



2025/1707

5.9.2025

COMMISSION IMPLEMENTING REGULATION (EU) 2025/1707

of 25 July 2025

laying down rules for the application of Regulation (EU) 2024/1257 of the European Parliament and of the Council as regards specific methods, requirements and tests, including compliance thresholds, for OBFCM devices and OBM systems, characteristics and performance of driver warning systems and inducement methods and methods to assess their operation, EVP format and data and methods of communication of EVP data of motor vehicles of categories M₁ and N₁

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2024/1257 of the European Parliament and of the Council of 24 April 2024 on type-approval of motor vehicles and engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7), amending Regulation (EU) 2018/858 of the European Parliament and of the Council and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009 of the European Parliament and of the Council, Commission Regulation (EU) No 582/2011, Commission Regulation (EU) 2017/1151, Commission Regulation (EU) 2017/2400 and Commission Implementing Regulation (EU) 2022/1362 ⁽¹⁾, and in particular Article 14(3), point (a) and Article 14(4), points (j), (k), (o), (s), (t), (u) and (v), thereof,

Whereas:

- (1) Regulation (EU) 2024/1257 requires the Commission to set out procedures and testing methodologies, administrative provisions, procedures and methodologies for amending and extending emission type-approvals and data access, documentation requirements and templates for emission type-approval, conformity of production, in-service conformity and market surveillance for types of vehicles of categories M₁ and N₁. By virtue of Article 5(2) and (3) of Regulation (EU) 2024/1257, those rules should apply also to N₂ vehicles designated as 'Euro 7ext' and 'Euro 7Gext' in accordance with that Article.
- (2) In particular, rules should be laid down regarding on-board monitoring (OBM) systems, excess exhaust emissions driver warning systems (EEEDWS), on-board fuel and electric energy consumption monitoring (OBFCM) devices, environmental vehicle passport (EVP) and in-vehicle display of environmental data and manipulation devices and manipulation strategies.
- (3) The state of development of on-board sensors allows the continuous estimation of the emission rates of nitrogen oxides from light-duty vehicles. The emissions of other pollutants such as particulate matter can be reliably monitored by monitoring the integrity of particulate filters. It is therefore appropriate to set out requirements for OBM systems that include on-board sensors to assign a monitoring status to exhaust pollutants of interest to provide information to authorities about the functioning of emission control systems and the quality of exhaust emissions monitoring.
- (4) For reasons of simplification and to achieve effective implementation of Regulation (EU) 2024/1257, it is appropriate to lay down rules specifying the general requirements for OBM and EEEDWS systems, OBFCM devices, EVP and in-vehicle display of environmental data laid down in that Regulation. Likewise, it is also appropriate to set out rules for the calculation of the OBM data parameters, for the on-board processing of OBM data, and for access to OBM data via the OBD port.

⁽¹⁾ OJ L, 2024/1257, 8.5.2024, ELI: <http://data.europa.eu/eli/reg/2024/1257/oj>.

- (5) To ensure that the measures used by OBM systems to induce repairs do not lead to road safety being endangered, it is appropriate that those systems use harmonised inducement methods.
- (6) To ensure secure transmission of OBM data over the air, it is appropriate to allow manufacturers to use their own infrastructure and cybersecurity methods provided they comply with United Nations Regulation No 155 ^(?).
- (7) To ensure the submission of anonymous OBM data by vehicle manufacturers, it is appropriate to lay down requirements to that effect.
- (8) To ensure that the anonymous OBM data transmitted to authorities is representative of the aggregate in-service emissions behaviour of vehicle types, it is appropriate to establish methods for the random sampling of OBM data to be transmitted over the air. Where the measures provided for in this Regulation entail the processing of personal data, that processing should be carried out in accordance with Regulations (EU) 2016/679 ^(?) and (EU) 2018/1725 ^(*) of the European Parliament and of the Council, as well as the relevant national law in accordance with those Regulations.
- (9) To ensure effective implementation of OBM systems over the lifetime of vehicles placed on the market, specific requirements should be set out to address in-service conformity testing and market surveillance of such systems.
- (10) Vehicles for which the OBM system has identified a potential malfunction or tampering should be considered to be in the process of being repaired. It is therefore appropriate to exclude such vehicles from certain aspects of in-service conformity testing.
- (11) Requirements for OBM systems should adhere to the principle of technology neutrality where possible. It is therefore appropriate to lay down rules for the processing and transmission of OBM data which are broadly applicable to all powertrains, while recognising that certain OBM parameters may not be relevant to certain powertrains, for example, battery durability parameters for vehicles not equipped with a traction battery, or exhaust emission parameters for vehicles without an engine, and should not be processed in such cases.
- (12) Certain OBM parameters that characterise the exhaust emissions of vehicles are also relevant to OBFCM devices. It is therefore appropriate to identify such parameters and to ensure they are transmitted by the vehicles using the data transmission methods envisaged for OBM systems, with a view to minimise the duplication of data that are transmitted over the air by OBM systems and OBFCM devices.
- (13) The methods and administrative arrangements for the transmission of anonymous OBM data from manufacturers to authorities should be set out at a later stage of implementation. It is therefore appropriate to refer to these by using generic terms such as 'authority server' that do not prejudice the solutions that will be implemented.

^(?) UN Regulation No 155 – Uniform provisions concerning the approval of vehicles with regards to cybersecurity and cybersecurity management system (OJ L 82, 9.3.2021, p. 30, ELI: <http://data.europa.eu/eli/reg/2021/387/oj>). In the case of a UN Regulation the series of amendments indicated reflects the version that has been published in the *Official Journal of the European Union*. Compliance with a series of amendments adopted after the particular series indicated shall be accepted as an alternative.

^(?) Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: <http://data.europa.eu/eli/reg/2016/679/oj>).

^(*) Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC (OJ L 295, 21.11.2018, p. 39, ELI: <http://data.europa.eu/eli/reg/2018/1725/oj>).

- (14) It is appropriate to specify the technical requirements so that vehicles make available information on their environmental performance through the EVP and, where appropriate, also by displaying relevant information inside the vehicle. The EVP should use technical solutions that ensure the interoperability with other digital product passports. To ensure the availability of information over time, EVP data should be made available by means of a QR code. The QR code acting as a data carrier for EVP data should respect the guidelines of ISO/IEC Standard 18004:2024.
- (15) A robust framework for the prohibition of manipulation devices and manipulation strategies should ensure that the emissions behaviour of vehicles is not altered between compliance testing and real-world driving, and that data on sensors, fuel or electric energy consumption, electric range, and battery durability remains accurate and reliable. It is therefore appropriate to set out general and technical requirements, as well as specific documentation requirements, to implement the prohibition of manipulation devices and manipulation strategies, and to clarify the roles and responsibilities of manufacturers, type-approval authorities, market surveillance authorities, the Commission and recognised third parties.
- (16) The measures provided for in this Regulation are in accordance with the opinion of the Technical Committee – Motor vehicles (TCMV),

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter and scope

1. This Regulation lays down measures for the implementation of Regulation (EU) 2024/1257, with regard to the following:
 - (a) on-board monitoring (OBM) systems including their sensors and driver warning systems;
 - (b) on-board fuel and electric energy consumption monitoring (OBFCM) devices;
 - (c) the format and data and off-board communication methods for the environmental vehicle passport (EVP);
 - (d) methods for in-vehicle display of environmental data about the vehicle type and the environmental performance of the individual vehicle;
 - (e) methods and procedures to establish the absence of manipulation devices and manipulation strategies.
2. This Regulation applies to the motor vehicles belonging to the following vehicle categories:
 - (a) M_1 and N_1 ;
 - (b) N_2 designated as 'Euro 7ext' and 'Euro 7Gext' in accordance with Article 5 of Regulation (EU) 2024/1257.

Article 2

Definitions

For the purpose of this Regulation, the following definitions shall apply:

- (1) 'OBM data' means data produced by the 'on-board monitoring system' or 'OBM system', including battery durability data;
- (2) 'OBM trip' means each period of vehicle operation that starts with the activation of the propulsion system and ends with the deactivation of the propulsion system. For the purpose of determining the end of an OBM trip, sequences of engine shut-off events followed by an engine re-start commanded by the vehicle control system (as a result of the operation of stop-start systems, hybrid vehicle control or automatic stall recovery) shall not be considered a deactivation of the propulsion system;

- (3) 'OBM trip data' means OBM data that relate to a particular OBM trip;
- (4) 'OBM hash function' means a standard mathematical algorithm implemented on-board the vehicle that takes a set of OBM data and converts it into a string of characters with a fixed predetermined length, and whose properties can be used to randomly select OBM data to be transmitted over the air, or to verify the integrity of the transmission of OBM data while preserving their anonymous nature;
- (5) 'OBM hash value' means the output of the OBM hash function for a given input;
- (6) 'OBM data schema' means a fixed structure for data that are input to the OBM hash function;
- (7) 'generic scan tool' means an external test equipment used for standardised off-board communication with the vehicle's electronic control systems;
- (8) 'service tool' means a specialised external test equipment used to perform manufacturer-defined service operations via communication with the vehicle's electronic control systems;
- (9) 'QR code' means a machine-readable matrix code that links to information;
- (10) 'Auxiliary Emission Strategy' or 'AES' means an emission strategy that becomes active and replaces or modifies a BES for a specific purpose and in response to a specific set of ambient or operating conditions and only remains operational as long as those conditions exist;
- (11) 'Base Emission Strategy' or 'BES' means an emission strategy that is active throughout the speed and load operating range of the vehicle unless an Auxiliary Emission Strategy is activated.

Article 3

General requirements for OBM systems

- 1. The manufacturer shall ensure that the OBM systems perform the functions as laid down in Articles 4 to 10 by means of hardware and software installed in the vehicle for as long as the vehicle is in use.
- 2. The manufacturer shall ensure that OBM systems comply with the OBM data requirements as laid down in Annex I.

Article 4

General requirements for the excess exhaust emissions driver warning system

- 1. The manufacturer shall ensure that the excess exhaust emissions driver warning system (EEEDWS) performs the following functions:
 - (a) assign the OBM monitoring status of NO_x and particulate matter (PM) in accordance with Article 5;
 - (b) provide driver warnings in accordance with Annex II as long as one or more of the exhaust emissions monitoring statuses is in 'Error' status;
 - (c) if driver warnings referred to in point (b) are not acted upon within the period specified in Annex II, limit vehicle use through harmonised inducement methods described in that Annex until appropriate repairs are carried out.

2. The EEEDWS may assign the monitoring status for exhaust emissions other than NO_x and PM using a generic OBM monitoring status parameter. Points (b) and (c) of paragraph 1 shall apply with regard to the generic OBM monitoring status parameter.

Article 5

OBM monitoring status of exhaust emissions

1. The manufacturer shall ensure that each OBM monitoring status is individually set. Each OBM monitoring status may be updated once after the end of each OBM trip as one of the following:

- (a) 'Normal' status, which shall indicate that the emissions control systems installed on the vehicle are judged to be functioning adequately and the OBM system has high confidence in the accuracy of OBM monitoring;
- (b) 'Intermediate' status, which shall indicate that the OBM system is unable to make a conclusive assessment of the status of the relevant emissions control systems or that an increased uncertainty in OBM monitoring values may exist;
- (c) 'Error' status, which shall indicate that faults or tampering that prevent adequate emissions control or monitoring and justify a repair have been identified.

As an indicative target when designing the OBM system, the manufacturer shall ensure that if the OBM determines that the vehicle may be in a state where its exhaust emissions as evaluated via a real-driving emissions (RDE) or other applicable in-service conformity test would be equal or higher than 2,5 times the applicable emission limit, the 'Error' status shall be activated.

2. The manufacturer may use any available data or engineering approach which allows the EEEDWS to determine the monitoring status of a pollutant, based on the expected exhaust emissions or performance of emissions control systems of a vehicle.

Article 6

Calculation of NO_x emissions for each OBM trip

1. The manufacturer shall ensure that, immediately after the end of each OBM trip, the OBM system performs a calculation of all exhaust emissions of NO_x in mg/km for the whole duration of the OBM trip, uninterruptedly. That calculation shall be made by dividing the estimated total mass emissions of NO_x during that OBM trip by the total distance driven during that OBM trip.

2. The calculation referred in paragraph 1 shall provide a reasonable indication of real-world exhaust emissions of NO_x based upon any of the following elements:

- (a) measurements performed by on-board sensors;
- (b) modelled data;
- (c) a combination of measurements performed by on-board sensors and modelled data.

Article 7

Calculation of other OBM data for each OBM trip

1. Immediately after the end of each OBM trip, the manufacturer shall ensure that the OBM system calculates the parameters listed in part A of Annex I and Appendices 2 to 6 of part C of Annex I in accordance with the specifications laid down in that Annex for the whole duration of the OBM trip, uninterruptedly.

2. The calculation referred to in paragraph 1 shall be based upon measurements performed by on-board sensors, upon modelled data or a combination thereof and shall provide a reasonable indication of the true values of the signals or parameters.

*Article 8***Calculation of hash value and on-board processing of OBM data**

1. Immediately after the calculations described in Articles 6 and 7 are completed, the manufacturer shall ensure the OBM system calculates the hash value for the OBM trip data in accordance with part B of Annex I.
2. The manufacturer shall ensure that the OBM system performs on-board processing of all other OBM data in accordance with part B of Annex I.

*Article 9***Over-the-air transmission of OBM data**

1. The manufacturer shall ensure that the contents of the OBM OTA outbox and other OBM data as required by part C of Annex I are transmitted over the air to servers under their control by taking cybersecurity measures in accordance with UN Regulation No 155.
2. The manufacturer shall ensure that over-the-air data transmission of OBM data is performed by the OBM system as soon as connectivity conditions are appropriate.
3. The over-the-air transmission of OBM data may be delayed for vehicles being operated outside the territory of the Union until they are operated in the Union and the connectivity conditions are appropriate.
4. The manufacturer shall ensure that the OBM system performs the tasks related to over-the-air transmission of OBM data set out in part C of Annex I.

*Article 10***Access to OBM data via OBD port**

1. The manufacturer shall ensure that all the OBM data stored by the vehicle and OBM instantaneous signals to support vehicle emissions testing are accessible via the standard OBD port using a generic scan tool.
2. The manufacturer shall ensure that the OBM system conforms to the standards specified in Appendix 1, paragraph 6.5.3 of UN Regulation No 154 ⁽⁵⁾, Annex C5.

