs, and the way date of entry into force of successive stages are drafted in the proposal. He wondered if the various dates should be moved to the dedicated section on transitional provisions.

20. The Chair asked if such approach would have any impact on the proposed 08 series of amendments to UN Regulation No. 83 to be adopted by WP.29 at its June 2023 session. The representative from OICA states any modification to the 08 series of amendments to UN Regulation No. 83 would be reflected in a supplement to be prepared for forthcoming sessions of GRPE.

21. The representative of the European Commission highlighted all contracting parties agreed with the existing proposal and mentioned his willingness to look into the issue raised by OICA during the session.

22. Following side meetings during the session, GRPE-89-16-Rev.1 and GRPE-89-17-Rev.1 were introduced to GRPE by the representative of Japan.

23. The representative of the European Commission agreed with the proposal but requested a scrutiny reserve in case unintended consequences had been introduced in the proposals. He also regretted the absence of some important EU member states from the discussions. He nevertheless confirmed this should not prevent from adopting the proposals.

24. The Chair congratulated the involved parties to finalize proposals to be considered by GRPE. The representative of Japan sought further clarifications in case the European Commission would find some issue with the proposals. The secretariat explained the different possible scenarios where the timing and magnitude of the potential error(s) would have an impact on the possible solutions. He confirmed the aim would be to submit the proposals to vote at the November 2023 session of WP.29/AC.1.

25. GRPE adopted ECE/TRANS/WP.29/GRPE/2023/16 as amended by GRPE-89-16-Rev.1 as reflected in Addendum 1 and requested the secretariat to submit it to WP.29 and AC.1 for consideration and vote at their November 2023 sessions as draft new supplement to the 02 series of amendments to UN Regulation No. 154 (WLTP).

26. GRPE adopted ECE/TRANS/WP.29/GRPE/2023/17 as amended by GRPE-89-17-Rev.1 as reflected in Addendum 2 and requested the secretariat to submit it to WP.29 and AC.1 for consideration and vote at their November 2023 sessions as draft new supplement to the 03 series of amendments to UN Regulation No. 154 (WLTP).

27. The representative from AVERE said they were looking into preparing a proposal to amend Annex B8 to consider the possibility for complete discharge/charge before performing the shortened test procedure, to save testing time in case of large battery capacity fitted to some vehicles.

28. The Chair welcomed a written proposal by AVERE on the topic in forthcoming sessions of GRPE.

29. The representative from OICA introduced GRPE-89-15. The representative from the European Commission agreed with most of the content of the proposal, showed some reservation on amending the definition of “vehicle type”, and made a suggestion on the proposal to amend para. 3.3. He finally sought some clarifications about the timing of the proposal and its potential adoption by WP.29 at its June 2023 session.

30. The Chair clarified slight editorial modifications would be possible at the June 2023 session of WP.29 and asked whether this proposal could be formally considered by GRPE at its next session.

31. The representative of OICA clarified OICA was expected to develop a formal proposal for the next session of GRPE. He explained that the existing definition of vehicle type might lead to some inconsistencies between interpolation family and inertia classes. The GRPE confirmed that a proposal on vehicle type will be discussed in the next GRPE session.

32. The representative of Australia introduced GRPE-89-22. The representative of OICA emphasized the proposed UN Regulation on RDE did not offer the possibility to choose an

equivalent to Euro 6d levels and referred to a proposal raised in previous sessions of GRPE (GRPE-87-09) to include levels in UN Regulation on RDE.

33. The representative of Australia emphasized Australia was keen to keep using UN legal instrument as part of their legislative framework to reduce the administrative burden and minimize technical barrier to trade.

34. The Chair noted conformity factor were different between Euro 6d and Euro 6e levels, and encouraged Australia to use the complete package of 08 series of amendments to UN Regulation No. 83, 03 series of amendments to UN Regulation No. 154 and UN Regulation on RDE to get the state-of-the-art regulatory package for tailpipe pollutant emissions. He further mentioned there was no immediate solution to provide a regulatory package equivalent to Euro 6d levels.

35. The representative of Australia understood the complexity of developing the desired solution for the country and hoped a solution could be found in the near future.

36. The representative of OICA introduced GRPE-89-19 and GRPE-89-20 and announced formal proposals were expected for the next session of GRPE.

B. UN Global Technical Regulations Nos. 15 on Worldwide harmonized Light vehicles Test Procedures (WLTP) and 19 (Evaporative emission test procedure for the Worldwide harmonized Light vehicle Test Procedures (WLTP EVAP)

Documentation: Informal document GRPE-89-33

37. The representative of OICA introduced GRPE-89-33. The Chair welcomed the good initiative to bring UN GTR No. 15 to the latest developments included in UN Regulation No. 154 and invited contacting parties and sponsor to help submit such proposal. The secretariat informed GRPE that the latest authorization to develop UN GTR No. 15 (ECE/TRANS/WP.29/AC.3/46) was submitted by Canada, China, the European Union, Japan and the United States of America in 2016.

38. The representative of Germany supported OICA in its endeavour to improve and update UN GTR No. 15 and the type 6 test.

C. Worldwide harmonized Real Driving Emissions test procedure

39. GRPE had not received any new proposals for discussion under this agenda item.

V. Heavy duty vehicles (agenda item 4)

A. UN Regulations Nos. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines) and 132 (Retrofit Emissions Control devices (REC))

Documentation: Informal documents GRPE-89-29, GRPE-89-30 and GRPE-89-31

40. The representative of OICA introduced GRPE-89-29, GRPE-89-30 and GRPE-89-31. The Chair noted the topic introduced, looking forward to a formal proposal.

41. He requested further information on the potential to include hydrogen in dual fuel legislation. The representative of OICA mentioned such possibility was still under development, with no proposal expected in the near future.

B. UN Global Technical Regulations Nos. 4 (World-wide harmonized Heavy Duty Certification procedure (WHDC)), 5 (World-Wide harmonized Heavy duty On-Board Diagnostic systems (WWH-OBD)) and 10 (Off-Cycle Emissions (OCE))

42. GRPE had not received any new proposals for discussion under this agenda item.

C. Worldwide provisions for Heavy Duty vehicles Fuel Economy

43. GRPE had not received any new proposals for discussion under this agenda item.

44. The Chair asked contracting parties to reconsider this topic; as such harmonized methodology would potentially be highly valued in the context of the forthcoming ITC strategy on climate change mitigation.

VI. UN Regulations Nos. 24 (Visible pollutants, measurement of power of C.I. engines (Diesel smoke)), 85 (Measurement of the net power), 115 (LPG and CNG retrofit systems), 133 (Recyclability of motor vehicles) and 143 (Heavy Duty Dual-Fuel Engine Retrofit Systems (HDDF-ERS)) (agenda item 5)

Documentation: ECE/TRANS/WP.29/GRPE/2023/18
Informal document GRPE-89-18

45. The representative from OICA introduced ECE/TRANS/WP.29/GRPE/2023/18, as amended by GRPE-89-18.

46. GRPE adopted ECE/TRANS/WP.29/GRPE/2023/18 as amended by GRPE-89-18 as reflected in Annex IV and requested the secretariat to submit it to WP.29 and AC.1 for consideration and vote at their November 2023 sessions as draft new supplement to the 03 series of amendments to UN Regulation No. 24 (Visible pollutants, measurement of power of C.I. engines (Diesel smoke)).

VII. Agricultural and forestry tractors, non-road mobile machinery (agenda item 6)

A. UN Regulations Nos. 96 (Diesel emission (agricultural tractors)) and 120 (Net power of tractors and non-road mobile machinery)

Documentation: Informal documents GRPE-89-08, GRPE-89-09, GRPE-89-10, GRPE-89-11, GRPE-89-12 and GRPE-89-13

47. The representative of EUROMOT introduced GRPE-89-08, GRPE-89-09, GRPE-89-10, GRPE-89-11 and GRPE-89-12. The representative of the UK highlighted the importance of the proposal to provide a harmonized route for the topic of hydrogen use in non-road mobile machinery. He was looking forward to considering a formal proposal at forthcoming sessions of GRPE.

48. The representative of France supported the initiative and offered to provide some comments to the proposal to improve some references to ISO standards and other type of administrative provisions.

49. The representative of the European Commission supported the proposal from EUROMOT.

50. The representative of the Netherlands introduced GRPE-89-13 on the topic of PM emissions from cooling units on refrigerated vehicles and asked input and information from the GRPE and request the possibility to start an IWG to develop a new Regulation The Chair

informed GRPE the topic of cooling units was already on the GRPE emission topics list (GRPE-87-55) and welcomed concrete activities on the issue.

51. The representative of the UK informed GRPE some testing activities were on-going in the country with first phase to be concluded in Summer 2023.

52. The representative of OICA opened the topic to also think about refrigerated vehicles that have no separate cooling unit, for which some excess emissions might be justifiable, and added more evidence would be needed to fully capture the scale of the issue. He recognized covering the topic with such broader view was beyond the scope of the proposal introduced by the Netherlands and invited GRPE to also reflect on the topic.

53. The representative of India highlighted India was looking at the emission of such engines, sometimes also used for other purposes. He welcomed the initiative of the Netherlands and mentioned his willingness to stay informed about any forthcoming activities.

54. The Chair invited GRPE to start thinking about the creation of a dedicated informal working group on the topic in order to prepare proposal to limit harmful emissions from such engines.

B. UN Global Technical Regulation No. 11 (Non-road mobile machinery engines)

55. GRPE had not received any new proposals for discussion under this agenda item.

VIII. Particle Measurement Programme (PMP) (agenda item 7)

Documentation: Informal documents GRPE-89-27, GRPE-89-35 and GRPE-89-37

56. The representative from the European Commission, Chair of the IWG on PMP, introduced GRPE-89-37 giving a status report of the activities of the IWG on PMP. The representative of OICA asked whether the IWG on PMP had any discussion on emission limits for brake emissions of heavy duty vehicles. The Chair of the IWG on PMP confirmed this had not yet been discussed.

57. The representative of Germany thanked the IWG on PMP for the update and supported the good work performed by the IWG.

58. The secretariat requested further clarifications on the development for forthcoming amendment to UN GTR No. 24 and also about the method selection for non-friction braking coefficients. The Chair of the IWG on PMP wished to submit the final text for inclusion of a methodology to determine vehicle-specific non-friction braking coefficients via a written procedure following this session of GRPE. He also clarified the latest text indicated OEMs could select between Table 5.1. or Annex C value for non-friction braking coefficients.

59. The representative of the European Commission, Chair of the IWG on PMP, introduced GRPE-89-27 proposing revised terms of references. The representative of the Netherlands asked whether health effects of brake / non-exhaust particulates was considered in the activities of the IWG on PMP. The Chair of the IWG on PMP explained the IWG did not have the appropriate expertise and focused on emissions for the time being. He welcomed inputs and/or relevant literature on the topic on adverse health effect of non-exhaust emissions.

60. The representative of the Netherlands asked about the best place to discuss such topic. The Chair confirmed GRPE is an appropriate place and asked GRPE about any other parties willing to support activities on this topic. The representative of the Netherlands confirmed their willingness to introduce the topic in more details at the next session of GRPE.

61. The representative of France confirmed their interest in the activity of heavy-duty brake particulate emissions, and asked further information about potential sponsors for the activities and if the authorization process already started to WP.29/AC.3. The Chair of the IWG on PMP suggested the EU might be in a position to sponsor the activity and that the request for authorization will be drafted once the revised ToRs are adopted by GRPE.

62. The representative of the US informed GRPE on the content of the Notice of Proposed Rulemaking recently released in the US, where a limit of 0.5mg/mi has been proposed as a limit for tailpipe emissions, including some testing at -7°C. He also confirmed the US was performing tests on European vehicles under EU and US test procedures and that he would consider briefing GRPE on the most prominent results at forthcoming session of GRPE.

63. GRPE adopted GRPE-89-27 as revised ToRs for the IWG on PMP.

64. The representative of France, co-Chair of the Task Force on Tyre Abrasion (TFTA), introduced GRPE-89-35. The representative of OICA requested additional information about the check of consistency of reference tyres. The co-Chair of the of the TFTA explained that definitions for reference and candidate tyres were needed, and that an ASTM definition had been agreed.

65. The representative of OICA asked whether such definition was only about tyre size. The co-Chair of the of the TFTA mentioned tyre size, thread depth, shape was all part of the information needed for a comprehensive ASTM description.

66. The Chair requested the secretariat to include a dedicated agenda item for the TFTA for the next session of GRPE.

IX. Motorcycles and mopeds (agenda item 8)

A. UN Regulations Nos. 40 (Emission of gaseous pollutants by motorcycles) and 47 (Emission of gaseous pollutants of mopeds)

67. GRPE had not received any new proposals for discussion under this agenda item.

B. UN Global Technical Regulations Nos. 2 (World-wide Motorcycle emissions Test Cycle (WMTC)), 17 (Crankcase and evaporative emissions of L-category vehicles) and 18 (On-Board Diagnostic (OBD) systems for L-category vehicles) and [XX] (Durability)

68. GRPE had not received any new proposals for discussion under this agenda item.

C. Environmental and Propulsion Performance Requirements (EPPR) for L-category vehicles

Documentation: Informal document GRPE-89-32

69. The Co-Chairs of IWG (the Netherlands and South Africa) on EPPR presented a status report (GRPE-89-32). The representative of the Republic of Korea asked whether the IWG was considering any activity on power measurement for electric 2- and 3-wheelers. The representative of China also required some information about range determination for electric 2- and 3- wheelers, and if the expected testing procedure for such test was likely to rely on the existing WMTC.

70. The Chair of the IWG on EVE asked if the IWG on EPPR was expecting to look at battery durability for electric 2- and 3- wheelers, and proposed to share knowledge and experience if deemed useful by the IWG on EPPR.

71. The co-Chair of the IWG on EPPR confirmed such issues were in the list of priorities, but have not yet been considered in detail. The secretary of the IWG on EPPR proposed to put this on the agenda for the next session of the IWG on EPPR.

X. Electric Vehicles and the Environment (EVE) (agenda item 9)

A. UN GTR No. 21 (DEVP) and No. 22 (In-Vehicle Battery Durability)

72. GRPE had not received any new proposals for discussion under this agenda item.

B. Other activities of IWG on EVE

Documentation: Informal document GRPE-89-36

73. The representative from the US, Co-Chair of the IWG on EVE presented the status report introducing the latest activities of the group (GRPE-89-36). The Chair reminded the request made by China at the March 2023 session of WP.29 to amend the title of UN GTR No. 22 to clearly reflect the fact that it refers only to light-duty vehicles.

74. He also congratulated the IWG on EVE for the clear and ambitious timeline on heavy-duty battery durability activities. The Chair of the IWG on EVE praised the strong collaborative atmosphere in the group to strive for swift delivery of important legislative provisions needed all over the globe.

XI. Mutual Resolution No. 2 (M.R.2) (agenda item 10)

75. GRPE had not received any new proposals for discussion under this agenda item.

XII. International Whole Vehicle Type Approval (IWVTA) (agenda item 11)

Documentation: Informal document GRPE-89-14

76. The GRPE ambassador to the IWG on IWVTA and DETA introduced GRPE-89-14 updating GRPE on an updated proposal about the implementation of the Unique Identifier (UI) in UN Regulations pertinent to GRPE. He regretted the limited involvement of the EC in this activity.

77. The representative of the Netherlands confirmed they would like to keep the E-marking, but would consider to have both E-marking and UI where possible. The representative of France provided two remarks on the potential implementation of UI; (a) UI could be added at a later stage if needed and (b) any next text added to prevent the use of the UI should not create the need for a new series of amendment, and should avoid questioning existing approvals.

78. The ambassador confirmed UI has not yet been used, as some (still non-existing) features in DETA would be needed to deploy the UI.

79. The representatives of South Africa and Spain showed concerns with the UI and did not support its deployment in UN Regulations under GRPE purview.

80. GRPE endorsed GRPE-89-14 and requested the ambassador to communicate that position to the IWG on DETA.

81. The representative of CITA thanked the ambassador and the contracting parties for agreeing on the proposed way forward. He reminded UI was created for GRE, and now it is considered only for three UN Regulations. He further clarified the schedule 5 does not offer an option for both E-marking and UI. He concluded by stating a strong support to the proposal from the ambassador.

82. The Chair concluded by also regretting the lack of funding for the development and hosting of DETA.

XIII. Vehicles Interior Air Quality (VIAQ) (agenda item 12)

Documentation: Informal documents GRPE-89-25 and GRPE-89-26

83. The Chair of IWG on Vehicles Interior Air Quality (VIAQ), representative from the Russian Federation, presented a status report on the ongoing activities of the group (GRPE-89-25) as well as the latest draft part IV of the Mutual Resolution (M.R.3) on Vehicle Interior Air Quality (GRPE-89-26).

84. The Chair acknowledged the good progress made by IWG on VIAQ and confirmed this status report would serve as an interim report as requested in the ToRs.

XIV. Lifetime compliance (agenda item 13)

Documentation: ECE/TRANS/WP.29/GRPE/2023/9
Informal documents GRPE-89-07, GRPE-89-21 and GRPE-89-24-Rev.2

85. The secretary of the IWG on Periodic Technical Inspection (PTI), representative from CITA, on behalf of the Co-Chairs of the IWG on PTI (the Netherlands and the Russian Federation), introduced ECE/TRANS/WP.29/GRPE/2023/9 and GRPE-89-24-Rev.2. He reminded the adoption of ECE/TRANS/WP.29/GRPE/2023/9 had been postponed at the January 2023 session of GRPE.

86. The representative of the European Commission asked whether this proposal would be formally adopted by GRPE. The Chair confirmed GRPE can adopt documents pertaining to any of the three agreements, and he encouraged GRPE to adopt this proposal during this session if possible.

87. The representative of the UK asked to elaborate on the square brackets around the emission limit still present in the proposal. The Chair confirmed this has to be agreed by GRPE.

88. The representative of the Netherlands explained the country as adopted a high limit value to avoid false negative and ask about the legal meaning of the sentence about mutual recognition under para. 3.2.2.

89. The representative of Germany informed GRPE that the country was about to start PN measurement at PTI in July 2023 and asked whether there was any discrepancy between the EU recommendation published recently and this proposal. The secretary of the IWG on PTI confirmed both text contained identical provisions.