*Article 11***Submission of anonymous OBM data**

1. The manufacturer shall collect all OBM data received over the air and submit it to the authority server, in anonymised form, using the infrastructure and common methods established to that effect.
2. The manufacturer shall submit all OBM data received over the air in a calendar year to the authority server before the end of the second quarter of the year which follows the calendar year in which that data has been received.
3. The first OBM data submission by manufacturers shall take place before the end of 2027 and include the data collected in the years 2025 and 2026.

⁽⁵⁾ UN Regulation No 154 – Uniform provisions concerning the approval of light duty passenger and commercial vehicles with regards to criteria emissions, emissions of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range (WLTP), 02 series of amendments (OJ L, 2022/2124, 10.11.2022, ELI: <http://data.europa.eu/eli/reg/2022/2124/oj>). In the case of a UN Regulation the series of amendments indicated reflects the version that has been published in the *Official Journal of the European Union*. Compliance with a series of amendments adopted after the particular series indicated shall be accepted as an alternative.

4. When the transmission of OBM data from a group of vehicles is impaired due to the obsolescence of over-the-air transmission hardware, the manufacturer shall notify the granting type-approval authority thereof without delay after the impairment.
5. Upon request of a type-approval authority or the market surveillance authority, the manufacturer shall submit, in anonymised form, the OBM data in their possession received over the air pertaining to specific OBM families or groups of vehicles with common family identifiers listed in part C of Annex I.
6. Authorities shall use anonymous OBM data submitted by manufacturers to support in-service conformity checks carried out in accordance with Regulation (EU) 2024/1257.

Article 12

Requirements for emission type-approval

1. The manufacturer applying for an emission type-approval under Regulation (EU) 2024/1257 shall provide the granting type-approval authority with a declaration of compliance with this Regulation using the format set out in Appendix 1 to Annex III. The declaration shall be submitted to the granting type-approval authority that receives the type-approval application under Commission Implementing Regulation (EU) 2505/1706 ⁽⁹⁾.
2. Before the manufacturer receives the emission type-approval according to Article 3 of Implementing Regulation (EU) 2505/1706, the granting type-approval authority shall request a simple demonstration of the functioning of the OBM system that follows the steps and the form set out in Appendix 2 to Annex III.
3. The granting type-approval authority shall acknowledge receipt of the declaration referred to in paragraph 1. The granting type-approval authority shall add the completed declaration and its attachments to the information package that is made available to other type-approval authorities. The granting type-approval authority shall ensure that the relevant information is added to the test report under Appendix 8a of Annex I of Implementing Regulation (EU) 2505/1706. According to Article 34 of Regulation (EU) 2018/858, a revision or an extension of the type-approvals linked to the aforementioned test report shall not be necessary in case of an update of declaration of compliance under Annex III of this Regulation.
4. The declaration referred to in paragraph 1 shall be updated when new vehicles are added to the scope of the declaration. Such updates to this declaration shall not require a new demonstration as referred to in paragraph 2. The granting type-approval authority shall apply paragraph 3 to every updated declaration.

Article 13

In-service conformity checks of OBM systems

Measures to ensure in-service conformity of OBM systems shall be taken in accordance with the conformity of production arrangements as laid down in Article 31 of Regulation (EU) 2018/858, Annex IV to Regulation (EU) 2018/858 and Part A of Annex IV to this Regulation.

Article 14

OBM monitoring status and eligibility of vehicles for in-service conformity checks

1. Vehicles with at least one OBM monitoring status referred to in Article 5 set to 'Error' shall not be eligible for in-service conformity testing of exhaust emissions in accordance with Article 10 of Implementing Regulation (EU) 2505/1706. Exhaust emissions in-service conformity tests where at least one OBM monitoring status transitions to 'Error' after the test shall be void.

⁽⁹⁾ Commission Implementing Regulation (EU) 2025/1706 of 25 July 2025 laying down rules, procedures and testing methodologies for the application of Regulation (EU) 2024/1257 as regards exhaust and evaporative emission type-approval of vehicles of categories M₁ and N₁ and amending Implementing Regulation (EU) 2020/683 (OJ L, 2025/1706, 5.9.2025, ELI: http://data.europa.eu/eli/reg_impl/2025/1706/oj).

2. During in-service conformity testing of exhaust emissions in accordance with Article 10 of Implementing Regulation (EU) 2505/1706, the following shall be considered as warning signals that may suggest malfunctioning in accordance with point 8.3.2 of UN Regulation No 168 ⁽⁷⁾:

- (a) the presence of one or more OBM monitoring statuses set to 'Error' as referred to in Article 5(1), point (c);
- (b) the presence of one or more ongoing OBD faults for which a malfunction indicator is active;
- (c) other faults that are apparent from a visual inspection of the vehicle prior to the trip.

3. Vehicles with at least one OBM monitoring status set to 'Error' prior to testing shall not be eligible for in-service conformity checks of the OBM system. Such vehicles shall, however, be eligible to perform a verification in accordance with Article 15.

4. Vehicles with at least one monitoring status set to 'Intermediate' prior to testing shall be eligible for in-service conformity testing of exhaust emissions in accordance with Article 10 of Commission Implementing Regulation (EU) 2505/1706 and for in-service conformity checks of the OBM system in accordance with Annex IV of this Regulation, provided that a pre-conditioning procedure described in point 4.6 of that Annex is performed.

Article 15

Market surveillance of OBM systems

Market surveillance authorities shall perform a verification of the compliance of OBM systems with the Articles 3 to 10 in accordance with part B of Annex IV.

Article 16

Requirements for OBFCM devices

1. The manufacturer shall ensure that vehicles equipped with an OBFCM devices transmit the OBM data parameters with relevance to OBFCM devices as specified in Appendices 2 and 3 to Annex I.
2. The manufacturer shall ensure that the transmission of OBM data parameters with relevance to OBFCM is performed in accordance with Article 9.

Article 17

Environmental vehicle passport

1. The manufacturer shall issue an environmental vehicle passport (EVP) for each vehicle containing information on the environmental performance of their vehicle type.
2. The manufacturer shall ensure that the data and format of the EVP are as laid down in Annex V.
3. The manufacturer shall use digital means to ensure off-board access to EVP data in accordance with Annex V.
4. The manufacturer shall ensure that EVP data are accessible for at least 20 years after the date of manufacture of the vehicle.

⁽⁷⁾ UN Regulation No 168 – Uniform provisions concerning the approval of light duty passenger and commercial vehicles with regards to real driving emissions (RDE) (OJ L, 2024/211, 12.1.2024, ELI: <http://data.europa.eu/eli/reg/2024/211/oj>). In the case of a UN Regulation the series of amendments indicated reflects the version that has been published in the *Official Journal of the European Union*. Compliance with a series of amendments adopted after the particular series indicated shall be accepted as an alternative.

5. In the case of a multi-stage type-approval, the manufacturer referred to in paragraphs 1 to 4 shall be understood as the manufacturer of the base vehicle, and the EVP data shall refer to the base vehicle.

Article 18

In-vehicle display of environmental data

The manufacturer shall ensure that the environmental data about the vehicle type and the environmental performance of individual vehicles listed in Annex VI are displayed inside the vehicle in accordance with that Annex.

Article 19

Manipulation devices and manipulation strategies

1. Vehicle manufacturers, type-approval authorities, market surveillance authorities and other actors indicated in Annex VII shall apply the tests, methods and procedures to establish the absence of manipulation devices and manipulation strategies as laid down in Annex VII.

2. The manufacturer shall produce all required documentation to technically justify the absence of manipulation devices and manipulation strategies in accordance with Annex VII.

Article 20

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 25 July 2025.

For the Commission
The President
Ursula VON DER LEYEN

LIST OF ANNEXES

ANNEX I	OBM data
Part A	Parameters and signals used by the OBM system
Part B	OBM hash function and on-board processing of OBM data
Part C	Over-the-air transmission of OBM data
Appendix 1	OBM parameters to support vehicle testing
Appendix 2	OBM trip parameters
Appendix 3	OBM lifetime parameters
Appendix 4	OBM outbox property parameters
Appendix 5	Battery durability parameters
Appendix 6	OBM data storage parameters
Appendix 7	OBM data schemas
Appendix 8	OBM data processing flowchart
ANNEX II	Driver warnings and inducement methods of the excess exhaust emissions driver warning system
Appendix 1	Schematic diagrams
ANNEX III	Declaration of compliance
Appendix 1	Manufacturer's declaration of compliance with the OBM requirements for the purposes of type-approval
Appendix 2	Simple demonstration of the functioning of the OBM system. Workflow description and steps
ANNEX IV	Methods for in-service conformity checks and market surveillance of OBM systems
Part A	In-service conformity checks of OBM systems
Part B	Market surveillance of OBM systems
ANNEX V	Environmental vehicle passport
Appendix 1	Environmental vehicle passport parameters
ANNEX VI	In-vehicle display of environmental data
Appendix 1	Parameters to be displayed inside the vehicle
ANNEX VII	Manipulation devices and manipulation strategies

ANNEX I

OBM DATA REQUIREMENTS

This Annex describes the requirements related to OBM data. It provides the technical specification of the parameters produced by the OBM system, the requirements for on-board processing of OBM data and for its over-the-air transmission.

Detailed technical specification of certain OBM parameters is provided in Part A of this Annex. A comprehensive list of parameters with a basic technical specification is provided in Appendices 1 to 6.

The requirements for on-board processing and over-the-air transmission of OBM data are covered in Part B of this Annex. The OBM data schemas are defined in Appendix 7. Appendix 8 is an illustrative flowchart of the OBM trip data processing.

Part C of this Annex contains supplemental technical specifications for the over-the-air transmission of OBM data.

PART A

OBM parameters

The manufacturer shall make all parameters listed in Appendices 1 and 3 to 6 to this Annex available on demand through the serial port on the standardised data link connector according to the specifications in those Appendices.

Unless otherwise specified, manufacturers shall make available parameters encompassing their full useful value range, with a level of accuracy commensurate with the capabilities of the control systems.

1. OBM parameters to support vehicle testing

1.1. For those parameters where it is indicated in Appendix 1 that they are part of the instantaneous data stream, these shall be updated by the applicable control unit at a minimum frequency of 1 Hertz.

1.2. Parameters that are not applicable to the vehicle fuel type or powertrain technology may be omitted.

1.3. Exhaust mass flow-tailpipe (parameter 1.11)

1.3.1. The OBM system shall provide a parameter 'Exhaust mass flow – tailpipe' to indicate the total exhaust mass flow at the tailpipe.

The parameter shall be calculated as the average mass of exhaust mass flow during the previous 1 second prior to being updated and shall be updated at least once per second.

1.4. Tailpipe NOx concentration (parameter 1.13)

1.4.1. The OBM system shall provide a parameter 'Tailpipe NOx concentration' to indicate the NOx emission concentration at the tailpipe. The parameter shall be provided for the whole duration of the OBM trip and may be based on sensor measurement, modelled data, or a combination thereof.

1.4.2. The parameter shall be calculated as the average concentration of NOx emissions during the previous 1 second prior to being updated and shall be updated at least once per second.

1.5. Modelled status (parameters 1.14 and 1.16)

1.5.1. The OBM system shall provide parameters 'Tailpipe NOx concentration modelled status' and 'Tailpipe NOx mass flow modelled status' to indicate how the tailpipe NOx concentration and mass flow concentration values are determined. Both parameters shall have either one of the following two statuses:

[0]. indicates that the applicable parameter value is calculated with NOx sensor input.

[1]. indicates that the applicable parameter value is calculated without NOx sensor input.

1.6. Tailpipe NOx mass flow (parameter 1.15)

1.6.1. The OBM system shall provide a parameter 'Tailpipe mass flow' to indicate the NOx emission mass flow at the tailpipe. The parameter shall be provided for the whole duration of the OBM trip and may be based on sensor measurement, modelled data, or a combination thereof.

1.6.2. The parameter shall be calculated as the average mass of NOx emissions during the previous 1 second prior to being updated and shall be updated at least once per second.

1.7. NOx to fuel mass ratios (parameters 1.19 - 1.27)

1.7.1. The OBM system shall provide separate parameters to calculate the ratio between NOx emissions and the fuel mass. This calculation process starts with all values of 'NOx to fuel mass ratio (i)' set to a default value of zero, and consists of the following three steps:

1.7.2. STEP 1: The following three parameters shall be calculated:

(a) 'Cumulative NOx – 100 km' (g) (parameter 1.19).

This parameter integrates the 'tailpipe NOx mass flow' (g/s).

The parameter shall have a resolution of 0,0001g or any smaller mass, a minimum value of zero and a maximum value of at least 100 000 g.

(b) 'Cumulative fuel mass – 100 km' (kg) (parameter 1.20).

This parameter integrates the 'Engine fuel flow' (g/s), with a conversion from the unit grams into kilograms.

The parameter shall have a resolution of 0,0000001 kg or any smaller mass, a minimum value of zero and a maximum value of at least 200 kg.

(c) 'Cumulative distance – 100 km' (km) (parameter 1.21).

This parameter integrates travelled distance by the vehicle.

The parameter shall have a resolution of 0,01 km or any smaller distance, a minimum value of zero and a maximum value of at least 100 km.

1.7.2.1. These parameters shall be continuously integrated, except when at least one of the following conditions apply:

- (1) the engine is off;
- (2) the time after first engine start during the OBM trip is less than 800 seconds;
- (3) the parameter 'Aftertreatment regeneration status' (parameter 1.28) indicates that an active particulate filter regeneration is in progress;
- (4) the ambient temperature is below -7 °C or above 38 °C;
- (5) the vehicle speed is above 160 km/h;
- (6) the altitude is above 1 300 m above mean sea level;
- (7) a tracked auxiliary emission strategy (AES) monitored by OBM is active as defined in paragraph 2.8.2;
- (8) when the vehicle is in a long cooldown phase;

- (9) when at least one of 'Monitoring status NOx' or 'Monitoring status generic' is set to 'Error' or 'Intermediate'. In this case, these parameters shall also be reset to zero;
- (10) when an input signal used to calculate any of the cumulated parameters above is deemed to be malfunctioning.

1.7.2.2. For the purposes of the integration of parameters 1.19 to 1.21, a 'long cooldown phase' shall be understood as covering the following periods:

- For a period of continuous idling, any period exceeding the first 180 seconds.
- The first 180 seconds after the vehicle reaches a speed above 1 km/h following a continuous idling period exceeding 180 seconds.
- The first 180 seconds after a restart of the engine following a continuous engine-off period exceeding 180 seconds.