90. The representative of the European Commission and Germany requested to make sure the PN limit would only be available from Euro 5b onwards for light duty vehicles. The representative of Australia also request to ensure the PN limit would only be available from Euro VI trucks.

91. GRPE adopted ECE/TRANS/WP.29/GRPE/2023/9 as amended by GRPE-89-24-Rev.2 as reflected in Annexes V and VI and requested the secretariat to submit it to the November 2023 session of WP.29 and AC.4.

92. The secretary of the IWG on PTI introduced GRPE-89-07-Rev.1. The representative of CITA supported the proposal and proposed to go ahead with the adoption of the ToRs providing the IWG on PTI also agreed with this proposal.

93. GRPE agreed with this approach and looked forward to some updates about the activities of the emission anti-tampering task force.

94. The representative of AAPC introduced GRPE-89-21. He requested guidance from GRPE on the best way to proceed to ensure full harmonization for OBD communication protocols in all regulatory tools under GRPE's purview.

95. The representative of OICA confirmed that for light-duty vehicles, UN Regulations Nos. 83 and 154 were up to date, with a proposal to update UN GTR No. 15 expected for the next session of GRPE. He acknowledged SAE was the leading body on harmonized OBD

communication protocols and highlighted the importance to be able to read Data Trouble Codes (DTCs) during periodic technical inspections.

96. The Vice-Chair mentioned OBD were used more widely than for emission related purposes, and that the newly created Vehicular Communication Task Force might be a good place to consider this topic if need be. The representative of OICA invited to reach out to SAE to know more about other OBD applications.

XV. Automotive Life Cycle Assessment (A-LCA) (agenda item 14)

Documentation: Informal document GRPE-89-34

97. The Chair of the IWG on A-LCA introduced GRPE-89-34. The representative of the US supported the sub-group and level approaches considered. He reminded the US position explained in GRPE-86-38, requesting to avoid publishing interim results. He raised concerns about potential misinterpretation in case of publication of interim results. He also agreed to review the level approach and provide feedback.

98. The Chair of the IWG on A-LCA confirmed at forthcoming meeting expected on 10 July 2023 to review a complete image of the levelling concepts of each sub-group. He also informed about nomination process to participate to sub-groups, leaving the door opened for more participants to join.

99. The representative of the US trusted the A-LCA leadership to address the US requests.

100. The Chair highlighted the importance to also raise important messages to GRPE in this new topic tackled by GRPE.

101. The representative of CLEPA confirmed a phased approach to publish results might be appropriate in order to accommodate the US concerns, to make progress is made even though the full lifecycle is not complete, for example through a cradle-to-gate approach, where a strong need had already been identified.

102. The representative of the US also requested to pay close attention to the robustness and quality of the data that would feed the methodology for the different levels, which was likely to drive the timing.

103. The Chair requested further information on the participants of the subgroups, and how to make sure the right stakeholders are involved in the most relevant activities.

104. The Chair of the IWG on A-LCA explained the list of participants of subgroups is managed by the IWG on A-LCA, and noted a balanced participation for the time being, and invited subgroups to process new invitations via the IWG on A-LCA leading team if and when additional expertise would be needed.

105. The secretary of the IWG on A-LCA mentioned he would be open to get advice from GRPE on stakeholder engagement in the various subgroups.

XVI. Priority topics for GRPE activities (agenda item 15)

Documentation: Informal document GRPE-89-38-Rev.1

106. The Chair introduced GRPE-89-38-Rev.1. The representative of OICA invited to consider adding power legislation in the updated list of priorities, for example to cover power on demand, and discuss the future of UN Regulation No. 85. He highlighted a need for a broad discussion for both light-duty and heavy-duty vehicles on this topic of power determination for all the various powertrain options now or soon-to-be available.

107. The representative of France provided some updated information on the TFTA activities, reminding GRPE that the ToRs of the TFTA was aiming for a new UN Regulation.

108. The representative of the US highlighted vehicle-level efficiency should be considered as well, not only looking at the powertrain. The Chair agreed with this proposal.

109. The representative of the Netherlands requested to wait until the next session to tackle the topic of cooling units, still waiting for some feedback before starting any activities.

110. GRPE endorsed GRPE-89-38-Rev.1, as amended during the session.

XVII. Election of officers (agenda item 16)

111. In compliance with Rule 37 of the Rules of Procedures (TRANS/WP.29/690, as amended) GRPE unanimously elected Mr. André Rijnders (Netherlands) as Chair of GRPE, and Mr. Duncan Kay (United Kingdom of Great Britain and Northern Ireland) as Vice-Chair for the sessions of GRPE scheduled for the year 2024.

XVIII. Any other business (agenda item 17)

Documentation: Informal document GRPE-89-23

112. The interim Chair of the GRPE's Task Force on Automated Vehicles Regulations Screening (AVRS), representative of the Netherlands, introduced GRPE-89-23. He updated GRPE on the progress made and the expected timeline for the activity.

113. He announced the task force was still looking for a stable leadership team. He volunteered to act as Chair for the task force and renewed the call for the vacant secretariat role. The representative of OICA mentioned OICA was having internal consultation to identify the most suitable candidate.

XIX. Provisional agenda for the next session

A. Next GRPE session

114. The next GRPE session, including IWG meetings, is scheduled to be held from Tuesday 9 January 2024 starting at 2.30 p.m. to Friday 12 January 2024 12.30 p.m. Interpretation services would be provided.

B. Provisional agenda for the next proper GRPE session

115. GRPE agreed on the following provisional agenda for its next session:

1. Adoption of the agenda.
2. Report on the last sessions of the World Forum for Harmonization of Vehicle Regulations (WP.29).
3. Light vehicles:
   (a) UN Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption), 103 (Replacement pollution control devices) and 154 (Worldwide harmonized Light vehicles Test Procedures (WLTP));
   (b) UN Global Technical Regulations Nos. 15 (Worldwide harmonized Light vehicles Test Procedures (WLTP)) and 19 (Evaporative emission test procedure for the Worldwide harmonized Light vehicle Test Procedure (WLTP EVAP));
   (c) Worldwide harmonized Real Driving Emissions test procedure.
4. Heavy duty vehicles:

(a) UN Regulations Nos. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines) and 132 (Retrofit Emissions Control devices (REC));

(b) UN Global Technical Regulations Nos. 4 (World-wide harmonized Heavy Duty Certification procedure (WHDC)), 5 (World-Wide harmonized Heavy Duty On-Board Diagnostic systems (WWH-OBD)) and 10 (Off-Cycle Emissions (OCE));

(c) Worldwide provisions for Heavy Duty vehicles Fuel Economy.

5. UN Regulations Nos. 24 (Visible pollutants, measurement of power of C.I. engines (Diesel smoke)), 85 (Measurement of the net power), 115 (LPG and CNG retrofit systems), 133 (Recyclability of motor vehicles) and 143 (Heavy Duty Dual-Fuel Engine Retrofit Systems (HDDF-ERS)).

6. Agricultural and forestry tractors, non-road mobile machinery:

(a) UN Regulations Nos. 96 (Diesel emission (agricultural tractors)) and 120 (Net power of tractors and non-road mobile machinery);

(b) UN Global Technical Regulation No. 11 (Non-road mobile machinery engines).

7. Particle Emissions.

(a) UN Global Technical Regulation No. 24 (Light-duty brake emissions);

(b) Activities of the IWG on Particle Measurement Programme (PMP);

(c) Activities of the Task Force on Tyre Abrasion (TFTA).

8. Motorcycles and mopeds:

(a) UN Regulations Nos. 40 (Emission of gaseous pollutants by motorcycles) and 47 (Emission of gaseous pollutants of mopeds);

(b) UN Global Technical Regulations Nos. 2 (World-wide Motorcycle emissions Test Cycle (WMTC)), 17 (Crankcase and evaporative emissions of L- category vehicles), 18 (On-Board Diagnostic (OBD) systems for L-category vehicles) and 23 (Durability);

(c) Environmental and Propulsion Performance Requirements (EPPR) for L-category vehicles.

9. Electric Vehicles and the Environment (EVE);

(a) UN GTR No. 21 (DEVP) and 22 on (In-Vehicle Battery Durability);

(b) Other activities of IWG on EVE.