1.7.2.3. When the parameter 'Cumulative distance – 100 km' is equal or higher than 100 km, the following step shall be executed:

1.7.3. STEP 2:

The value of 'NOx to fuel mass ratio (3)' shall be assigned to 'NOx to fuel mass ratio (4)'

The value of 'NOx to fuel mass ratio (2)' shall be assigned to 'NOx to fuel mass ratio (3)'

The value of 'NOx to fuel mass ratio (1)' shall be assigned to 'NOx to fuel mass ratio (2)'

The value of 'NOx to fuel mass ratio (0)' shall be assigned to 'NOx to fuel mass ratio (1)'

The following parameter shall be calculated:

$$\text{NO}_x \text{ to fuel mass ratio (0)} = \frac{\text{Cumulative NO}_x - 100 \text{ km (g)}}{\text{Cumulative Fuel mass - 100 km (kg)}}$$

When 'NO_x to fuel mass ratio (0)' has been calculated, the parameters 'Cumulative NO_x – 100 km', 'Cumulated fuel mass – 100 km' and 'Cumulated distance – 100 km' shall all be reset to zero.

Prior to first calculation of each 'NO_x to fuel mass ratio' parameter since the manufacture of the vehicle, or if the 'NO_x to fuel mass ratio' parameters are reset during a control unit reprogramming event, or by control unit replacement, a default value of 0xFF for each data byte shall be used.

1.7.4. STEP 3:

The parameter 'NOx to fuel mass ratio average' (g/kg) (parameter 1.27) shall be calculated as follows:

$$\text{NO}_x \text{ to fuel mass ratio average} = \frac{1}{n} \sum_{i=0}^{i=n-1} \text{NO}_x \text{ to fuel mass ratio (i)}$$

With n being the number of 'NOx to fuel mass ratio (i)' values not equal to 0xFFFF.

1.7.4.1. The parameters 'Cumulative NOx – 100km', 'Cumulative fuel mass – 100 km' and 'Cumulative distance – 100km' shall all be reset to zero, and the sequence is repeated from step 1.

1.7.4.2. The 'NOx to fuel mass ratio (i)' parameters and the 'NOx to fuel mass ratio average' parameter shall consist of 2 data bytes with a minimum value of zero and a maximum value of 200 g/kg.

1.7.4.3. The parameters 'Cumulative NOx – 100 km', 'Cumulative fuel mass – 100 km' and 'Cumulative distance – 100 km' shall be reset to zero when diagnostic trouble codes are reset by a generic scan tool or service tool. These parameters may also be reset to zero in case of an ECU reprogramming event.

1.8. Aftertreatment operational status (parameter 1.31)

1.8.1. The OBM system shall provide a parameter 'Aftertreatment operational status' to indicate whether the aftertreatment system has reached and maintains the conditions to allow effective abatement of exhaust emissions monitored by the OBM system. This parameter shall have either one of the following two statuses:

- [0]. indicates that the actual conditions do not allow for effective abatement of exhaust emissions monitored by the OBM system.
- [1]. indicates that the actual conditions allow for effective abatement of exhaust emissions monitored by the OBM system.

1.8.2. Manufacturers shall provide a description in the type-approval documentation of thresholds and parameters used to calculate the status of this parameter.

1.9. OBM inducement system status (parameter 1.45)

1.9.1. The OBM system shall provide an 'OBM inducement system status' parameter to indicate that the OBM system has activated the vehicle inducement as described in Annex II paragraph 2.4. The parameter shall consist of 4 data bits with the following statuses:

- Bit 0: OBM inducement system is active (0 means FALSE, 1 means TRUE)
- Bit 1: Monitoring status NOx has triggered the OBM inducement system (0 means FALSE, 1 means TRUE)
- Bit 2: Monitoring status PM has triggered the OBM inducement system (0 means FALSE, 1 means TRUE)
- Bit 3: Monitoring status generic has triggered the OBM inducement system (0 means FALSE, 1 means TRUE)

1.10. Possible tampering status (parameter 1.46)

1.10.1. The OBM system shall provide a 'Possible tampering status' parameter to indicate the tampering detection level. This parameter shall have either one of the following three statuses:

- [0]. 'Level 0 – No tampering detected'.
- [1]. 'Level 1 – Possible tampering detected', resulting in at least one of the exhaust emissions monitored by the OBM system having an expected increase, resulting in emissions of up to 2,5 times the applicable emission limit.
- [2]. 'Level 2 – Possible tampering detected', resulting in at least one of the exhaust emissions monitored by the OBM system having an expected increase resulting in emissions of more than 2,5 times the applicable emission limit.

1.10.2. Once the 'Possible tampering' status parameter has been set to level 1 or level 2 it shall not reset to a lower level unless reset by a generic scan tool or service tool.

1.11. Monitoring status (parameters 1.47 - 1.49)

1.11.1. The OBM system shall provide separate parameters for the 'Monitoring status NOx', the 'Monitoring status PM' and the 'Monitoring status generic' to indicate the OBM monitoring statuses as laid down in Article 4. For each of these monitors the parameter shall have one of the following three statuses as defined in Article 5.

- [0]. Normal status
- [1]. Intermediate status
- [2]. Error status

1.12. OBM OTA outbox overwrite counter (parameter 1.55)

- 1.12.1. The OBM system shall provide an 'OBM OTA outbox overwrite counter' parameter to reflect the number of times the 'OBM OTA outbox' has been overwritten.

The 'OBM OTA outbox overwrite counter' shall increment by 1 if the previous 'OBM OTA outbox' data package has not been successfully transmitted as defined in paragraph 8.4. by the time new data have filled the 'OBM OTA queue'.

- 1.12.2. The parameter shall be reset to zero when diagnostic trouble codes are reset by a generic scan tool or service tool. If the parameter reaches its maximum value, it shall freeze and not reset to zero until reset by a generic scan tool or service tool.

2. OBM trip parameters

- 2.1. OBM trip parameters are those parameters that refer to an OBM trip. They generally characterise the emissions that were generated during the OBM trip, the conditions during which it took place. Some trip parameters related to hashing are used to support the random selection of OBM trips for later over-the-air transmission.

- 2.2. Prior to first calculation of each applicable parameter since the manufacture of the vehicle, reset of stored data using a generic scan tool or service tool or if a parameter is reset due to a control unit reprogramming event, or control unit replacement, a default value of 0xFF for each data byte shall be adopted unless otherwise specified.

- 2.3. For parameters not required to be calculated based on powertrain type, a default value of 0xFF shall be adopted for each data byte.

- 2.4. In case of a malfunction preventing the calculation of an OBM trip parameter, a value of 0xFF for each applicable data byte may be reported where the OBM system is unable to provide a reasonable alternative estimated value through modelling or alternative signals. When 0xFF is provided due to malfunction, bit 2 of parameter 2.22 shall be set.

2.5. OBM trip odometer (parameters 2.1 and 2.2)

- 2.5.1. The OBM system shall provide a 'Vehicle odometer value' and an 'OBM trip distance' value to indicate both the total driven distance in the vehicle lifetime, as indicated to the driver and the total driven distance during the OBM trip at the end of the OBM trip. These odometer values shall use the same data source as the odometer value displayed to the driver.

2.6. Idle – time (parameter 2.4)

- 2.6.1. The OBM system shall provide a parameter 'Idle – time' to record the cumulated time of engine operation at idle during the OBM trip.

- 2.6.2. For the purpose of calculating this parameter, idle shall mean that the accelerator pedal is released by the driver and either the vehicle speed is less than or equal to one km per hour or engine speed is less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission).

2.7. Distance-specific NO_x (parameter 2.5)

- 2.7.1. The OBM system shall provide a 'Distance-specific NO_x' parameter to indicate the average mass emissions of NO_x during the OBM trip.

- 2.7.2. The 'Distance-specific NO_x' parameter shall be calculated as the total mass emissions of NO_x during the OBM trip divided by the OBM trip distance at the end of the OBM trip. For OBM trips with a total driven distance during the OBM trip below 1 km, the total mass emissions of NO_x during the OBM trip shall be divided by 1 km.

2.8. **OBM trip ratios (parameters 2.9 - 2.22)**

- 2.8.1. The OBM system shall provide various OBM trip ratios. Each ratio shall be calculated as the cumulative distance driven while meeting the conditions during the OBM trip, divided by the OBM trip distance.

2.8.2. **Aftertreatment status and emission control system ratio (parameters 2.9 - 2.12)**

- 2.8.2.1. The OBM system shall provide OBM trip aftertreatment status ratio parameters to reflect the percentage of the OBM trip distance driven with the emissions aftertreatment / control systems in specific conditions:

- (a) The parameter 'Regeneration distance ratio' (parameter 2.9) shall represent the percentage of the OBM trip distance where at least one aftertreatment regeneration process is ongoing;
- (b) The parameter 'Monitored AES distance ratio' (parameter 2.10) shall represent the percentage of the OBM trip distance where at least one monitored AES is active as indicated by the AES status parameter;
- (c) The parameter 'Reagent inhibited ratio' (parameter 2.11) shall represent the percentage of the OBM trip distance with reagent delivery to the exhaust aftertreatment system prevented due to environmental conditions;
- (d) The parameter 'Modelled data ratio' (parameter 2.12) shall represent the percentage of the OBM trip distance driven where the distance specific emissions data is calculated without active NO_x sensor inputs.

2.8.3. **Speed bin ratios (parameters 2.13 - 2.16)**

- 2.8.3.1. The OBM system shall provide speed bin ratio parameters to reflect the percentage of the OBM trip distance driven in different speed bins during the OBM trip. The Speed bin ratio parameters are defined as:

- (a) 'Speed – urban slow ratio': vehicle speed lower than or equal to 30 km/h
- (b) 'Speed – urban ratio': vehicle speed greater than 30 km/h and lower than or equal to 60 km/h
- (c) 'Speed – rural ratio': vehicle speed greater than 60 km/h and lower than or equal to 90 km/h
- (d) 'Speed – motorway ratio': vehicle speed greater than 90 km/h

2.8.4. **Distance EV ratio (parameter 2.17)**

- 2.8.4.1. The OBM system shall provide a 'Distance EV ratio' parameter to reflect the percentage of the OBM trip distance driven without the use of the engine.

2.8.5. **OBM trip condition ratios (parameters 2.18 - 2.21)**

- 2.8.5.1. The OBM system shall provide OBM trip condition ratio parameters to reflect the percentage of the OBM trip distance driven in specific conditions:

- (a) the parameter 'Ambient temperature – low ratio' (parameter 2.18) shall represent the percentage of the OBM trip distance with ambient temperatures below 0 °C
- (b) the parameter 'Ambient temperature – high ratio' (parameter 2.19) shall represent the percentage of the OBM trip distance with ambient temperatures higher than 35 °C

- (c) the parameter 'Altitude – high ratio' (parameter 2.20) shall represent the percentage of the OBM trip distance at altitudes higher than 700 m above mean sea level
- (d) the parameter 'Outside extended ambient conditions ratio' (parameter 2.21) shall represent the percentage of the OBM trip distance, where one or more of the following conditions apply:
 - ambient temperature is lower than -7 °C or higher than 38 °C
 - the altitude is higher than 1 300 m above mean sea level

2.8.6. **MI status (parameter 2.22)**

2.8.6.1. The OBM system shall provide a 'MI status (end of trip)' parameter to indicate failure status during the OBM trip. The parameter shall consist of three data bits with the following statuses:

- Bit 0: Indicates MI status at the end of the OBM trip (0 means MI off, 1 means MI on)
- Bit 1: Indicates a malfunction was detected during this OBM trip that would normally activate the MI once the necessary consecutive detection criteria for MI activation are met (e.g., a pending fault code was stored). 0 means no faults detected, 1 means at least one applicable failure detected during an OBM trip
- Bit 2: Indicates a malfunction was detected during this OBM trip that resulted in at least 1 OBM trip parameter adopting a default value as defined in paragraph 2.4 (0 means no faults detected, 1 means at least one applicable failure detected during an OBM trip)

In case the powertrain technology fitted to the vehicle does not support an MI status, bits 0 and 1 shall be reported as zero.

2.9. **OBM Monitoring, OBM Inducement and Possible tampering statuses (end of trip) (parameters 2.25 – 2.29)**

2.9.1. The OBM system shall provide OBM monitoring, OBM inducement and tampering detection level statuses to reflect the statuses of the monitors and inducement systems defined in paragraphs 1.9 to 1.11.

2.9.2. **Manufacturer-reserved OBM trip parameters (parameter 2.30)**

2.9.2.1. The OBM system shall provide ten 'manufacturer-reserved' parameters. These may be optionally employed by the manufacturer to report manufacturer-defined OBM data. Personal data shall not be included in these parameters. Unused data parameters shall be filled with zero values.

2.9.3. **OBM trip hash validity status (parameter 2.31)**

2.9.3.1. The OBM system shall provide a parameter 'OBM trip hash validity status' to indicate successful hashing of the OBM trip data package.

- [0]. indicates that computation of the 'OBM trip hash value' is incomplete.
- [1]. indicates that computation of the 'OBM trip hash value' has completed successfully and that the truncated hash value is saved to the applicable OBM trip data storage as defined in paragraph 9.6.

2.9.3.2. Prior to first calculation since the manufacture of the vehicle, reset of stored data using a generic scan tool or service tool or parameter reset due to a control unit reprogramming event, or control unit replacement, a default value of 0x00 for each data byte shall be adopted unless otherwise specified.

2.9.4. **OBM trip hash value (parameter 2.32)**

- 2.9.4.1. The OBM system shall provide a parameter 'OBM trip hash value' to record the OBM trip hash value resulting from the hash function defined in paragraph 9.6.
- 2.9.4.2. Until computation of the 'OBM trip hash value' of the applicable OBM trip data is completed each allocated data byte of the parameter shall adopt a value equal to 0xFF.

3. **OBM lifetime parameters**

- 3.1. All lifetime parameters listed in Appendix 3 shall be made available on demand through the serial port on the standardised data link connector of the OBM system.
- 3.2. For those parameters that are not applicable to the vehicle fuel type or powertrain technology, availability through the serial port on the standardised data link connector of the OBM system may be omitted.
- 3.3. By way of exemption from the reset conditions specified in the standards referred to in Part A, once the vehicle has entered into service, lifetime values shall be preserved.
- 3.4. In case of malfunctions affecting the values of lifetime counters, or replacement of the relevant control units, the counters may be frozen or reset simultaneously, as applicable, to ensure that the values remain fully synchronised.

3.5. **NOx mass (lifetime) (parameter 3.1)**

- 3.5.1. The OBM system shall provide parameter 'NOx mass (lifetime)' parameter to indicate the lifetime NOx mass emission of the vehicle. The value of this parameter shall be calculated by integration of parameter 'Tailpipe NOx mass flow' (parameter 1.15) at a time increment of 1 second.

3.6. **Odometer value (parameter 3.5)**

- 3.6.1. The OBM system shall provide a parameter 'Odometer value' to indicate the odometer value indicated to the vehicle user.

3.7. **Total distance travelled – EV (lifetime) (parameter 3.6)**

- 3.7.1. The OBM system shall provide parameter 'Total distance travelled – EV (lifetime)' to indicate the total distance that the vehicle has travelled in full electric mode, i.e., without the use of the engine.

3.8. **Speed bin ratios – lifetime (parameter 3.11 - 3.15)**

- 3.8.1. The OBM system shall provide speed bin ratio parameters to reflect the percentage of the OBM trip distance driven in different speed bins during the vehicle lifetime. The Speed bin ratio – lifetime parameters are defined as:
 - (a) 'Speed – urban slow ratio – lifetime': vehicle speed lower than or equal to 30 km/h
 - (b) 'Speed – urban ratio – lifetime': vehicle speed greater than 30 km/h and lower than or equal to 60 km/h
 - (c) 'Speed – rural ratio – lifetime': vehicle speed greater than 60 km/h and lower than or equal to 90 km/h
 - (d) 'Speed – motorway ratio – lifetime': vehicle speed greater than 90 km/h and lower than or equal to 145 km/h
 - (e) 'Speed outside extended – lifetime': vehicle speed greater than 145 km/h

3.9. Total Distance Travelled - OBM (lifetime) (parameter 3.4)

- 3.9.1. The OBM system shall provide a parameter 'Total distance travelled – OBM (lifetime)' to indicate the odometer value associated with the parameter 'NOx Mass (lifetime)'. The parameter shall include distance travelled during the lifetime of the vehicle both with the internal combustion engine running and when the vehicle is driven in full electrical mode.

4. OBM outbox property parameters

- 4.1. All 'OBM OTA outbox' parameters listed in Appendix 4 to this Annex shall be made available on demand through the serial port on the standardised data link connector of the OBM system.

4.2. OBM version number (parameter 4.1)

- 4.2.1. The OBM system shall provide an 'OBM version number' to indicate the version of the base OBM system and the manufacturer implementation version. The 'OBM version number' parameter shall consist of 2 data bytes.

- 4.2.2. The base OBM system version shall be represented in a two-digit number ranging from 00 to 64. Vehicles complying to this Regulation shall have a base OBM system version number of 01, corresponding to the OBM data schema specified in Appendix 7.

- 4.2.3. The manufacturer implementation version number may be used by the manufacturer to designate specific schemes where the manufacturer defines data as described in paragraph 4.3. The manufacturer implementation version number shall be represented in a three-digit number ranging from 000 to 999.

- 4.2.4. The 'OBM version number' shall be formed as a two bytes integer number by adding the base OBM system version number as the thousands integer (A) to the manufacturer implementation version number (B) as shown below.

$$\begin{array}{cc} 01 & 000 \\ \underbrace{\hspace{1cm}} & \underbrace{\hspace{1cm}} \\ A & B \end{array}$$

4.3. Manufacturer-reserved outbox parameters (parameter 4.2)

- 4.3.1. The OBM system may provide up to 10 'Manufacturer-reserved outbox' parameters. These may be optionally employed by the manufacturer to report manufacturer-defined outbox metadata. Manufacturers shall clearly describe the data within the type-approval document package.

4.4. OBM transmission hash validity status (parameter 4.3)

- 4.4.1. The OBM system shall provide a parameter OBM transmission hash validity status to indicate successful hashing of the 'OBM OTA outbox' data package prior to transmission.

[0]. indicates that computation of the 'OBM transmission hash value' is incomplete

[1]. indicates that computation of the 'OBM transmission hash value' has completed successfully and that the hash value is saved to the applicable 'OBM OTA outbox' data storage as defined in paragraph 9.8

- 4.4.2. Prior to first calculation since the manufacture of the vehicle, reset of stored data using a generic scan tool or service tool or parameter reset due to a control unit reprogramming event, or control unit replacement, a default value of 0x00 for each data byte shall be adopted unless otherwise specified.

4.5. **OBM transmission hash value (parameter 4.4)**

- 4.5.1. The OBM system shall provide a parameter 'OBM transmission hash value' to record the hash value resulting from the hashing function defined in paragraph 9.8.
- 4.5.2. Until computation of the 'OBM transmission hash value' of the applicable 'OBM OTA outbox' is completed each allocated data byte of the parameter shall adopt a value equal to 0xFF.

5. **Battery durability parameters**

- 5.1. The values of all parameters listed in Appendix 5 to this Annex shall be made available on demand through the serial port on the standardised data link connector of the OBM system and be made available, for OTA transmission, to the 'OBM OTA outbox' defined in paragraph 8.4.
- 5.2. For those parameters that are not applicable to the vehicle fuel type or powertrain technology, availability through the serial port on the standardised data link connector of the OBM system may be omitted.

5.3. **Current battery lifetime distance (parameter 5.3)**

- 5.3.1. The OBM system shall provide a parameter 'Current battery lifetime distance' to indicate the distance travelled with the currently installed battery used for propulsion purposes.
- 5.3.2. For vehicles where the lifetime values were reset as described in paragraph 3, or in case that vehicles have battery swapping capabilities, the manufacturer shall fill the 'Current battery lifetime distance' value with a different value to best represent the actual distance travelled with the currently installed battery used for propulsion purposes.

5.4. **Traction battery replacement status (parameter 5.12)**

- 5.4.1. The OBM system shall provide a 'Traction battery replacement status' parameter to indicate if the battery system has been replaced, repaired or exchanged during the vehicle lifetime. The parameter shall consist of 4 bytes. If the 'Traction battery replacement status' parameter is supported by the applicable control unit, the following bits in byte A shall be set:

Bit 0: shall indicate if battery replacement history is available:

- [0]. indicates battery replacement history is unavailable or unsupported
- [1]. indicates battery replacement history is available

Bit 1: shall indicate if the battery has been replaced or exchanged:

- [0]. indicates that the battery has not been replaced or exchanged or, when no battery replacement history is available, that no data is available
- [1]. indicates that a battery system repair or exchange has occurred at least once during the vehicle lifetime

Byte A bits 2-7 and byte B, C and D are reserved for future expansion.

- 5.4.2. If a traction battery replacement status indicator is not supported by the applicable control system a value of 0x00 for each data byte shall be reported.

6. **OBM data storage parameters**

- 6.1. The contents of the OBM system on board data storage used to record and manage OBM data shall be stored on the vehicle and made available on demand through the serial port on the standardised data link connector of the OBM system.

- 6.2. Where a data parameter specified in the OBM data schemas defined in Appendix 7 is not applicable to the vehicle powertrain type as indicated in the tables in Appendix 2 to Appendix 5, each unused data byte shall be filled with the value 0xFF.
- 6.3. Unused data bytes of manufacturer defined parameters and reserved data allocation shall be filled with the values 0x00.
- 6.4. Prior to first calculation of each applicable parameter since the manufacture of the vehicle, reset of stored data using a generic scan tool or service tool or if a parameter is reset due to a control unit reprogramming event, or control unit replacement a default values of 0xFF for each data byte shall be adopted unless otherwise specified.
- 6.5. **OBM recent trips**
- 6.5.1. The 'OBM recent trips' parameter shall represent the last [10] valid OBM trip data packages as defined in paragraph 8.2 and described in Appendix 6, table 6.1.
- 6.5.2. The data contents of each OBM trip data package shall be stored to maintain the layout and order of data parameters as used for OBM trip data hashing defined in paragraph 9.6.
- 6.6. **OBM OTA queue**
- 6.6.1. The 'OBM OTA queue' parameter shall represent up to [5] stored OBM trip data packages that have been selected for OTA data transmission as defined in paragraph 8.3. and described in Appendix 6 table 6.2.
- 6.6.2. The data contents of each OBM trip data package shall be stored to maintain the layout and order of data parameters as used for OBM trip data hashing defined in paragraph 9.6.
- 6.6.3. When OBM data are cleared using a generic scan tool or service tool the 'OBM OTA queue' shall not be reset.
- 6.7. **OBM OTA outbox**
- 6.7.1. The 'OBM OTA outbox' parameter shall represent the 'OBM OTA outbox' data package as defined in paragraph 8.4. and described in Appendix 6 table 6.3.
- 6.7.2. The data contents of the 'OBM OTA outbox' data package shall be stored to maintain the layout and order of data parameters as used for 'OBM OTA outbox' data hashing described in paragraph 9.8.
- 6.8. **OBM last transmission**
- 6.8.1. The 'OBM last transmission' parameter shall represent the stored 'OBM last transmission' as defined in paragraph 8.5. and described in Appendix 6 table 6.4.
- 6.8.2. By way of exemption from the reset conditions specified in the standards referred to in Part A, once the vehicle has entered into service, the content of the 'OBM last transmission' parameter shall be preserved and shall not be reset when vehicle data is reset using a generic scan tool or service tool.
- 6.9. **OBM transmitted hash list**
- 6.9.1. The data contents of the 'OBM transmitted hash list' parameter represent the contents of the stored 'OBM transmitted hash list' as defined in paragraph 8.6 and described in Appendix 6 table 6.5. The contents of the 'OBM transmitted hash list' shall be stored in non-volatile memory. Data bytes yet to be filled since the manufacture of the vehicle shall show a value of 0xFF.

- 6.9.2. By way of exemption from the reset conditions specified in the standards referred to in Part A, once the vehicle has entered into service, the content of the 'OBM transmitted hash list' parameter shall be preserved. Where technically feasible the stored values shall not reset after control unit software updates and shall not be reset when vehicle data is reset using a generic scan tool or service tool. Only in case of a replacement of the relevant control units, may the content of the 'OBM transmitted hash list' be reset to 0xFF.

PART B

On-board processing of OBM data

The on-board processing of OBM data includes the following aspects:

- the calculation of OBM trip data parameters for every OBM trip and other OBM parameters;
- the on-board storage and processing of OBM data across dedicated memory spaces on-board the vehicle;
- OBM data hashing to calculate hash values for specific sets of OBM data. This supports the selection of OBM data for later over-the-air transmission and the verification of the integrity of OBM data.

These aspects are graphically summarised in a flowchart in Appendix 8.

7. Calculation of OBM parameters

- 7.1. The OBM system shall ensure that the parameters listed in Appendices 2 to 5 (other than those that represent static values) are calculated according to their technical specification and the requirements set out in this paragraph. Parameters that are not applicable to the vehicle powertrain technology may be omitted.

7.2. Calculation of OBM trip data parameters

- 7.3. Upon the conclusion of each OBM trip (trip end), the OBM system shall finalise the calculation and record all relevant trip parameters defined in Appendix 2.

- 7.4. The calculation of OBM trip data parameters may be omitted if any of the following conditions is met:

- the 'OBM trip distance' (parameter 2.2) is less than 0,1 km at the end of the OBM trip.
- the 'OBM trip distance' (parameter 2.2), 'OBM trip time' (parameter 2.3) or 'Idle – time' (parameter 2.4) reach their maximum values during the OBM trip.
- a new OBM trip is started before the calculation of trip data parameters and hashing of the OBM trip data have been completed.

- 7.5. When the calculation of OBM trip data parameters has not been completed, data from the trip may be discarded and not be stored on-board the vehicle. Data from discarded trips shall be included in the update of OBM lifetime parameters as defined in paragraph 7.7.

- 7.6. When the calculation of trip data parameters is complete, the OBM system shall hash the OBM trip data according to paragraph 9.6. The calculation of OBM trip data parameters and hashing of the OBM trip data shall be completed at the latest 10 seconds after the end of the OBM trip.

7.7. Calculation of OBM lifetime parameters

- 7.8. At least once after the end of each OBM trip, the OBM shall update the OBM lifetime parameters defined in Appendix 3 in accordance with the specifications and reset rules set out in Appendix 3 and in paragraph 3.

8. On-board storage and processing of OBM data

- 8.1. The OBM system shall make use of the on-board memory spaces described in paragraphs 8.2 to 8.6 to support the processing of OBM data. The content of these memory spaces shall reflect the parameters described in paragraph 6.

8.2. OBM recent trips

- 8.2.1. The 'OBM recent trips' memory space shall store OBM trip data packages for the 10 most recent OBM trips.

- 8.2.2. OBM data for recent trips shall be managed on a rolling basis. When a new OBM trip data package is added to the 'OBM recent trips' memory space, the oldest OBM trip data package shall be deleted unless there are empty positions available.

8.3. OBM OTA queue

- 8.3.1. The 'OBM OTA queue' memory space shall store up to 5 OBM trip data packages that have been selected for over-the-air transmission as defined in paragraph 9.7.

- 8.3.2. Where an OBM trip data package has been selected for over the air transmission (OTA) according to paragraph 9.7, the OBM system shall copy that OBM trip data package to the 'OBM OTA queue'.

- 8.3.3. The OBM system shall monitor whether the queue is full.

- If it is not full, the OBM system shall continue adding subsequent OBM trip data packages until capacity is reached.
- When the 'OBM OTA queue' is full the OBM system shall transfer the contents of the 'OBM OTA queue' to the 'OBM OTA outbox' and clear the contents of the 'OBM OTA queue'.

8.4. OBM OTA outbox

- 8.4.1. The 'OBM OTA outbox' memory space shall be used to prepare OBM data for over-the-air transmission.

- 8.4.2. After transferring the contents of the 'OBM OTA queue', the OBM system shall append the following additional parameters to the 'OBM OTA outbox':

- OBM lifetime parameters from Appendix 3;
- OBM outbox properties parameters from Appendix 4;
- Battery durability parameters from Appendix 5;
- The contents of the 'OBM transmitted hash list' memory space.

- 8.4.3. The parameter values appended to the 'OBM OTA outbox' shall be the parameter values at the time that the 'OBM OTA queue' is copied to the 'OBM OTA outbox'.

- 8.4.4. For parameters not required to be calculated based on powertrain type, a default value of 0xFF shall be adopted for each data byte.

8.4.5. After appending these additional data, the OBM system shall perform the hashing of the contents of the OBM OTA outbox according to paragraph 9.8. When a full 'OBM OTA queue' triggers the move of new OBM trip data packages to the 'OBM OTA outbox' before the 'OBM OTA outbox' transmission has completed and was subsequently cleared, the existing 'OBM OTA outbox' parameter values shall be deleted before copying in the contents of the more recent 'OBM OTA queue'. In this case, the 'OBM OTA outbox overwrite counter' described in paragraph 1.12. shall be incremented by one.

8.5. **OBM last transmission**

8.5.1. The 'OBM last transmission' memory space shall store the 'OBM OTA outbox' data package corresponding to the most recent over-the-air transmission.