10. Mutual Resolution No. 2 (M.R.2).

11. International Whole Vehicle Type Approval (IWVTA).

12. Vehicle Interior Air Quality (VIAQ).

13. Lifetime compliance.

14. Automotive Life Cycle Assessment (A-LCA)

15. Priority topics for GRPE activities.

16. Any other business.

C. Informal meetings scheduled to be held in conjunction with the next GRPE session

116. The following informal meetings were scheduled to be held, subject to confirmation:

Date	*Time*	*Group*	*Acronym*	*Meeting format*
9 January 2024	9.30 a.m. – 12.30 p.m.	Automotive Life Cycle Assessment	A-LCA	Hybrid
	9.30 a.m. – 12.30 p.m.	Vehicle Interior Air Quality	VIAQ	Hybrid
	2.30 p.m. – 5.30 p.m.	Particle Measurement Programme	PMP	Hybrid
	2.30 p.m. – 5.30 p.m.	Environmental and Propulsion Performance Requirements of L-category vehicles	EPPR	Hybrid
	2.30 p.m. – 5.30 p.m.	Electric Vehicles and the Environment	EVE	In-person

Annex I

List of informal documents (GRPE-89-) distributed without an official symbol before and during the session

No.	*(Author) Title*	*Follow-up*
1r1	(Secretariat) Provisional annotated agenda	A
2	(Secretariat) Informal meetings in conjunction with the GRPE (proper) session: schedule and rooms reservation	A
3	(Chair) Draft running order	A
4	(Secretariat) General Information, 89th, 90th and 91st sessions of GRPE	A
5	(Secretariat) Highlights of the recent WP.29 and ITC Sessions	A
6	(Secretariat) Development of the ITC Strategy on reducing greenhouse gas emissions in inland transport	A
7	(PTI) Revised Proposed Terms of Reference – Emissions Antitampering Task Force	B
8	(EUROMOT) Presentation on proposal to amend the 05 series of amendments to UN Regulation No. 96	A
9	(EUROMOT) Proposal to include hydrogen in the 05 series of amendments to UN Regulation No. 96	A
10	(EUROMOT) Proposal to correct administrative or typographic errors in the 05 series of amendments to UN Regulation No. 96	A
11	(EUROMOT) Proposal to include hydrogen in the 02 series of amendments to UN Regulation No. 120	A
12	(EUROMOT) Proposal to correct typographic errors in the 02 series of amendments to UN Regulation No. 120	A
13	(Netherlands) Reducing Emissions from Cooling Units in Road Transport	A
14	(IWVTA/DETA Ambassador) UI inclusion in UN Regulations: Updated proposal from the GRPE Ambassador to IWG on DETA	B
15	(OICA) Proposal to correct ECE/TRANS/WP.29/GRPE/2023/2	A
16r1	(Japan, EC, OICA) Proposal to amend ECE/TRANS/WP.29/GRPE/2023/16	B
17r1	(Japan, EC, OICA) Proposal to amend ECE/TRANS/WP.29/GRPE/2023/17	B
18	(OICA) Proposal to supersede ECE/TRANS/WP.29/GRPE/2023/18	B
19	(OICA) Proposal for a new supplement to the 05 series of amendments to UN Regulation No. 83	A
20r1	(OICA) Proposal for a new supplement to the 01 series of amendments to UN Regulation No. 101	A
21	(AAPC) Harmonizing OBD communication protocols	A
22	(Australia) Transition to new emission rules in Australia	A
23	(Netherlands) Report of the Task Force Automated Vehicles Regulation Screening (TF-AVRS)	A
24r2	(IWG on PTI) Proposal to amend ECE/TRANS/WP.29/GRPE/2023/9	B
25	(VIAQ) Status report of the IWG on VIAQ	A
26	(VIAQ) Draft Part IV of the Mutual Resolution (M.R.3) on Vehicle Interior Air Quality	A
27	(PMP) Proposal for revised ToRs	B
28	(Chairs and secretariat) GRPE inputs to the development of the ITC Strategy on reducing greenhouse gas emissions in inland transport	A
29	(OICA) Type Approval of H2 engines - Change proposals for UN R49	A
30	(OICA) Proposed amendments to UNR 49.05 for inclusion of H2 requirements	A
31	(OICA) Proposed amendments to UNR 49.06 for inclusion of H2 requirements	A
32	(EPPR) Status report of the IWG on EPPR	A
33	(OICA) latest information about amendments to the original and 01 series to UN regulation No. 154 and UN GTR No. 15	A

No.	*(Author) Title*	*Follow-up*
34	(A-LCA) Status report of the IWG on A-LCA	A
35	(TFTA) Status report of the Task Force on Tyre Abrasion	A
36	(EVE) Status report of the IWG on EVE	A
37	(PMP) Status report of the IWG on PMP	A
38r1	(Chair and secretariat) updated list of priorities	A
39	(Chair and secretariat) Proposal for GRPE contribution to ITC climate change mitigation strategy	A

Notes:

A Consideration by GRPE completed or to be superseded;

B Adopted;

C Further consideration on the basis of a revised proposal;

D Distribute at the January 2024 session with an official symbol.

Annex II

Informal meetings held in conjunction with the GRPE session

Date	*Time*	*Group*	*Acronym*
30 May 2023	9.30 a.m. – 12.30 p.m.	Electric Vehicles and the Environment	EVE
	2.30 p.m. – 5.30 p.m.	Environmental and Propulsion Performance Requirements of L-category vehicles	EPPR
	2.30 p.m. – 5.30 p.m.	Automotive Life Cycle Assessment	A-LCA

Annex III

List of GRPE informal working groups, task forces and subgroups

Name (Acronym) (Status)	*Chair or Co-Chairs*	*Secretaries*	*End of mandate*
Environmental and Propulsion Performance Requirements of L-category vehicles (EPPR) (group)	Niels den Ouden Joseph Mashele	Edwin Bastiaensen	January 2025
Electric Vehicles and the Environment (EVE) (group)	Michael Olechi Pangiota Dilara Chen Chunmei (Vice-Chair) Hisakazu Suzuki (Vice-Chair)	Kendelle Anstey	January 2024
Particle Measurement Programme (PMP) (group)	Barouch Giechaskiel	Rainer Vogt	June 2025
Vehicle Interior Air Quality (VIAQ) (group)	Andrey Kozlov Inji Park	Andreas Wehrmeier	November 2025
Automotive Life Cycle Assessment (A-LCA) (group)	Tetsuya Niikuni Charyung Kim	Noriyuki Ichikawa Hans Nuglisch Romain Denayer	June 2025

Annex IV

[English only]

Adopted on the basis of ECE/TRANS/WP.29/GRPE/2023/18 as amended by GRPE-89-18 (see para. 46)

A new Supplement to the 03 series of amendments to UN Regulation No. 24

I. Proposal

Part I, paragraph 8.3.1., amend to read:

"8.3.1. An engine which has not been run in shall be subjected to the test under free acceleration prescribed in annex 5 to this Regulation.

The engine shall be deemed to conform to the approved type if the absorption coefficient determined does not exceed by more than 0.5m-1 the figure shown in the approval mark or document for that engine (see paragraph 8.1. above). On the request of the manufacturer, **the reference fuel** ~~commercially available fuel~~ may be used rather than **commercially available fuel** ~~the reference fuel~~."

Annex 4, paragraph 3.2., amend to read:

"3.2. Fuel

The fuel shall be the reference fuel whose specifications are given in Annex 6 to this Regulation.

In the case that testing for **Engine Power**~~emission of gaseous and particulate pollutants~~ according to UN Regulation~~s~~ No~~s~~. 85 and/or **testing for emission of gaseous and particulate pollutants according to UN Regulation No.** 49 is conducted at the same time as testing to this Regulation, at the request of the manufacturer the fuel for testing emission of gaseous and particulate pollutants may be used for testing to this Regulation."

Annex 5, add new *paragraph 1.5.* to read:

"**1.5. Fuel**

The fuel used shall be ~~the one available on the market~~ commercially available. In any case of dispute, the fuel shall be the reference fuel whose specifications are given in Annex 6 to this Regulation."

Annex 10, paragraph 9.1., amend to read:

"9.1. ~~The net power of the engine measured by the technical service may differ by ± 2 per cent from the net power specified by the manufacturer, with a tolerance of 1.5 per cent for the engine speed.~~

The net power indicated by the manufacturer shall be accepted if it does not differ by more than ± 2 per cent for maximum power and more than ± 4 per cent at the other measurement points on the curve with a tolerance of ± 2 per cent for engine speed, or within the engine speed range (X1 min^{-1} - 2 per cent) to (X2 min^{-1} +2 per cent) (X1 < X2) from the values measured by the technical service on the engine submitted for testing."

II. Justification

1. The wording at the end of paragraph 8.3.1. should be reversed to reflect the new wording proposed in Annex 5.

2. Recent amendments have attempted to clarify the fuels which may be used for the various stages of approval but it has since been noticed that this clarity is still absent from Annex 5 (free acceleration test). This new paragraph therefore makes Annex 5 consistent with Annex 4.

3. An amendment was adopted at GRPE 86th session in June 2022 to introduce the allowance of harmonized reference fuels. Sadly, however the text contained a contradiction between the words “testing for emission of gaseous and particulate pollutants” and the references to “UN Regulations Nos. 85 and/or 49” as Regulation No. 85 is not emissions legislation.

4. GRPE 87th session discussed and adopted a similar amendment to Regulation No. 85 (GRPE-2022-08e as amended by GRPE-87-16e) in January 2023 and this proposal seeks to bring consistency.

5. Alignment with UN Regulation No. 85, i.e. ± 2 per cent at maximum power and ± 4 per cent at other measuring points. Supplement 8 considered this only for Annex 4 (TEST AT STEADY SPEEDS OVER THE FULL-LOAD CURVE) and not for Annex 10 ("ECE" METHOD OF MEASURING THE NET POWER OF C.I. ENGINES).