8.5.2. Following the successful transmission of the 'OBM OTA outbox', the OBM system shall copy the entire 'OBM OTA outbox' package to the 'OBM last transmission' memory space.

8.5.3. After verifying that the data package has been successfully stored in 'OBM last transmission' memory space, the OBM system shall clear the contents of the 'OBM OTA outbox'.

8.6. **OBM transmitted hash list**

8.6.1. The 'OBM transmitted hash list' memory space shall store the 'OBM transmission hash value' parameter values from the 5 most recent transmitted 'OBM OTA outbox' data packages.

8.6.2. This memory space shall be managed on a rolling basis. When a new 'OBM transmission hash value' is added to the memory space, the oldest 'OBM transmission hash value' is deleted unless there are empty positions available.

8.6.3. Upon the successful transmission of the 'OBM OTA outbox', the OBM system shall save the 'OBM transmission hash value' in the 'OBM transmitted hash list'.

8.6.4. By way of exemption from the reset conditions specified in the standards referred to in Part A, once the vehicle has entered into service, the content of the 'OBM transmitted hash list' shall be preserved as described in paragraph 6.9.

9. **OBM data hashing**

9.1. The OBM system shall apply the standard hash function described in paragraph 9.5. to compute the hash value of OBM trip data (according to paragraph 9.6.) and of the 'OBM OTA outbox' (according to paragraph 9.8.).

9.2. The OBM trip data hash value shall be used to select an OBM trip data package for later over-the-air transmission as defined in paragraph 9.7.

9.3. Hash values of 'OBM OTA outbox' data packages may be used to verify the integrity of the transmission of OBM data from vehicles to authorities.

9.4. Prior to hashing, OBM data must be structured according to the OBM data schemas provided in Appendix 7. For those data parameters defined within these OBM data schemas that are not applicable to the vehicle powertrain type, the OBM system shall fill each unused data byte with a default value of 0xFF.

9.5. **OBM hash function**

9.5.1. The OBM system shall implement a SHA-256 hashing process to support the hashing operations specified in this Annex. All hashing operations shall be carried out on-board the vehicle in compliance with internationally recognised cryptographic standards to ensure cryptographic robustness, data integrity, and resistance to unauthorised manipulation.

9.6. OBM trip data hashing

- 9.6.1. Following the calculation of OBM trip data parameters according to paragraph 7.2, the contents of the OBM trip data shall be hashed based on the OBM trip data schema layout specified in Appendix 7 for bytes 0 through to byte 58. The hash function shall be applied to OBM trip data on-board the vehicle only once. After calculation of the hash value for the OBM trip data, no modifications to the OBM trip data package shall be allowed. The 'OBM trip hash validity status' byte and 'OBM trip hash value' parameter shall not be included in the computation of the hash value.
- 9.6.2. All reserved data bytes shall be filled with zero values unless otherwise specified.
- 9.6.3. After calculation of the hash value for the OBM trip data, no modifications to the OBM trip data shall be allowed.
- 9.6.4. The resulting hash value shall be truncated, preserving the most significant 4 bytes.
- 9.6.5. Until the hash function computation is finalised, the 'OBM trip hash value' parameter shall store a placeholder value of 0xFFFFFFFF and, the 'OBM trip hash validity status' shall indicate the hash function computation is incomplete as defined in paragraph 2.9.3.
- 9.6.6. Once the hash computation is complete, the 'OBM trip hash value' shall be updated with the truncated hash value, and the 'OBM trip hash validity status' shall be set to indicate the computation of the 'OBM trip hash value' is complete. The completed OBM trip data together with the 'OBM trip hash value', in the layout specified in Appendix 7, shall be referred to as the OBM trip data package.

9.7. Criterion for OBM trip data selection for later over-the-air transmission (hash condition)

- 9.7.1. The criterion for OBM trip data package selection for later over-the-air transmission shall be based on the value of the least significant byte of the resulting, truncated 'OBM trip hash value'. If this value is equal to either 00, 40, 80, or C0, the hash condition shall be considered as fulfilled.
- 9.7.2. Following the OBM trip data hashing according to paragraph 9.6, the OBM system shall determine whether the 'OBM trip hash value' satisfies the hash condition. If the condition is satisfied, the OBM trip data package is selected for OTA transmission.

9.8. OBM OTA outbox hashing

- 9.8.1. The contents of the 'OBM OTA outbox' shall be hashed based on the OBM OTA outbox data schema layout specified in Appendix 7 for bytes 0 through to byte [679]. The hash function shall be applied to the contents of the OBM OTA outbox on-board the vehicle only once. After calculation of the hash value for the OBM OTA outbox, no modifications to the OBM trip data package shall be allowed. The 'OBM transmission hash validity status' byte and 'OBM transmission hash value' parameter shall not be included in the computation of the hash value.
- 9.8.2. The resulting hash value shall not be truncated and shall be stored in its full length of 32 bytes.
- 9.8.3. Until the hash computation is finalised, the 'OBM transmission hash value' parameter shall store a placeholder value with each data byte set to a value of 0xFF and the 'OBM trip hash validity status' shall indicate the hash function computation is incomplete as defined in paragraph 4.4.

- 9.8.4. Once the hash computation is complete, the 'OBM transmission hash value' shall be updated with the calculated hash value, and the 'OBM transmission hash validity status' shall be set to indicate the computation of the 'OBM transmission hash value' is complete. The completed 'OBM OTA outbox' together with the 'OBM transmission hash value', in the layout specified in Appendix 7, shall be referred to as the 'OBM OTA outbox' data package.

PART C

Over-the-air transmission of OBM data

10. Over-the-air transmission of OBM data

- 10.1. When the 'OBM OTA outbox' hash computation is complete as defined in paragraph 9.8 the OBM system shall transmit the 'OBM OTA outbox' data package using OTA communication to the manufacturer's server.
- 10.2. Data transmission may be delayed to such a time when suitable conditions are met to support data transmission. The vehicle may transmit the 'OBM OTA outbox' data package more than once to the manufacturer's server to support successful transmission.
- 10.3. The 'OBM OTA outbox' data packages shall retain the structure and content of bytes 0 through [712] as defined in the 'OBM OTA outbox' data schema of Appendix 7 for anonymous transmission to the authority server and access through the OBD port.
- 10.4. Manufacturers shall clearly describe the 'manufacturer-reserved' OBM trip parameters, 'manufacturer-reserved outbox' parameters and definition of 'OBM version number', to the type-approval authority at time of type-approval. The same information shall be shared as part of the data communication process.
- 10.5. Prior to submission of OBM data to the authority server, the manufacturer shall append the family vehicle identifiers listed in table 10.1 to enable authorities to determine the vehicle type, variant, applicable family designations and supplementary information applicable to the vehicle type-approval.

Table 10.1

Vehicle family identifiers

Vehicle family identifier	Identifier
Vehicle type	CoC field 0.2.
Vehicle variant	CoC field 0.2.
Vehicle version	CoC field 0.2.
Whole-vehicle type-approval code	CoC field 0.11(b).
PEMS family	CoC field 0.2.3.3.
OBM family	Reserved
Battery durability family	Reserved
Date of manufacture	0.11.
Worst case energy consumption of part B family	Reserved
Part A family identifier	Reserved

If any family identifier is not applicable to the vehicle type 'NONE' shall be stated.

Appendix 1

OBM parameters to support vehicle testing

Reference	Name	Description	Required for Instantaneous data stream
General Parameters			
1.1	Number of diagnostic trouble codes (DTCs)	Number of stored 'MI on' fault codes	-
1.2	MI status	Malfunction Indicator status	Yes
1.3	Engine coolant temperature	Engine coolant temperature derived from engine coolant temperature, cylinder head temperature or another applicable sensor	Yes
1.4	Engine speed	Revolutions per minute of engine crankshaft	Yes
1.5	Calculated load value	Percent of maximum available engine torque. Calculated load value shall be calculated based on current engine torque / peak engine torque @STP as a function of engine speed	Yes
1.6	Vehicle speed	Vehicle road speed	Yes
1.7	Ambient air temperature	Ambient air temperature. If the parameter provided is normally estimated or modelled from other sensors or signals, the value used for calculation of OBM trip data signals shall be provided	Yes
1.8	Ambient air pressure	Ambient / barometric pressure. If the parameter provided is normally estimated or modelled from other sensors or signals the value used for calculation of OBM trip data signals shall be provided	Yes
1.9	Vehicle / engine fuel rate	Fuel injected into engine / aftertreatment	Yes
1.10	AES flag / timer	Status information to indicate AES is active	-
1.11	Exhaust mass flow -tailpipe	Exhaust mass flow rate at the tailpipe as defined in paragraph 1.3	Yes
Exhaust emissions parameters			
1.12	NOx sensor concentration(s)	NOx sensor signal(s) derived from physical sensors installed on the vehicle Manufacturers may provide either raw and /or compensated signals as deemed most appropriate to support testing and repair	Yes

Reference	Name	Description	Required for Instantaneous data stream
1.13	Tailpipe NOx concentration	Estimated / measured total concentration of NOx emissions at the tailpipe as defined in paragraph 1.4	Yes
1.14	Tailpipe NOx concentration modelled status	Modelled status of 'Tailpipe NOx concentration' signal, as defined in paragraph 1.5	Yes
1.15	Tailpipe NOx mass flow	Estimated / measured total mass of NOx emissions at the tailpipe as defined in paragraph 1.6	Yes
1.16	Tailpipe NOx mass flow modelled status	Modelled status of 'Tailpipe NOx mass flow' signal, as defined in paragraph 1.5	Yes
1.17	PM sensor output	Particle mass sensor(s) output value(s) applicable to sensor type installed on the vehicle	Yes
1.18	Status of PM sensor	Status of PM sensor operation	Yes
NOx to fuel mass parameters			
1.19	Cumulative NOx – 100 km	Total emitted NOx mass (g) during the current NOx to fuel mass 100 km driven period, as defined in paragraph 1.7	-
1.20	Cumulative fuel mass – 100 km	Total fuel burned (kg) during the current NOx to fuel mass 100 km driven period, as defined in paragraph 1.7	-
1.21	Cumulative distance – 100 km	Total driven distance (km) during current NOx to fuel mass 100 km driven period, as defined in paragraph 1.7	-
1.22	NOx to fuel mass ratio (0)	Calculated ratio of NOx emissions to fuel consumed over 100 km (0), as defined in paragraph 1.7	-
1.23	NOx to fuel mass ratio (1)	Calculated ratio of NOx emissions to fuel consumed over 100 km (1), as defined in paragraph 1.7	-
1.24	NOx to fuel mass ratio (2)	Calculated ratio of NOx emissions to fuel consumed over 100 km (2), as defined in paragraph 1.7	-
1.25	NOx to fuel mass ratio (3)	Calculated ratio of NOx emissions to fuel consumed over 100 km (3), as defined in paragraph 1.7	-
1.26	NOx to fuel mass ratio (4)	Calculated ratio of NOx emissions to fuel consumed over 100 km (4), as defined in paragraph 1.7	-
1.27	NOx to fuel mass ratio average	Parameter shall represent the average value of the 5 last completed 'NOx to fuel mass ratio' (0-4) values, as defined in paragraph 1.7	-

Reference	Name	Description	Required for Instantaneous data stream
Aftertreatment regeneration status parameters			
1.28	Aftertreatment regeneration status	Status of aftertreatment regeneration	Yes
1.29	Normalised trigger for particulate filter regeneration	Normalised trigger for active particle filter (PF) regeneration functions employed on the vehicle	Yes
1.30	Particulate filter average regeneration distance	Average distance between particulate filter regenerations	-
NOx control system parameters			
1.31	Aftertreatment operational status	Aftertreatment operational status, as defined in paragraph 1.8	Yes
1.32	SCR inducement state	SCR inducement system actual state	-
1.33	Average reagent consumption	Average aftertreatment reagent consumption	-
1.34	Average reagent demand	Average demanded aftertreatment reagent consumption	-
1.35	Reagent tank level	Reagent tank level	-
1.36	SCR catalyst NH ₃ target	Target SCR catalyst NH ₃ storage	-
1.37	SCR catalyst NH ₃ storage	Actual/modelled SCR catalyst NH ₃ storage	-
Electrical system parameters ⁽¹⁾			
1.38	Hybrid/EV Battery System voltage	Rechargeable energy storage system voltage	Yes
1.39	Hybrid/EV Battery System current	Rechargeable energy storage system current	Yes
1.40	Hybrid/EV battery temperature data	Rechargeable energy storage system temperature data to include as applicable to the application min, max, average and current battery temperature, battery coolant temperatures and current state of battery thermal control	-
1.41	Low voltage battery voltage	Control module system voltage	Yes
1.42	Hybrid/EV battery system remaining charge (SOC)	Remaining level of charge for a battery pack used for propulsion, expressed as a percentage of total useable battery energy	Yes

Reference	Name	Description	Required for Instantaneous data stream
1.43	Accelerator pedal position	Relative or 'learned' pedal position shall be displayed as a normalised value	Yes
1.44	Hybrid/EV battery system cumulative energy	Cumulative battery system energy consumption for the last second	Yes
OBM system status parameters			
1.45	OBM inducement system status	Status of the OBM inducement system as defined in paragraph 1.9	-
1.46	Possible tampering status	Status of vehicle tampering detection as defined in paragraph 1.10	-
1.47	Monitoring status NOx	Monitoring status for NOx according to Article 5	-
1.48	Monitoring status PM	Monitoring status for PM according to Article 5	-
1.49	Monitoring status generic	Generic monitoring status according to Article 5	-
EEEDWS Counters			
1.50	OBM warning distance	Counter to track warning distance as defined in Annex II, paragraph 2.2.4	-
1.51	OBM distance since monitoring status reset	Distance driven since all monitoring statuses equal to 'normal' or 'intermediate', as defined in Annex II, paragraph 2.2.5	-
1.52	OBM current inducement distance	Distance travelled in current inducement period, as defined in Annex II, paragraph 2.2.7	-
1.53	Distance since DTC reset	Distance accumulated since diagnostic trouble codes were last cleared by a generic scan tool or service tool	-
1.54	Distance travelled while MI activated	Distance travelled while the MI is activated	-
1.55	OBM OTA outbox overwrite counter	Number of times the 'OBM OTA outbox' is overwritten since last fault clear as defined in paragraph 1.12	-

Notes:

⁽¹⁾ Only applicable to OVC-HEV, PEV and FCV/FCHV

Appendix 2

OBM trip parameters

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ¹ / relevance to OBFCM ²
2.1	Vehicle odometer value	Vehicle odometer value, as defined in paragraph 2.5	km	0/429 496 729,5		4	All / yes
2.2	OBM trip distance	Total driven distance during the OBM trip, as defined in paragraph 2.5	km	0/6 553,5		2	All/ yes
2.3	OBM trip time	Duration of the OBM trip	s	0/65 535		2	All / yes
2.4	Idle – time	Cumulated period of engine operation at idle during the OBM trip, as defined in paragraph 2.6	s	0/65 535	1	2	A ³ , B ³ , C ³ / yes
2.5	Distance-specific NOx	Average mass emissions of NOx during the OBM trip, as defined in paragraph 2.7	mg/km	0/6 553,5		2	A ³ , B ³ C ³ / no
2.6	Fuel consumed volume – OBM trip	Total fuel consumed by the vehicle / engine during the OBM trip	L	0/655,35	0,01	2	A ³ , B ³ , C ³ / yes
2.7	Net electrical energy consumed – OBM trip	Total net-in-vehicle electrical energy consumed over the duration of the OBM trip while propulsion system active This value shall reflect cumulative discharge energy observed by the energy storage system	kWh	0/6 553,5	0,1	2	C ³ , D ³ , E ³ / yes
2.8	Net electrical energy into battery – OBM trip	Total electrical energy into the hybrid / EV battery over the duration of the OBM trip while propulsion system active, not counting any energy when an off-board charger is connected to the vehicle	kWh	0/6 553,5	0,1	2	C ³ , D ³ , E ³ / yes

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ¹ / relevance to OBF ²
2.9	Regeneration distance ratio	Percentage trip distance driven with at least one active aftertreatment regeneration, as defined in paragraph 2.8.2	%	0/100	2,55 ⁻¹	1	A ³ , B ³ , C ³ / yes
2.10	Monitored AES distance ratio	Percentage trip distance driven with at least one monitored AES is active, as defined in paragraph 2.8.2	%	0/100	2,55 ⁻¹	1	A, B, C / no
2.11	Reagent inhibited ratio	Percentage trip distance driven with reagent delivery prevented due to environmental conditions, as defined in paragraph 2.8.2	%	0/100	2,55 ⁻¹	1	A ³ , B ³ , C ³ / no
2.12	Modelled data ratio	Percentage trip distance driven where the distance specific emissions data is calculated without active NOx sensor inputs, as defined in paragraph 2.8.2	%	0/100	1	1	A, B, C / no
2.13	Speed – urban slow ratio	Percentage trip distance driven in urban slow speed conditions, as defined in paragraph 2.8.3	%	0/100	2,55 ⁻¹	1	All / yes
2.14	Speed – urban ratio	Percentage trip distance driven in urban speed conditions, as defined in paragraph 2.8.3	%	0/100	2,55 ⁻¹	1	All / yes
2.15	Speed – rural ratio	Percentage trip distance driven in rural speed conditions, as defined in paragraph 2.8.3	%	0/100	2,55 ⁻¹	1	All / yes
2.16	Speed – motorway ratio	Percentage trip distance driven in motorway speed conditions, as defined in paragraph 2.8.3	%	0/100	2,55 ⁻¹	1	All / yes
2.17	Distance EV – ratio	Percentage trip distance of the OBM trip distance driven without the use of the engine., as defined in paragraph 2.8.4	%	0/100	2,55 ⁻¹	1	C ³ , D, E / yes

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ¹ / relevance to OBFCM ²
2.18	Ambient temperature – low ratio	Percentage trip distance driven at low ambient temperature, as defined in paragraph 2.8.5	%	0/100	2,55 ⁻¹	1	All / yes
2.19	Ambient temperature – high ratio	Percentage trip distance driven at high ambient temperature, as defined in paragraph 2.8.5	%	0/100	2,55 ⁻¹	1	All / yes
2.20	Altitude – high ratio	Percentage trip distance driven at high elevation, as defined in paragraph 2.8.5	%	0/100	2,55 ⁻¹	1	A, B, C / yes
2.21	Outside extended ambient conditions ratio	Percentage trip distance driven outside RDE extended ambient conditions, as defined in paragraph 2.8.5	%	0/100	2,55 ⁻¹	1	All / yes
2.22	MI status (end of trip)	Status of MI at the end of trip and error state during trip, as defined in paragraph 2.8.6	-	-	-	1	A, B, C, D ³ , E ³ / no
2.23	NOx to fuel mass ratio (0) (end of trip)	Value of parameter 1.22 at the end of the OBM trip	g/kg	0/200		2	A, B, C / no
2.24	SCR inducement state (end of trip)	Replication of byte A of ‘SCR inducement system actual state’ as required in UN Regulation No 154 ⁴ Appendix 6 paragraph 7, at the end of the OBM trip	-			1	A ³ , B ³ , C ³ / no
2.25	Monitoring status NOx (end of trip)	OBM monitoring status for NOx, as defined in paragraph 2.9	-			1	A, B, C / no
2.26	Monitoring status PM (end of Trip)	OBM monitoring status for PM, as defined in paragraph 2.9	-			1	A, B, C / no
2.27	Monitoring status generic (end of trip)	OBM monitoring status for ‘generic’, as defined in paragraph 2.9	-			1	A, B, C / no

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ¹ / relevance to OBFCM ²
2.28	OBM inducement status (end of trip)	Status of the OBM inducement system, as defined in paragraph 2.9	-			5/8	A, B, C / no
2.29	Possible tampering status (end of trip)	Possible tampering status (parameter 1.46) at the end of the OBM trip, as defined in paragraph 2.9	-			3/8	A, B, C / no
2.30	Manufacturer-reserved #0	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #1	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #2	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #3	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #4	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #5	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #6	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #7	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #8	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -
	Manufacturer-reserved #9	Manufacturer-defined data, as defined in paragraph 2.9.2	-	-	-	1	All / -

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ¹ / relevance to OBFCM ²
2.31	OBM trip hash validity status	Status of trip hash function completed, as defined in paragraph 2.9.3	-	0/255	-	1	All / no
2.32	OBM trip hash value	Most significant 32 bits of the OBM trip hash value as defined in paragraph 2.9.4	-	0/4 294 967 295	-	4	All / no

Notes

⁽¹⁾ A: ICEV; B: NOVC-HEV; C: OVC-HEV; D: PEV; E: FCV/FCHV

⁽²⁾ In relation to Article 16

⁽³⁾ Applicable if technology is fitted to the vehicle. Otherwise, a value of 0xFF shall be reported

⁽⁴⁾ UN Regulation No 154 – Uniform provisions concerning the approval of light duty passenger and commercial vehicles with regards to criteria emissions, emissions of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range (WLTP), 02 series of amendments (OJ L, 2022/2124, 10.11.2022, ELI: <http://data.europa.eu/eli/reg/2022/2124/oj>). In the case of a UN Regulation the series of amendments indicated reflects the version that has been published in the *Official Journal of the European Union*. Compliance with a series of amendments adopted after the particular series indicated shall be accepted as an alternative.

OBM lifetime parameters

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾ / relevance to OBFCM ⁽²⁾
3.1	NOx mass (lifetime)	Total lifetime NOx tailpipe emissions, as defined in paragraph 3.5	kg	0/4 294 967,295	0,001	4	A, B, C / no
3.2	Total fuel consumed – (lifetime) ⁽⁴⁾	Total fuel consumed by the vehicle during its lifetime	l	0/42 949 672,95	0,01	4	A, B, C / yes
3.3	Total distance travelled – OBFCM (lifetime)	Total distance travelled during the vehicle lifetime, applicable to lifetime values stored (OBFCM)	km	0/429 496 729,5	0,1	4	All / yes
3.4	Total distance travelled – OBM (lifetime)	Total distance travelled during the vehicle lifetime, applicable to lifetime values stored (OBM)	km	0/429 496 729,5	0,1	4	All / no
3.5	Odometer value	Total distance travelled during the vehicle lifetime indicated to the vehicle user, as defined in paragraph 3.6	km	0/429 496 729,5	0,1	4	All / yes
3.6	Total distance travelled – EV (lifetime)	Total distance travelled without the use of the engine during the vehicle lifetime, as defined in paragraph 3.7	km	0/429 496 729,5	0,1	4	C ⁽³⁾ , D, E / yes
3.7	OBM warning distance (lifetime)	Distance driven with any one or more monitoring statuses equal to 'Error' during the vehicle lifetime, as defined in Annex II, paragraph 2.2.4	km	0/65 535	1	2	A, B, C / no
3.8	OBM inducement distance (lifetime)	Counter to indicate the distance travelled in inducement during the vehicle lifetime, as defined in Annex II, paragraph 2.2.8	km	0/65 535	1	2	A, B, C / no
3.9	OBM monitoring status reset counter (lifetime)	Number of times monitoring statuses / diagnostic trouble codes have been reset as defined in Annex II, paragraph 2.2.6	-	0/65 535	1	2	A, B, C /no

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾ / relevance to OBFCM ⁽²⁾
3.10	NOx to fuel mass ratio average	Replication of parameter 1.27	g/kg	0/200	40*13 107 ⁻¹	2	A, B, C / no
3.11	Speed – urban slow ratio –lifetime	Percentage distance driven during vehicle lifetime in urban slow speed conditions, as defined in paragraph 3.8	%	0/100	2,55 ⁻¹	1	All / yes
3.12	Speed – urban ratio – lifetime	Percentage distance driven during vehicle lifetime in urban speed conditions, as defined in paragraph 3.8	%	0/100	2,55 ⁻¹	1	All / yes
3.13	Speed – rural ratio – lifetime	Percentage distance driven during vehicle lifetime in rural speed conditions, as defined in paragraph 3.8	%	0/100	2,55 ⁻¹	1	All / yes
3.14	Speed – motorway ratio – lifetime'	Percentage distance driven during vehicle lifetime in motorway speed conditions, as defined in paragraph 3.8	%	0/100	2,55 ⁻¹	1	All / yes
3.15	Speed – outside extended ratio – lifetime'	Percentage distance driven during vehicle lifetime outside extended speed conditions, as defined in paragraph 3.8	%	0/100	2,55 ⁻¹	1	All / yes

Notes

- ⁽¹⁾ A: ICEV; B: NOVC-HEV; C: OVC-HEV; D: PEV; E: FCV/FCHV
- ⁽²⁾ In relation to Article 16
- ⁽³⁾ Applicable if technology is fitted to the vehicle. Otherwise, a value of 0xFF shall be reported
- ⁽⁴⁾ Not applicable to gaseous fuels

OBM outbox property parameters

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾
4.1	OBM version number	Version number of the OBM system in use as defined in paragraph 4.2	-	0/65 535	1	2	All
4.2	Manufacturer-reserved outbox #0	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #1	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #2	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #3	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #4	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #5	Manufacturer-defined data as defined in paragraph 4.3.	-	0/255	1	1	All
	Manufacturer-reserved outbox #6	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #7	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #8	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All
	Manufacturer-reserved outbox #9	Manufacturer-defined data as defined in paragraph 4.3	-	0/255	1	1	All

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾
4.3	OBM transmission hash validity status	Status of OBM outbox transmission hash function completed as defined in paragraph 4.4	-	-	1	1	All
4.4	OBM transmission hash value	Hash value resulting from the hashing of the 'OBM OTA outbox' as defined in paragraph 4.5	-	2 ²⁵⁶	1	32	All

Notes

⁽¹⁾ A: ICEV; B: NOVC-HEV; C: OVC-HEV; D: PEV; E: FCV/FCHV

Battery durability parameters

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾
5.1	On-board SOCE value	On-board estimate of battery performance expressed as a percentage of useable battery energy	%	0/100	2,55 ⁻¹	1	C, D
5.2	On-board SOCR value	On-board estimate of battery performance expressed as a percentage of the certified electric range of the vehicle	%	0/100	2,55 ⁻¹	1	C, D
5.3	Current battery lifetime distance	Odometer value related to battery durability lifetime values, as defined in paragraph 5.3	km	0/429 496 729,5	0,1	4	C, D
5.4 ⁽²⁾	Virtual distance	Energy system virtual distance accounting for V2X energy storage usage that is not reflected by the vehicle odometer	km	0/429 496 729,5	0,1	4	C, D
5.5	Elapsed time since battery last charged by more than 50% SOC swing	Elapsed time since electrical energy storage charged by more than 50 % state of charge	days	0/65 535	1	2	C, D
5.6	Average battery pack temperature active (lifetime)	Average battery temperature while propulsion system is active	°C	-40/215	1	1	C, D
5.7	Average battery temperature charging (lifetime)	Average battery temperature during charging	°C	-40/215	1	1	C, D

Reference	Name	Description	Unit	Min/Max Value	Resolution	Size (bytes)	Applicable powertrains ⁽¹⁾
5.8 ⁽²⁾	Average battery temperature while vehicle off (lifetime)	Average battery temperature during non-usage of the vehicle	°C	-40/215	1	1	C, D
5.9 ⁽²⁾	Total discharge energy in V2X [kWh] (lifetime)	Total lifetime energy supplied to off-board usage	kWh	0/429 496 729,5	0,1	4	C, D
5.10 ⁽²⁾	Total energy supplied to a non-propulsion usage (lifetime)	Total lifetime discharge energy for non-traction purposes. Only applicable for N ₁ , Euro 7ext and Euro 7Gext vehicles and if requested by the manufacturer	kWh	0/429 496 729,5	0,1	4	C, D
5.11	Energy storage total accumulated energy throughput (lifetime)	Total lifetime energy that passes out of the energy storage system for propulsion and non-propulsion uses	kWh	0/429 496 729,5	0,1	4	C, D
5.12	Traction battery replacement status	Status byte to indicate battery has been replaced in vehicle lifetime, as defined in paragraph 5.4	-	0/-	-	4	C, D

Notes

- ⁽¹⁾ A: ICEV; B: NOVC-HEV; C: OVC-HEV; D: PEV; E: FCV/FCHV
- ⁽²⁾ May be omitted if the manufacturer does not apply a virtual distance calculation

—

OBM data storage parameters

Table 6.1

OBM recent trips

Reference	Name	Description	Data slot size (bytes)
6.1.1	OBM trip data package – recent #0	Most recent valid OBM trip data package (n)	64
6.1.2	OBM trip data package – recent #1	Recent valid OBM trip data package (n-1 to n-8)	64
6.1.3	OBM trip data package – recent #2		64
6.1.4	OBM trip data package – recent #3		64
6.1.5	OBM trip data package – recent #4		64
6.1.6	OBM trip data package – recent #5		64
6.1.7	OBM trip data package – recent #6		64
6.1.8	OBM trip data package – recent #7		64
6.1.9	OBM trip data package – recent #8		64
6.1.10	OBM trip data package – recent #9	Least recent valid OBM trip data package of stored recent trips (n-9)	64

Table 6.2

OBM OTA queue data slots

Reference	Name	Description	Data slot size (bytes)
6.2.1	OBM trip data package #0	OBM trip data packages selected for OTA transmission as defined in paragraph 8.3	64
6.2.2	OBM trip data package #1		64
6.2.3	OBM trip data package #2		64
6.2.4	OBM trip data package #3		64
6.2.5	OBM trip data package #4		64

Table 6.3

OBM OTA outbox data slots

Reference	Name	Data slot size (bytes)
6.3.1	OBM outbox property parameters as defined in paragraph 4, excluding ‘OBM transmission hash validity status’ and ‘OBM transmission hash value’	12
6.3.2	OBM lifetime parameters defined in paragraph 3	37
6.3.3	Battery durability parameters as defined in paragraph 5	31
6.3.4	‘OBM OTA outbox trip data’, as defined in paragraph 6.6	320
6.3.5	OBM transmitted hash list, as defined in paragraph 8.6	160
6.3.6	Data reserved for expansion of OBM outbox	120
6.3.7	‘OBM transmission hash validity status’, as defined in paragraph 4.4	1
6.3.8	‘OBM transmission hash value’, as defined in paragraph 4.5	32

Table 6.4

OBM last transmission list

Reference	Name	Data slot size (bytes)
6.4.1	OBM OTA outbox package	713

Table 6.5

OBM transmitted hash list slots (rolling list)

Reference	Parameter name	Data slot size (bytes)
6.5.1	OBM transmission hash value #0	32
6.5.2	OBM transmission hash value #1	32
6.5.3	OBM transmission hash value #2	32
6.5.4	OBM transmission hash value #3	32
6.5.5	OBM transmission hash value #4	32

OBM data schemas

Prior to computation of the OBM data hashes by the applicable control unit, the applicable data parameters shall be combined in the order shown in the tables of this appendix to assure correct use of the big-endian structure and enable consistent verification methods.