6. The wording is inconsistent “commercially available fuel” vs “fuel available on the market”.

Annex V

[English only]

Adopted on the basis of GRPE-89-24-Rev.2 (see para. 91)

A new amendment to UN Rule No. 1

Annex, paragraph 3., amend to read:

"3. Environmental nuisances

3.1. Exhaust emissions

3.1.1. Vehicles with positive-ignition engines:

Item	*Method*	*Main Reasons for Rejection*	*Defect Assessment*		
			Minor	*Major*	*Danger ous*
3.1. Positive ignition engine emissions					
3.1.1. Exhaust emissions control equipment	Visual inspection	(a) Emission control equipment fitted by the manufacturer absent, modified or obviously defective. (b) Leaks which would affect emission measurements		X X	
3.1.2. Gaseous emissions	For vehicles up to emission classes Euro 5 and Euro V or equivalent: Measurements using an exhaust gas analyser in accordance with the requirements[1] or reading of OBD. Tailpipe testing shall be the default method of exhaust emission assessment. On the basis of an assessment of equivalence, and by taking into account the relevant type approval legislation, Contracting Parties may authorise the use of OBD in accordance with the manufacturer's recommendation and other requirements. For vehicles as of emission classes Euro 6 and Euro VI or equivalent: Measurement using an exhaust gas analyser in accordance with requirements[1] or reading of OBD in accordance with manufacturer's recommendations and other requirements[1]. Measurements not applicable for two-stroke engines	(a) Either gaseous emissions exceed the specific levels given by the manufacturer; (b) Or, if this information is not available the CO emissions exceed, (i) For vehicles not controlled by an advanced emission controls system: 4.5%, or 3.5% According to the date of first registration or use specified in requirements[1] (ii) for vehicles controlled by an advanced emission control system: - At engine idle: 0.5% - At high idle: 0.3% for vehicles of emission class Eur 5 and Euro 6 or equivalent: - At engine idle: 0.3% - At high idle: 0.2%		X X	

Item	*Method*	*Main Reasons for Rejection*	*Defect Assessment*		
			Minor	*Major*	*Danger ous*
		According to the date of first registration or use specified in requirements[1] (c) Lambda coefficient outside the range 1± 0.03 or not in accordance with manufacturer's specification; (d) OBD read-out indicating significant malfunction		X X	
3.2. Compression ignition engine emissions					
3.2.1. Exhaust emissions control equipment	Visual inspection	(a) Emission control equipment fitted by the manufacturer absent or obviously defective. (b) Leaks which would affect emission measurements		X X	
3.2.2. **Exhaust emissions measurement**	**Test procedures:** **For vehicle up to emission classes Euro 5a and Euro V or equivalent:** **Apply 3.2.2.1.** **For vehicles as of emission classes Euro 5b and Euro VI or equivalent:** **Apply either 3.2.2.1. or 3.2.2.2. according to national implementation.** **Mutual recognition of periodic technical inspection certificate is not affected by the choice of the Exhaust emissions test procedures.**				
3.2.2.**1.** Opacity Vehicles registered or put into service before 1 January 1980 are ~~**excepted**~~ **exempted** from this requirement	For vehicle up to emission classes Euro 5 and Euro V or equivalent: Exhaust gas opacity to be measure during free acceleration (no load from idle up to cut-off speed) with gear lever in neutral and clutch engaged or reading of OBD. The tailpipe testing shall be the default method of exhaust emissions assessment. On the basis of an assessment of equivalence, Contracting Parties may authorise the use of OBD in accordance with the manufacturer's recommendation and other requirements. For vehicles as of emission classes Euro 6 and Euro VI or equivalent:	(a) For vehicle registered or put into service for the first time after the date specified in the requirements[1] Opacity exceeds the level recorded on the manufacturer's plate on the vehicle.		X	

Item	*Method*	*Main Reasons for Rejection*	*Defect Assessment*		
			Minor	*Major*	*Dangerous*
	Exhaust gas opacity to be measured during free acceleration (no load from idle up to cut-off speed) with gear lever in neutral and clutch engaged or reading of OBD in accordance with the manufacturer's recommendations and other requirements[1] Vehicle preconditioning: 1. Vehicles may be tested without preconditioning, although for safety reasons checks should be made that the engine is warm and in a satisfactory mechanical condition				
	2. Precondition requirements: (i) Engine shall be fully warm, for instance the engine oil temperature measured by a probe in the oil level dipstick tube to be at least 80ºC or normal operating temperature if lower, or the engine block temperature measured by the level of infrared radiation to be at least an equivalent temperature. If, owing to the vehicle configuration, this measurement is impractical, the establishment of the engine's normal operating temperature may be made by other means, for example by the operation of the engine cooling fan. (ii) Exhaust system shall be purged by at least three free acceleration cycles or by an equivalent method.				
	Test procedure: 1. Engine and any turbocharger fitted, to be at idle before the start of each free acceleration cycle. For heavy-duty diesels, this means waiting for at least 10 seconds after the release of the throttle. 2. To initiate each free acceleration cycle, the throttle pedal must be fully depressed quickly and continuously (in less than one second) but not violently, so as to obtain maximum delivery from the injection pump.	(b) Where this information is not available or requirements[1] do not allow the use of reference values, - For naturally aspirated engines: 2.5 m^{-1} - For turbo-charged engines: 3.0 m^{-1} - For vehicles identified in requirements[1] or first registered or put into service for the first time after the date specified in requirements: for vehicles of emission classes Euro 5 and Euro V or equivalent 1.5 m^{-1} for vehicles of emission classes Euro 6 and Euro VI or equivalent 0.7 m^{-1}		X	

Item	*Method*	*Main Reasons for Rejection*	*Defect Assessment*		
			Minor	*Major*	*Dangerous*
	3. During each free acceleration cycle, the engine shall reach cut-off speed or, for vehicles with automatic transmissions, the speed specified by the manufacturer or, if this data is not available, then two thirds of the cut-off speed, before the throttle is released. This could be checked, for instance, by monitoring engine speed or by allowing a sufficient time to elapse between initial throttle depression and release, which in the case of vehicles of categories M_2, M_3, N_2 and N_3, should be at least two seconds.				
	4. Vehicles shall only be failed if the arithmetic means of at least the last three free acceleration cycles are in excess of the limit value. This may be calculated by ignoring any measurement that depart significantly from the measured mean, or the result of any other statistical calculation that takes account of the scattering of the measurements. Contracting Parties may limit the number of test cycles. 5. To avoid unnecessary testing, Contracting Parties may fail vehicles which have measured values significantly in excess of the limit values after fewer than three free acceleration cycles or after the purging cycles. Equally to avoid unnecessary testing, Contracting Parties may pass vehicles which have measured values significantly below the limits after fewer than three free acceleration cycles or after the purging cycles.				
3.2.2.2. Particulate Number counting	**Vehicle preparation** **At the beginning of the test the vehicle should be:** **— Hot, i.e., engine coolant temperature > 60 °C but preferably > 70 °C** **— Conditioned, by operating for a period of time at low idling and/or performing stationary accelerations up to maximum 2 000 rpm engine speed or by driving. Conditioning is done in order to ensure that the DPF efficiency is not influenced by a recent regeneration. Conditioning time is considered the period in which the engine is switched on including pre-**	**Measurement results exceed 1 000 000 (1/cm^3)**		**X**	

Item	Method	Main Reasons for Rejection	Defect Assessment		
			Minor	Major	Dangerous
	test phases (e.g., stabilization phase). The recommended total conditioning time is 300 seconds. **A fast pass test is possible with engine coolant temperature < 60 °C. However, if the vehicle fails to pass the test, then the test is repeated and the vehicle should fulfil the requirements set for the engine coolant temperature and the conditioning.** **PN-PTI instrument preparation:** **— The PN-PTI instrument is powered on for at least the warm-up time indicated by the manufacturer;** **— Self-checks of the instrument defined in Annex 1 to R.E.6 monitor the proper operation of the instrument during operation and trigger a warning or message in case of malfunction;** **Before each test, the good condition of the sampling system is verified, including checking the sampling hose and probe for damage.** **Test procedure:** **— Before the start of a measurement, the following data is registered:** **(a) vehicle registration number,** **(b) vehicle identification number,** **(c) type-approved emissions level (Euro emission standard);** **— The software of the particle counter automatically guides the instrument operator through the test procedure;** **— The probe is inserted at least 0.20 m into the outlet of the exhaust system. In justified exemptions where sampling at this depth is not possible, the probe is inserted at least 0.05 m. The sampling probe does not touch the walls of the tailpipe;** **— If the exhaust system has more than one outlet, the test is done to all of them and the respective PN-PTI limit is respected at all tests. In this case, the highest measured PN**			

Item	Method	Main Reasons for Rejection	Defect Assessment		
			Minor	Major	Dangerous
	concentration measured at different exhaust system outlets is considered to be the vehicle's PN concentration; **— The vehicle operates at low idling. In case the engine of a vehicle is not switched on at static conditions then the start/stop system is deactivated by the test operator. For hybrid and plug-in hybrid vehicles, the thermal engine is required to be switched on (e.g., by switching on the air-conditioning system for hybrids or by selecting battery charging mode for plug-in hybrids);** **— After the probe has been inserted into the tailpipe, the following steps are followed for the PN-PTI test:** **(a) A stabilization period of at least 15 seconds with the engine running at idle speed. Optionally, before the stabilization period 2-3 accelerations up to maximum 2 000 rpm engine speed are performed,** **(b) After the stabilisation period, the PN concentration emissions are measured. The duration of the test is at least 15 seconds (total measurement duration). The test result is the average PN concentration of the measurement duration. If the measured PN concentration is more than two times the PN-PTI limit then the measurement may stop immediately before waiting for 15 seconds to elapse and the test result is reported.** **After the completion of the test procedure, the PN-PTI instrument reports (and stores or prints) the average PN concentration of the vehicle and a "PASS" or "FAIL" message.** **— If the test result is less than or equal to the PN-PTI limit, the instrument reports a "PASS" message and the test was passed.** **— If the test result is greater than the PN-PTI limit, the instrument reports a "FAIL" message and the test failed.**			

3.3. Test equipment

Vehicle emissions are tested using equipment designed to establish accurately whether the limit values prescribed or indicated by the manufacturer have been complied with.

For the particulate number counting test, the equipment shall comply with the requirements laid down in the Resolution R.E.6 on test-equipment, skills and training of inspectors, supervision, chapter 3.”

Annex VI

[English only]

Adopted on the basis of GRPE-89-24-Rev.2 (see para. 91)

A new amendment to R.E.6.

Insert a new paragraph 3.3., to read:

"3.3. Technical requirements concerning the equipment to measure number of particles;

All the technical requirements can be found in Annex 1 of this Resolution."

Insert a new Annex 1, to read:

"Annex 1 : Technical requirements concerning the equipment to measure number of particles

1. Metrological requirements

1.1. Indication of the measurement result

The instrument should ensure that:

(a) The PN per volume is expressed as number of particles per cm^3;

(b) The inscriptions for this unit are assigned unambiguously to the indication; "#/cm^3", "cm^{-3}", "particles/cm^3", "1/cm^3" are allowed.

1.2. Measuring range

The instrument should ensure that:

(a) The minimum measuring range, that may be subdivided, is from 5 000 1/cm3 (maximum value for lower range) to twice the PN-PTI limit value (minimum value for the upper range);

(b) The exceedance of the range is indicated visibly by the instrument (e.g. warning message or flashing number);

(c) The measuring range is declared by the PN-PTI instrument manufacturer and complies with the minimum range defined in this paragraph. It is recommended that the PN-PTI instrument display range is wider than the measuring range, ranging from zero up to at least five times the PN-PTI limit value.

1.3. Resolution of the displaying device (for digital indicating instruments only)

The instrument should ensure that:

(a) PN concentrations as measurement results are legible, clear and unambiguously shown with their unit to the user;

(b) Digital figures are at least 5 mm high;

(c) The display provides a minimum resolution of 1 000 1/cm^3. If required by the NMI, during type examination/initial verification/subsequent verification access to a minimum resolution of 100 1/cm^3 between zero and 50 000 1/cm^3 is available.

1.4. Response time

The instrument should ensure that:

(a) For measuring PN concentration, the PN-PTI instrument including the sampling line and sample preconditioning device (if any) indicates 95 % of the final value of a reference PN sample within 15 s after changing from HEPA filtered or ambient air.

(b) Optionally, this test may be performed with two different PN concentrations.

(c) The PN-PTI instrument may be provided with a logging device to check that requirement.

1.5. Warm-up time

The instrument should ensure that:

(a) The PN-PTI instrument does not indicate the measured PN concentration during the warm-up time;

(b) After the warm-up time, the PN-PTI instrument meets the metrological requirements indicated in this Section.

1.6. Maximum permissible error **('MPE')**

The MPE is relative to the actual concentration value (MPE_{rel}) or an absolute concentration value (MPE_{abs}), whichever is greater.

(a) Reference operating conditions (see Section 1.13): MPE_{rel} is 25 % of the actual concentration but not lower than MPE_{abs}

(b) Rated operating conditions (see Section 1.13): MPE_{rel} is 50 % of the actual concentration but not lower than MPE_{abs}

(c) Disturbances **(see Section 1.14): MPE_{rel} is 50 % of the actual concentration but not lower than MPE_{abs}**

The MPE_{abs} is recommended to be less than or equal to 25 000 1/cm^3.

1.7. Efficiency requirements

The counting efficiency requirements are listed below:

	Particle size or geometric mean diameter [nm]	*Counting efficiency [-]*
Required	23 ± 5 %	0.2-0.6
Optional	30 ± 5 %	0.3-1.2
Required	50 ± 5 %	0.6-1.3
Required	70 or 80 ± 5 %	0.7-1.3
Optional	100 ± 5 %	0.7-1.3
Optional	200 ± 10 %	0.5-3.0

(a) The counting efficiency is determined with monodisperse particles with sizes defined in this Section or with polydisperse particles with geometric mean diameter ('GMD') defined in this Section and geometric standard deviation ('GSD') lower or equal to 1.6;

(b) The minimum concentration used for the efficiency tests should be higher than the lower value of the measuring range of the PN-PTI instrument divided by the lower counting efficiency defined for each particle size in this Section. E.g. for a lower value of the measuring range 5 000 1/cm3, at 23 nm, the concentration of the particles measured by the reference system should be at least 25 000 1/cm3;

(c) Counting efficiency tests are performed under reference operating

conditions (see Section 1.13) with thermally stable and soot-like particles. If needed, any neutralization and/or drying of the generated particles takes place before the splitter to the reference and test instrument(s). In case of monodisperse particles testing, the correction for multiple charged particles is not higher than 10 % (and is reported);

(d) The reference instrument is a traceable faraday cup electrometer or a traceable particle counter with counting efficiency > 0.5 at 10 nm (combined with a traceable diluter if necessary for polydisperse particles). The expanded uncertainty of the reference system, including the diluter if applicable, is less than 12.5 % but preferably less than or equal to one-third of the MPE at reference operating conditions;

(e) If the PN-PTI instrument includes any internal adjustment factor, it should remain the same (fixed) for all tests described in this paragraph.

(f) The whole PN-PTI instrument (i.e. including the sampling probe and sampling line, if present) should fulfil the counting efficiency requirements. At the request of the manufacturer, the PN-PTI instrument counting efficiencies may be tested in separate parts at representative conditions inside the instrument. In that case, the efficiency of the whole PN-PTI instrument (i.e. multiplication of efficiencies of all parts) fulfils the counting efficiency requirements.

1.8. Linearity requirements

The linearity testing should ensure that:

(a) The whole PN-PTI instrument is tested for its linearity with thermally stable, polydisperse soot-like particles with GMD 70 ± 10 nm and GSD lower or equal to 1.6;

(b) The reference instrument is a traceable particle counter with counting efficiency > 0.5 at 10 nm. The reference instrument may be accompanied by a traceable diluter in order to measure high concentrations, but the entire reference system (diluter + particle counter) expanded uncertainty remains below 12.5 % but preferably less than or equal to one-third of the MPE at reference operating conditions;

(c) The linearity tests are done with at least 9 different concentrations within the measuring range and the MPE at reference operating conditions (see Section 1.6) is respected.

(d) It is recommended to include at the testing concentrations the lower value of the measuring range, the applicable PN-PTI limit (± 10 %), twice the PN-PTI limit (± 10 %), and PN-PTI limit times 0.2. At least one concentration should be between the PN-PTI limit and the higher value of the measuring range as well as at least 3 concentrations distributed equally between the point where the MPE changes from absolute to relative and the PN-PTI limit.

(e) If the device is tested in parts, the linearity check may be limited to the particle detector, but the efficiencies of the rest of the parts should be taken into account for the error calculation.

The linearity requirements are summarized below:

Control location	*Reference*	*Minimum number of tested concentrations*	*MPE*
NMI	Traceable particle counter with traceable diluter	9	Reference operating conditions (see Section 1.6)

1.9. Zero-level

The zero point is tested with a HEPA filter. Zero-level is the average signal of the PN-PTI instrument with a HEPA filter at its inlet over a period of at least 15 s after a stabilization period of at least 15 s. The maximum permissible zero-level is 5 000 1/cm3.

1.10. Volatile removal efficiency

The volatile removal efficiency testing should ensure that the system achieves > 95 % removal efficiency of tetracontane (C40H82) particles with electrical mobility size 30 nm ± 5 % and with concentration between 10 000 and 30 000 1/cm3. If needed, neutralisation of the tetracontane particles takes place before the splitter to the reference and test instrument(s). Alternatively, polydisperse tetracontane particles may be used with GMD between 30 and 35 nm and total concentration between 50 000 and 150 000 1/cm3. In both cases (testing with monodisperse or polydisperse tetracontane particles), the reference system fulfils the same requirements as described in Section 1.8.

Volatile removal efficiency tests with larger tetracontane particle size (monodisperse) or GMD (polydisperse) and/or higher tetracontane concentrations than those described in this Section may be accepted only if the PN-PTI instrument passes the test (> 95 % removal efficiency).

1.11. Stability with time or drift

For the stability test, the PN-PTI instrument is used in accordance with the manufacturer's operating instructions. The stability testing of the instrument has to ensure that the measurements made by the PN-PTI instrument under stable environmental conditions remain within the MPE at reference operating conditions (see in Section 1.6). No PN-PTI instrument adjustment can be performed during the stability test.