Table 1

OBM trip data schema

Contents of OBM trip (64 bytes in total; values in brackets indicates [parameter reference; size in bytes])								
Data bytes	OBM trip parameters [64 bytes]							
0-7	Vehicle odometer value [ref. 2.1; 4 bytes]			OBM trip distance [ref. 2.2; 2 bytes]		OBM trip time [ref. 2.3; 2 bytes]		
8-15	Idle time [ref. 2.4; 2 bytes]		Distance-specific NOx [ref. 2.5; 2 bytes]		Fuel consumed volume – OBM trip [ref. 2.6; 2 bytes]		Net electrical energy consumed – OBM trip [ref. 2.7; 2 bytes]	
16-23	Net electrical energy into battery – OBM trip [ref. 2.8; 2 bytes]		Regeneration distance ratio [ref. 2.9; 1 byte]	Monitored AES distance ratio [ref. 2.10; 1 byte]	Reagent inhibited ratio [ref. 2.11; 1 byte]	Modelled data distance ratio [ref. 2.12; 1 byte]	Speed – urban slow ratio [ref. 2.13; 1 byte]	Speed – urban ratio [ref. 2.14; 1 byte]
24-31	Speed – rural ratio [ref. 2.15; 1 byte]	Speed – motorway ratio [ref. 2.16; 1 byte]	Distance EV – ratio [ref. 2.17; 1 byte]	Ambient temperature – low ratio [ref. 2.18; 1 byte]	Ambient temperature – high ratio [ref. 2.19; 1 byte]	Altitude – high ratio [ref. 2.20; 1 byte]	Outside extended conditions ratio [ref. 2.21; 1 byte]	MI status (end of trip) [ref. 2.22; 1 byte]
32-39	NOx to fuel mass ratio (0) (end of trip) [ref. 2.23; 2 bytes]		SCR inducement state (end of trip) [ref. 2.24; 1 byte]	Monitoring status NOx (end of trip) [ref. 2.25; 1 byte]	Monitoring status PM (end of trip) [ref. 2.26; 1 byte]	Monitoring status generic (end of trip) [ref. 2.27; 1 byte]	OBM inducement status + Possible tampering status [ref. 2.28, 2.29; 1 byte]	Reserved for expansion [1 byte]

Contents of OBM trip (64 bytes in total; values in brackets indicates [parameter reference; size in bytes])								
Data bytes	OBM trip parameters [64 bytes]							
40-47	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]	Reserved for expansion [1byte]
48-55	Reserved for expansion [1byte]	Manufacturer-reserved #0 [ref. 2.30; 1byte]	Manufacturer-reserved #1 [ref. 2.30; 1byte]	Manufacturer-reserved #2 [ref. 2.30; 1byte]	Manufacturer-reserved #3 [ref. 2.30; 1byte]	Manufacturer-reserved #4 [ref. 2.30; 1byte]	Manufacturer-reserved #5 [ref. 2.30; 1byte]	Manufacturer-reserved #6 [ref. 2.30; 1byte]
56-63	Manufacturer-reserved #7 [ref 2.30; 1byte]	Manufacturer-reserved #8 [ref 2.30; 1byte]	Manufacturer-reserved #9 [ref 2.30; 1byte]	OBM trip hash validity status [ref 2.31; 1 byte]	OBM trip hash value [ref. 2.32; 4 bytes] Placeholder value 0xFFFFFFFF			

Table 2

OBM OTA outbox data schema

Data bytes	Contents of OTA outbox ([xx] bytes in total; values in brackets indicates [parameter reference; size in bytes])							
OBM outbox version [2 bytes]								
0-1	OBM version [ref. 4.1; 2 bytes]							
Manufacturer reserved outbox data [10 bytes]								
2-7			Manufac- turer- reserved outbox #0 [ref. 4.2; 1 byte]	Manufacturer- reserved outbox #1 [ref. 4.2; 1 byte]	Manufacturer- reserved outbox #2 [ref. 4.2; 1 byte]	Manufacturer- reserved outbox #3 [ref. 4.2; 1 byte]	Manufacturer- reserved outbox #4 [ref. 4.2; 1 byte]	Manufacturer- reserved outbox #5 [ref. 4.2; 1 byte]

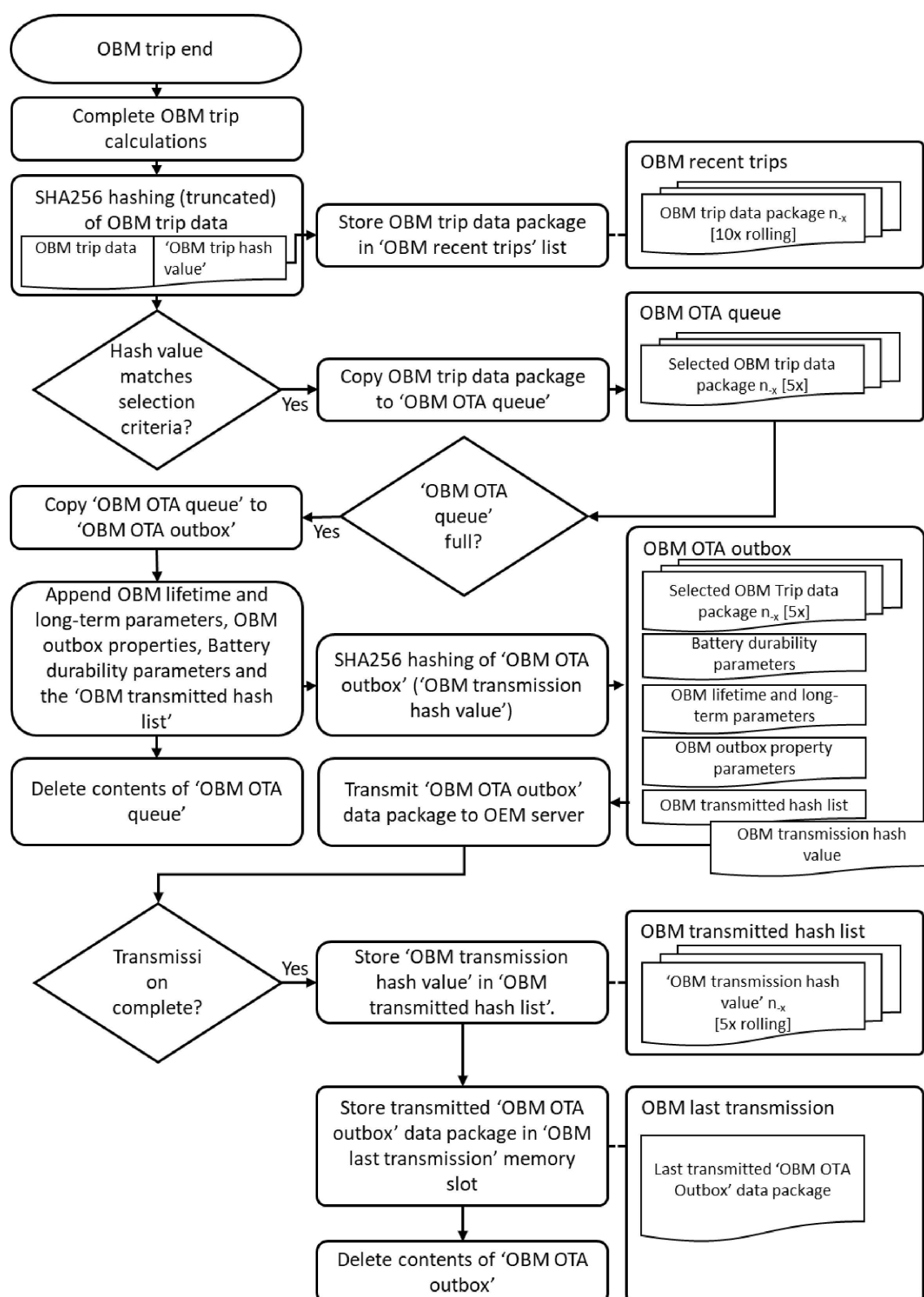
Data bytes	Contents of OTA outbox ([xx] bytes in total; values in brackets indicates [parameter reference; size in bytes])							
8-11	Manufacturer-reserved outbox #6 [ref. 4.2; 1 byte]	Manufacturer-reserved outbox #7 [ref. 4.2; 1 byte]	Manufacturer-reserved outbox #8 [ref. 4.2; 1 byte]	Manufacturer-reserved outbox #9 [ref. 4.2; 1 byte]				
Lifetime values [37 bytes]								
12-15					NOx mass (lifetime) [ref. 3.1; 4 bytes]			
16-23	Total fuel consumed (lifetime) [ref. 3.2; 4 bytes]		Total distance travelled (OBFCM) (lifetime) [ref. 3.3; 4 bytes]					
24-31	Total distance travelled (OBM) (lifetime) [ref. 3.4; 4 bytes]		Odometer value [ref. 3.5; 4 bytes]					
32-39	Distance travelled in EV mode (lifetime) [ref. 3.6; 4 bytes]		OBM warning distance (lifetime) [ref. 3.7; 2 bytes]		OBM inducement distance (lifetime) [ref. 3.8; 2 bytes]			
40-47	OBM monitoring status reset counter (lifetime) [ref. 3.9; 2 byte]	NOx to fuel mass ratio average [ref. 3.10; 2 bytes]	Speed – urban slow ratio – lifetime [ref. 3.11; 1 byte]	Speed – urban ratio – lifetime [ref. 3.12; 1 byte]	Speed – rural ratio – lifetime [ref. 3.13; 1 byte]	Speed – motorway ratio – lifetime [ref. 3.14; 1 byte]		
48	Speed – outside extended ratio – lifetime [ref. 3.15; 1 byte]							
Battery durability data [31 bytes]								
49-55		On-board SOCE value [ref. 5.1; 1 byte]	On-board SOCR value [ref. 5.2; 1 byte]	Average battery temperature active – lifetime [ref. 5.6; 1 byte]	Average battery temperature charging – lifetime [ref. 5.7; 1 byte]	Average battery pack temperature – vehicle off lifetime [ref. 5.8; 1 byte]		Elapsed time since battery last charged by more than 50 % SOC swing [ref. 5.5; 2 bytes]

Data bytes	Contents of OTA outbox ([xx] bytes in total; values in brackets indicates [parameter reference; size in bytes])	
56-63	Current battery lifetime distance [ref. 5.3; 4 bytes]	Virtual distance [ref. 5.4; 4 bytes]
64-71	Total discharge energy in V2X [kWh] – (lifetime) [ref. 5.9; 4 bytes]	Total energy supplied to a non-propulsion usage – (lifetime) [ref. 5.10; 4 bytes]
72-79	Energy storage total accumulated energy throughput (lifetime) [ref. 5.11; 4 bytes]	Traction battery replacement status [ref. 5.12; 4 bytes]
OBM OTA outbox trip data [320 bytes]		
80-143	OBM OTA outbox trip data #0 [ref. 6.3.4; 64 bytes]	
144-207	OBM OTA outbox trip data #1 [ref. 6.3.4; 64 bytes]	
208-271	OBM OTA outbox trip data #2 [ref. 6.3.4; 64 bytes]	
272-335	OBM OTA outbox trip data #3 [ref. 6.3.4; 64 bytes]	
336-399	OBM OTA outbox trip data #4 [ref. 6.3.4; 64 bytes]	
OBM transmitted hash list [160 bytes]		
400-431	OBM transmission hash value #0 [ref. 6.5.1; 32 bytes]	
432-463	OBM transmission hash value #1 [ref. 6.5.2; 32 bytes]	
464-495	OBM transmission hash value #2 [ref. 6.5.3; 32 bytes]	
496-527	OBM transmission hash value #3 [ref. 6.5.4; 32 bytes]	
528-559	OBM transmission hash value #4 [ref. 6.5.5; 32 bytes]	
	Expansion [135 bytes]	
560-679	Reserved for expansion	
	Hash value [33 bytes]	

Data bytes	Contents of OTA outbox ([xx] bytes in total; values in brackets indicates [parameter reference; size in bytes])
680-	OBM transmission hash validity status [ref. 4.3; 1 byte]
681-712	OBM transmission hash value [ref. 4.4; 32 bytes]

Appendix 8

OBM data processing flowchart



ANNEX II

DRIVER WARNINGS AND INDUCEMENT METHODS OF THE EXCESS EXHAUST EMISSIONS DRIVER WARNING SYSTEM**1. Introduction**

- 1.1. This annex sets out the requirements for driver warnings and inducement method applicable to the excess exhaust emissions driver warning system (EEEDWS). Illustrative schematic diagrams are provided in Appendix 1 to this Annex.