If the instrument is equipped with a means for drift compensation, such as an automatic zero or automatic internal adjustment, the action of those adjustments does not produce an indication that can be confused with a measurement of an external gas. The stability measurements are performed for at least 12 h (not necessarily continuously) with nominal concentration of at least 100 000 1/cm3. The comparison to a reference instrument (same requirements as the reference system described in Section 1.8) is done at least every hour. Accelerated stability test of 3 h with nominal concentration at least 10 000 000 1/cm3 is permitted. In this case, the comparison to the reference instrument is done hourly but with nominal concentration 100 000 1/cm3.

1.12. Repeatability

The repeatability testing should ensure that for 20 consecutive measurements of the same reference PN sample carried out by the same person with the same instrument within relatively short time intervals, the experimental standard deviation of the 20 results is not greater than one third of the MPE (reference operating conditions) for the relevant sample. Repeatability is tested with a nominal concentration of at least 100 000 1/cm3. Between every two consecutive measurements, HEPA filtered airflow or ambient airflow is supplied to the PN-PTI instrument.

1.13. Influence quantities

Reference operating conditions are presented below. The MPE specified for "Reference operating conditions applies (see in Section 1.6)

Ambient temperature	20 °C ± 2 °C
Relative humidity	50 % ± 20 %
Atmospheric pressure	Stable ambient (± 10 hPa)

Mains voltage	Nominal voltage ± 5 %
Mains frequency	Nominal frequency ± 1 %
Vibration	None/negligible
Voltage of battery	Nominal voltage of the battery

The minimum requirements for rated operating conditions testing are presented below. The MPE specified for"rated operating conditions" applies (see in Section 1.6).

Ambient temperature (IEC 60068-2-1, IEC 60068-2-2, IEC 60068-3-1)	From + 5 °C (test level index 2 according to OIML D11) (or less if specified by the manufacturer) to + 40 °C (test level index 1 according to OIML D11) (or more if specified by the manufacturer). When critical internal temperatures of the PN-PTI instrument are out of range, then the instrument does not indicate the measured value and indicates a warning
Relative humidity (IEC 60068-2-78, IEC 60068-3-4, IEC 60068-2-30)	Up to 85 %, no condensation (test level index 1 according to OIML D11) (when used inside) Up to 95 % condensing (when used outside)
Atmospheric pressure	860 hPa to 1 060 hPa
Mains voltage (IEC 61000-2-1, IEC 61000-4-1)	- 15 % to + 10 % of the nominal voltage (test level index 1 according to OIML D11)
Mains frequency (IEC 61000-2-1, IEC 61000-2-2, IEC 61000-4-1)	± 2 % of the nominal frequency (test level index 1 according to OIML D11)
Voltage of the road vehicle battery (ISO 16750-2)	12 V battery: 9 V to 16 V; 24 V battery: 16 V to 32 V
Voltage of internal battery	Low voltage, as specified by the manufacturer, up to the voltage of a new or fully charged battery of the specified type

1.14. Disturbances

Significant faults as specified in MPE for disturbances (see in Section 1.6) should either not occur or should be detected and acted upon by means of checking facilities in case of the following minimum requirements for disturbances described below.

Mechanical shock (IEC 60068-2-31)	Handheld: 1 fall of 1 m on each bottom edge Transportable: 1 fall of 25 mm on each bottom edge (test level index 1 according to OIML D11)
Vibration only for hand-held instruments (IEC 60068-2-47, IEC 60068-2-64, IEC 60068-3-8)	10 Hz to 150 Hz, 1.6 ms-2, 0.05 m2s-3, -3 dB/octave (test level index 1 according to OIML D11)
AC mains voltage dips, short interruptions and reductions (IEC 61000-4-11, IEC 61000-6-1, IEC	0.5 cycles – reduction to 0 % 1 cycle – reduction to 0 %

61000-6-2)	25/30 (*) cycles – reduction to 70 % 250/300 (*) cycles – reduction to 0 % (*) For 50 Hz/60 Hz respectively (test level index 1 according to OIML D11)
Burst (transients) on AC mains (IEC 61000-4-4)	Amplitude 2 kV Repetition rate 5 kHz (test level index 3 according to OIML D11)
Burst (transients) on signal, data and control lines (IEC 61000-4-4)	Amplitude 1 kV Repetition rate 5 kHz (test level index 3 according to OIML D11)
Surges on AC mains power lines (IEC 61000-4-5)	Line to line 1.0 kV Line to ground 2.0 kV (test level index 3 according to OIML D11)
Surges on signal, data and control lines (IEC 61000-4-5)	Line to line 1.0 kV Line to ground 2.0 kV (test level index 3 according to OIML D11
Electrostatic discharge (IEC 61000-4-2)	6 kV contact discharge 8 kV air discharge (test level index 3 according to OIML D11)
Radiated, radio-frequency, electromagnetic fields (IEC 61000-4-3, IEC 61000-4-20)	80 (26*) MHz up to 6 GHz, 10 V/m (test level index 3 according to OIML D11) * For an equipment under test, without any cabling to apply the test, the lower frequency limit is 26 MHz
Conducted radio-frequency fields (IEC 61000-4-6)	0.15 up to 80 MHz, 10 V (e.m.f.) (test level index 3 according to OIML D11)
Power frequency for magnetic fields (IEC 61000-4-8)	Continuous 100 A/m Short duration 1 000 A/m for 1 s (test level index 5 according to OIML D11)
For instruments powered by a road vehicle battery:	
Electrical transient conduction along supply lines	Pulses 2a, 2b, 3a, 3b, test level IV (ISO 7637-2)
Electrical transient conduction via lines other than supply lines	Pulses a and b, test level IV (ISO 7637-3)
Load dump	Test B (ISO 16750-2)

2. Technical requirements

2.1. Construction

The instrument should fulfil the following specifications:

(a) All parts from the exhaust pipe up to the particle detector, which are in contact with raw and diluted exhaust gas, are made of corrosion-resistant material and do not influence the composition of the gas sample. The material of the sampling probe withstands the exhaust gas temperature;

(b) The PN-PTI instrument incorporates good particle sampling practices for minimization of particle losses;

(c) The sampling probe is so designed that it can be inserted at least 0.2 m (at least 0.05 m in justified exemptions) into the exhaust tail

pipe of the vehicle and be securely held in place by a retaining device regardless of the depth of insertion and the tail pipe shape, size, and wall thickness. The sampling probe design facilitates sampling at the inlet of the sampling probe without touching the wall of the exhaust tail pipe;

(d) **The instrument either contains a device that prevents water condensation from forming in the sampling and measuring components or a detector that gives an alarm and prevents a measurement result to be indicated. Some examples of devices or techniques that can prevent water condensation are heating of sampling line or dilution with ambient air near the sampling probe;**

(e) **If an adjustment reference is needed due to the measurement technique, simple means to provide such a sample (for example a sample/adjustment/verification port) is available with the instrument;**

(f) **When a dilution unit is included in the PN-PTI instrument, the dilution factor remains constant during a measurement;**

(g) **The device conveying the exhaust gas is mounted so that its vibrations do not affect the measurements. It can be switched on and off by the user separately from the other instrument components. However, no measurement can be performed when it is switched off. The gas handling system should be flushed automatically with ambient air before the device conveying the exhaust gas is switched off;**

(h) **The instrument is equipped with a device that indicates when the gas flow rate is lower than the minimum flow rate and, thus, the flow decreases to a level that would cause the detection to exceed either the response time or the MPE at reference operating conditions (see in1.6). Additionally, and according to the technology used, the particle detector is equipped with temperature, current, voltage or any other relevant sensors that monitor critical parameters for the operation of PN-PTI instrument in order to remain within the MPE specified in these guidelines;**

(i) **The sample preconditioning device (when applicable) has to be airtight to such an extent that the influence of dilution air on the measurement results is not more than 5 000 1/cm3;**

(j) **The instrument may be equipped with an interface permitting coupling to any peripheral device(s) or other instrument(s), as long as the metrological functions of the instrument(s) or their measurement data are not influenced by the peripheral devices, by other interconnected instruments or by disturbances acting on the interface. Functions that are performed or initiated via an interface meet the relevant requirements and conditions. If the instrument is connected to a data printer or an external data storage device, then the data transmission from the instrument to the printer is designed so that the results cannot be falsified. It is not possible to print out a document or store the measuring data in an external device (for legal purposes) if the instrument checking facility(ies) detect(s) a significant fault or a malfunction. The PN-PTI instrument interface respects the requirements of OIML D 11 and OIML D 31;**

(k) **The PN-PTI instrument has a reporting frequency equal to or greater than 1 Hz;**

(l) **The instrument is designed according to good engineering practice to ensure that particle counting efficiencies are stable across the test;**

(m) **The PN-PTI instrument or the device with the relevant software permits the logging time defined by the measurement procedure**

described in item 3.2.2.2. of the UN Rule No. 1 and reports the measurement and the test result according to the measurement procedure;

(n) The PN-PTI instrument or the device with the relevant software guides the user through the steps described in the measurement procedure described item 3.2.2.2. of the UN Rule No. 1;

(o) Optionally the PN-PTI instrument or the device with the relevant software may count the hours of operation in measurement mode.

2.2. Requirements for ensuring correct operation

(a) If the detection of one or more of disturbances is achieved by the use of automatic self-checking facilities, then it should be possible to check the correct functioning of such facilities;

(b) The instrument is controlled by an automatic checking facility that operates in such a way that, before a measurement can be indicated or printed, all adjustments, and all other checking facility parameters are confirmed for proper values or status (i.e. within limits);

(c) The following checks are integrated:

(i) The PN-PTI instrument automatically and continuously monitors relevant parameters that have a significant influence on the measuring principle used (e.g. sample volume flow, detector temperature). If intolerable deviations occur, no measured value is displayed. If the PN-PTI requires a working fluid, performing measurements is not possible, if its level is not sufficient;

(ii) Memory test with clear verification of the software and function of the most important assemblies (automatically after each switch-on, then at the latest after each change of day);

(iii) A clean air or leakage test procedure to detect the specific maximum leakage (at least with each self-test, recommended before each measurement). If the measured value is larger than 5 000 1/cm3, the instrument does not allow the user to further proceed with the measurement;

(iv) If required by the measuring principle, a zero-setting procedure performed with a HEPA filter at the inlet of the PN-PTI instrument (at least with each self-test, recommended before each measurement);

(d) Optionally, the PN-PTI instrument may integrate an ambient air or high PN concentration measurement procedure check, performed before the clean air or leakage test procedure, in which the PN-PTI instrument detects more particles than a predefined PN concentration;

(e) Instruments equipped with an automatic adjustment facility or a semi-automatic adjustment facility allow the user to make a measurement only after correct adjustments have been completed;

(f) Instruments equipped with a semi-automatic adjustment facility do not allow the user to make a measurement when an adjustment is required;

(g) A means for warning of a required adjustment may be provided for both automatic and semi-automatic adjustment facilities;

(h) Effective sealing devices are provided on all parts of the instrument that are not materially protected in another way against operations liable to affect the accuracy or the integrity of the instrument. This applies in particular to:

(i) adjustment means,

(ii) software integrity (see also OIML D 31 normal risk level or WELMEC 7.2 risk class C requirements);

(i) The legally relevant software is clearly identified. The identification is displayed or printed:

(i) on command, or

(ii) during operation, or

(iii) at start up for a measuring instrument that can be turned off and on again. All relevant provisions in OIML D 31 normal risk level or WELMEC 7.2 risk class C apply;

(j) Software is protected in such a way that evidence of any intervention (e.g. software updates, parameters changes) is available. All relevant provisions in OIML D 31 normal risk level or WELMEC 7.2 risk class C apply;

(k) The metrological characteristics of an instrument are not influenced in any inadmissible way by connecting it to another device, by any feature of the connected device itself or by any remote device that communicates with the measuring instrument;

(l) A battery-operated instrument functions correctly with new or fully charged batteries of the specified type and either continues to function correctly or does not indicate any values whenever the voltage is below the manufacturer's specified value. Specific voltage limits for road vehicle batteries are prescribed in rated operating conditions (see Section 1.13.).

3. Metrological controls

Metrological requirements are tested in three different stages:

(a) Type examination;

(b) Initial verification;

(c) Subsequent verification.

3.1. Type examination

Compliance check is conducted for metrological requirements specified in Section 1 and technical requirements specified in Section 2, applied to at least one PN-PTI instrument, which represents the definitive instrument type. Tests are performed by a NMI.

3.2. Initial verification

For each PN-PTI instrument produced, the instrument manufacturer or a notified body chosen by the manufacturer does an initial verification.

The initial verification includes a linearity test with polydisperse particles with monomodal size distribution, GMD 70 ± 20 nm and GSD lower or equal to 2.1. The linearity check is performed with 5 reference PN samples. The MPE at reference operating conditions applies (see Section 1.6). The 5 reference PN samples concentration cover from one fifth of the PN-PTI limit to two times the PN-PTI limit (including those two concentrations, ±10 %) and also includes the PN-PTI limit (± 10 %).

The reference system consists of a traceable particle counter with counting efficiency at 23 nm higher or equal than 0.5 or fulfilling Section 1.7. The particle counter may be accompanied by a traceable diluter. The expanded uncertainty of the entire reference system remains below 12.5 % but preferably less than or equal to one-third of the MPE at reference operating conditions.

The material used for initial verification is thermally stable and soot-

like. Other materials (e.g. salt particles) may be used.

The entire experimental setup used for initial verification (particle generator, PN-PTI instrument and reference system) is tested by the responsible NMI (preferably during the type examination of the PN-PTI instrument) and a setup correction factor to the NMI's type examination testing is determined. The setup correction factor takes under consideration differences between type examination and initial verification tests that arise from e.g. the particles material and the particle size distribution as well as the different reference instruments. The setup correction factor should be constant over the aforementioned concentration range (coefficient of variation less than 10 %) and is recommended to be in the range from 0.65 to 1.5. When the reference system or the particle generator change, the initial verification experimental setup is tested again by the responsible NMI.

Initial verification linearity requirements are summarized below:

Control location	*Reference instrument*	*Minimum number of concentrations*	*MPE*
Manufacturer or a notified body chosen by the manufacturer	Traceable particle counter (optionally with a traceable diluter)	5	Reference operating conditions (see Section 1.6)

Additional tests during the initial verification include:

(a) a visual inspection to determine conformance with the approved PN-PTI instrument type,

(b) a check of the power supply voltage and frequency at the location of use to determine compliance with the specifications on the measuring instrument's label,

(c) a clean air or leakage test (as described in the operating instructions),

(d) a zero-level test (as described in Section 1.9) if it differs from the clean air or leakage check,

(e) a low gas flow check by restricting the gas flow supplied to the sampling probe,

(f) a response time check.

Optionally, high PN concentration, counting efficiency and repeatability tests may be performed.

3.3. Subsequent verification

Subsequent verification of the accuracy of the PN-PTI instrument should take place whenever required by the instrument manufacturer, but no later than one year from the latest verification. Subsequent verification is a test performed at 3 different concentrations with polydisperse particles with monomodal size distribution, GMD 70 ± 20 nm and GSD lower or equal to 2.1. The MPE at rated operating conditions applies. The concentrations used for the test are one fifth of the PN-PTI limit, the PN-PTI limit, and twice the PN-PTI limit (concentrations within 20 %).

The subsequent verification test may be done either:

(a) in the premises of the manufacturer or of a notified body chosen by the manufacturer; or
(b) at the place of use of the PN-PTI instrument.

When the subsequent verification is performed in the premises of the manufacturer or of a notified body chosen by the manufacturer using the same approved setup for the initial verification, the same setup correction factor

applies.

When the subsequent verification is performed at the place of use of the PN-PTI instrument, the portable setup comprises a portable particle generator and a portable reference system (traceable particle counter and optionally a traceable diluter).

The particle size distribution produced by the portable particle generator is required to fulfil the GMD and GSD defined in Section 3.2 for a total of at least 3 h spread over 3 different days under the same conditions that will be used in the field. That test is required to be repeated at least annually.

The portable reference system fulfils the same requirements as the reference systems used for initial verification linearity tests (see Section 3.2) but its expanded uncertainty at rated operating conditions remains below 20 % but preferably less than or equal to one-third of the MPE at rated operating conditions.

The entire portable experimental setup used for subsequent verification (portable particle generator, PN-PTI instrument and reference system) is tested by the responsible NMI and a setup correction factor to the NMI's type examination testing is determined. The setup correction factor takes into consideration differences between type examination and subsequent verification tests that arise from e.g. the particles material and the particle size distribution as well as the different reference instruments. The setup correction factor should be constant over the Subsequent verification testing concentration range (coefficient of variation less than 10 %) and is recommended to be in the range from 0.65 to 1.5. When the portable reference system or the portable particle generator change, a new approval by the NMI is required.

The subsequent verification linearity requirements are summarized below:

Control location	*Reference instrument*	*Minimum number of concentrations*	*MPE*
Manufacturer or notified body facilities or field	Traceable particle counter (optionally with a traceable diluter)	3	Rated operating conditions (see Section 1.6)

Additional tests during the subsequent verification include:

(a) a visual inspection to determine the validity of the previous verification and the presence of all required stamps, seals and documents,

(b) a clean air or leakage check (as described in the operating instructions),

(c) a zero-level test (as described in Section 1.9) if it differs from the clean air or leakage check,

(d) a low gas flow check by restricting the gas flow supplied to the sampling probe,

(e) a response time check,

(f) a high PN concentration test (optionally).”

II. Justification

1. The proper working of a diesel particulate filter cannot be determined in the PTI with an opacity test because opacimeters have a lack of sensitivity and are not able to measure low

particulate emissions. In order to measure low particulate emissions (near to zero) low cost particle counters were developed and these are now commercially available.

2. In daily use some diesel particulate filters fail or are removed. The particulate emissions of these vehicles raise dramatically and cause adverse health effects of human beings.

3. The measured PN-concentrations in the proposed low idle speed test are representative because they correlate reasonably well with PN emissions in chassis dynamometer tests.

4. The European Commission recommendation on “particle number measurement for the periodic technical inspection of vehicles equipped with compression ignition engines” has been used as a basis for the modifications from ECE/TRANS/WP.29/GRPE/2023/9.