2. Driver warning and inducement method requirements

- 2.1. The driver warnings and inducement methods shall be initiated as soon as at least one of the monitoring statuses of exhaust emissions referred to in Article 5 is set to 'Error' and remain active until none of the monitoring statuses are set to 'Error'.

2.2. Counters

- 2.2.1. The EEEDWS shall include the counters described in paragraphs 2.2.3 to 2.2.8 to support the operation of the driver warnings and inducement methods.

- 2.2.2. Further technical specifications of the counters are described in the relevant tables of Annex I.

2.2.3. 'OBM warning distance' counter

- 2.2.3.1. If any of the monitoring statuses of exhaust emissions is set to 'Error', the 'OBM warning distance' counter shall increment by a value of 0,1 for every 0,1 kilometres driven with the internal combustion engine running, to record the distance travelled by the vehicle in kilometres since the initiation of the driver warnings.

- 2.2.3.2. The 'OBM warning distance' counter shall have a resolution of 0,1 km or any smaller distance, a minimum value of 0 km and a maximum value of at least 6 53,5 km.

- 2.2.3.3. While all monitoring statuses of exhaust emissions have a continuous status other than 'Error', the 'OBM warning distance' counter may decrement as follows:

- if the 'OBM warning distance' counter has a value greater than 400 km, the counter may decrement by the distance driven in kilometres with the internal combustion engine running,
- if the 'OBM warning distance' counter has a value equal to or lower than 400 km, the counter may decrement by up to 100 km for each accumulated 100 km distance driven with the internal combustion engine running.

- 2.2.3.4. The 'OBM warning distance' counter may reset under the following conditions:

- if any of the monitoring statuses of exhaust emissions is reset using a generic scan tool or service tool, the 'OBM warning distance' counter shall reset to 2 400 km or the value at the time of reset, whichever is lower,
- the 'OBM warning distance' counter may reset to zero at the end of a valid OBM trip following a minimum accumulated distance driven with the internal combustion engine running of 400 km while all monitoring statuses of exhaust emissions have a continuous status other than 'Error'.

2.2.3.5. If the 'OBM warning distance' counter reaches its maximum value, it shall freeze until one of the conditions to decrement or reset are met.

2.2.4. 'OBM warning distance – lifetime' counter

2.2.4.1. If, during the vehicle lifetime, any of the monitoring statuses of exhaust emissions is set to 'Error', the 'OBM warning distance – lifetime' counter shall record the distance travelled with any of the monitoring statuses of exhaust emissions in 'Error' and the internal combustion engine running.

2.2.4.2. The 'OBM warning distance – lifetime' counter shall have a resolution of 1 km, a minimum value of 0 km and a maximum value of 65 535 km.

2.2.4.3. The 'OBM warning distance counter – lifetime' shall not reset to zero, and when it reaches its maximum value, it shall freeze.

2.2.5. 'OBM distance since monitoring status reset' counter

2.2.5.1. The 'OBM distance since monitoring status reset' counter indicates the distance travelled with the internal combustion engine running since none of the monitoring statuses of exhaust emissions were last set to 'Error'.

2.2.5.2. The 'OBM distance since monitoring status reset' counter shall have a resolution of 1 km or any smaller distance, a minimum value of 0 km and a maximum value of at least 65 535 km.

2.2.5.3. The 'OBM distance since monitoring status reset' counter shall reset to zero when one of these conditions is met:

- any of the monitoring statuses of exhaust emissions transition from 'Error' to either 'Normal' or 'Intermediate' status resulting in all monitoring statuses of exhaust emissions having a 'Normal' or 'Intermediate' status,
- the monitoring statuses of exhaust emissions are reset using a generic scan tool or service tool.

2.2.5.4. If the 'OBM distance since monitoring status reset' counter reaches its maximum value, it shall freeze until one of the conditions to reset to zero is met.

2.2.6. 'OBM monitoring status reset – lifetime' counter

2.2.6.1. The 'OBM monitoring status reset – lifetime' counter shall count the number of times that any command to reset monitoring statuses or clear OBM data is received from a generic scan tool or service tool during the vehicle's lifetime. This counter shall be an integer with a minimum value of 0 and a maximum value of 65 535. If the 'OBM monitoring status reset – lifetime' counter reaches its maximum value, it shall freeze and not reset to zero.

2.2.6.2. If the monitoring statuses of exhaust emissions are reset as part of a manufacturer software update, it shall not be required to increment the 'OBM monitoring status reset – lifetime' counter.

2.2.7. 'OBM current inducement distance' counter

2.2.7.1. The 'OBM current inducement distance' counter shall count the distance driven in kilometres with the internal combustion engine running since the current or last inducement period began as described in paragraph 2.4.2.

2.2.7.2. The 'OBM current inducement distance' counter shall have a resolution of 0,1 km or any smaller distance, a minimum value of 0 km and a maximum value of at least 6 553,5 km. If the counter reaches its maximum value, it shall freeze and not reset.

2.2.7.3. If the inducement period is paused as described in paragraph 2.4.3, the 'OBM current inducement distance' counter shall freeze.

2.2.7.4. The 'OBM current inducement distance' counter shall reset to zero when one of the following conditions is met:

- the inducement system is activated as defined in paragraph 2.4,
- the monitoring statuses of exhaust emissions are reset using a generic scan tool or service tool.

2.2.8. **'OBM inducement distance – lifetime' counter**

2.2.8.1. The 'OBM inducement distance – lifetime' counter shall count the distance driven in kilometres with the internal combustion engine running during the vehicle lifetime while inducement is active.

2.2.8.2. The 'OBM inducement distance – lifetime' counter shall have a resolution of 1 km, a minimum value of 0 km and a maximum value of 65 535 km. If the counter reaches its maximum value, it shall freeze and not reset.

2.2.8.3. If the inducement period is paused or reset as described in paragraph 2.4.3 the 'OBM inducement distance – lifetime' counter shall freeze until conditions to increment are met.

2.3. **Driver warnings**

2.3.1. **General requirements for the display of driver warnings**

2.3.1.1. The EEEDWS shall include a warning system consisting of visual alarms to inform the driver when faults or tampering that prevent adequate emissions control or adequate performance of the OBM system have been identified. The warning system may also include an audible component to alert the driver.

2.3.1.2. A facility to permit the driver to dim the visual warnings and mute the audible component of the warning system may be provided on vehicles designed and constructed for use by the rescue services, armed services, civil defence, fire services and forces responsible for maintaining public order.

2.3.1.3. If any of the monitoring statuses of exhaust emissions is set to 'Error', the MI as defined in UN Regulation No 154, Annex C5, shall be continuously activated, and an appropriate driver warning shall be displayed according to paragraphs 2.3.2, 2.3.3 and 2.3.4. The driver warning displayed shall be sufficiently clear for the driver to understand that faults or tampering that prevent adequate emissions control or monitoring and justify a repair have been identified by the OBM system. The driver warning shall also indicate the remaining distance until the repair inducement will be activated.

2.3.1.4. The driver warnings may be temporarily interrupted as required to display important safety and other emissions control system related warnings to the driver.

2.3.1.5. When an OBM driver warning coincides with the continuous warning described in paragraph 3.4 of Appendix 6 of UN Regulation No 154, both driver warnings may be displayed simultaneously to the driver, if possible. If simultaneous display of the driver warnings is not possible, the driver warnings shall be suppressed temporarily for the duration of the continuous warning and the 'OBM warning distance' shall be managed according to the following rules:

- For values of the 'OBM warning distance' at time of driver warning suppression between 0 and 1 400: At the end of the continuous warning described in paragraph 3.4 of Appendix 6 of UN Regulation No 154, reset the 'OBM warning distance' to 1 400 km or the value at the time of reset, whichever is lower,
- For values of the 'OBM warning distance' at time of driver warning suppression between 1 400 and 2 400: At the end of the continuous warning described in paragraph 3.4 of Appendix 6 of UN Regulation No 154, manufacturers may reset the 'OBM warning distance' to a minimum of 2 350 km. For values of the 'OBM warning distance' above 2 400 before inducement has started: Reset and freeze the 'OBM warning distance' to 2 400 km for the duration of the continuous warning described in paragraph 3.4 of Appendix 6 of UN Regulation No 154.

2.3.2. Low-level warning

2.3.2.1. When the 'OBM warning distance' counter value is lower than 1 400 km and any of the monitoring statuses of exhaust emissions is set to 'Error', the driver warnings shall be displayed for a sufficient period upon activation of the powertrain.

2.3.3. Delayed activation of the MI and display of the driver warnings.

2.3.3.1. Without prejudice to other criteria for MI activation, while the 'OBM warning distance' counter described in paragraph 2.2.3 has a value lower than 400 km, manufacturers may delay activation of the MI, as specified in paragraph 2.3.1, and the display of the low-level warning, as specified in paragraph 2.3.2. If the 'OBM warning distance' counter reaches a value of 400 km while the activation of MI and display of warnings are delayed, the low-level warning shall be displayed to the driver without waiting until the next activation of the powertrain.

2.3.3.2. When the 'Level 2 – Possible tampering detected' status is set in the 'Tampering status' parameter as defined in Annex I, paragraph 1.10, the delayed activation of the MI and display of the driver warnings shall not be permitted.

2.3.4. High-level warning

2.3.4.1. When the 'OBM warning distance' counter value is equal to or greater than 1 400 km and the inducement method is not yet activated and any of the monitoring statuses of exhaust emissions is set to 'Error', a driver warning shall be persistently displayed.

2.3.5. Inducement method warning

2.3.5.1. When the inducement method is activated as described in paragraph 2.4, a driver warning shall be continuously displayed and clearly indicate that the repair inducement system is active. The warning shall also indicate the number of remaining restarts or the remaining distance before engine start is prohibited, depending on the type of inducement method installed.

2.3.5.2. When the repair inducement warning period has expired, a clear continuous warning indicating engine starts are prohibited shall be displayed.

2.3.6. Suppression of the driver warnings following a monitoring status update

2.3.6.1. Without prejudice to other criteria for MI activation, if the driver warning system has been activated as described in paragraphs 2.3.1 to 2.3.4 and all monitoring statuses of exhaust emissions that were set to 'Error' have transitioned to 'Normal' or 'Intermediate', the driver warnings and MI activation may be suppressed at the start of the next OBM trip.

2.4. Inducement method to facilitate repairs

2.4.1. General requirements of inducement method to facilitate repairs

2.4.1.1. The vehicle shall be equipped with an inducement method to ensure appropriate repairs to emissions control systems are carried out when faults or tampering that prevent adequate emissions control or monitoring and justify a repair have been identified by the OBM system.

2.4.1.2. The inducement method shall be designed to ensure the vehicle cannot be operated using its engine if the sequence of driver warnings is ignored. Hybrid vehicle operation in zero-emission mode may remain unrestricted during active inducement.

2.4.1.3. The requirement for the inducement method shall not apply to vehicles designed and constructed for use by the rescue services, armed services, civil defence, fire services and forces responsible for maintaining public order. Permanent deactivation of the driver inducement system for these vehicles shall only be done by the vehicle manufacturer.

2.4.2. Activation of the inducement method

2.4.2.1. An inducement method in accordance with point 2.4.4 shall be activated at the start of the next OBM trip following the warning distance counter exceeding 2 400 km, provided any of the monitoring statuses remains in 'Error'.

2.4.3. Pausing and deactivation of the inducement method following a monitoring status update

2.4.3.1. If, after the inducement method was activated, all the monitoring statuses in 'Error' have transitioned to 'Normal' or 'Intermediate', the countdown of distance or number of engine starts may be paused and the driver warning may be hidden as long as all monitoring statuses are not in 'Error'.

2.4.3.2. If the 'OBM warning distance' counter decrements to a value less than 2 400 km, the inducement method may be deactivated at the start of the next OBM trip.

2.4.4. Manufacturer options for inducement methods

2.4.4.1. The manufacturer shall select one option of inducement methods to install from those described in paragraphs 2.4.4.2 to 2.4.4.5.

2.4.4.2. Option A – no engine starts after maximum number of engine starts

2.4.4.2.1. This option allows a countdown of engine starts remaining once the inducement system activates. Engine restarts shall be prevented at the start of the next new OBM trip after the number of engine restarts performed since activation of inducement reaches a maximum value of no more than 20. Engine starts initiated by the vehicle control system, such as start-stop systems, or engine restarts resulting from an engine stall condition shall not be included in this countdown.

2.4.4.3. Option B – no engine starts after remaining distance

2.4.4.3.1. This option allows a countdown of distance once the inducement system starts. Engine restarts shall be prevented at the next new OBM trip after the vehicle has driven, with the engine running, a maximum distance of no more than the average driving range of one full tank of fuel since the activation of the repair inducement. Engine restarts initiated by the vehicle control system, such as start-stop systems, or engine restarts resulting from an engine stall condition shall be permitted after maximum distance has been exceeded. The average driving range of one full fuel tank shall be derived from the fuel consumption as determined from a Type 1 test.

2.4.4.4. **Option C – no engine start after refuelling**

2.4.4.4.1. This option results in a vehicle being unable to start after re-fuelling if the inducement system has activated.

2.4.4.5. **Option D – fuel lockout**

2.4.4.5.1. This option prevents the vehicle from being refuelled by locking the fuel filler system after the inducement system activates. The lockout system shall be robust to prevent it being tampered with.

2.4.5. **Reactivation of inducement after failed repair**

2.4.5.1. After a repair has been carried out to correct a fault where the OBM system has activated the inducement method as defined in paragraph 2.4.2 and engine start has been inhibited, the inducement method may be deactivated by a generic scan tool or service tool to enable the vehicle to be restarted.

2.4.5.2. The vehicle shall operate for a maximum of 400 km with the internal combustion engine running, distributed over several OBM trips, or a single OBM trip exceeding 400 km to enable the success of the repair to be validated. If the monitoring status of any exhaust emissions resets to 'Error' during the validation period, the 'OBM warning distance' counter shall reset to 2 401 km and the inducement system shall be activated at the start of the next OBM trip.

2.4.5.3. After reactivation of the inducement system, the maximum number of engine starts permitted shall be limited to no more than 3. Engine starts initiated by the vehicle control system, such as start-stop systems, or engine restarts resulting from an engine stall condition shall not be included in this countdown.

2.5. **Information requirements**

2.5.1. The manufacturer shall deliver new vehicles with clear information in user manuals or other appropriate means to ensure that vehicle users are aware of the functionality of driver warnings and inducement methods of the excess exhaust emissions driver warning system.

Appendix 1

Schematic diagrams

Figure 1

Display of driver warnings

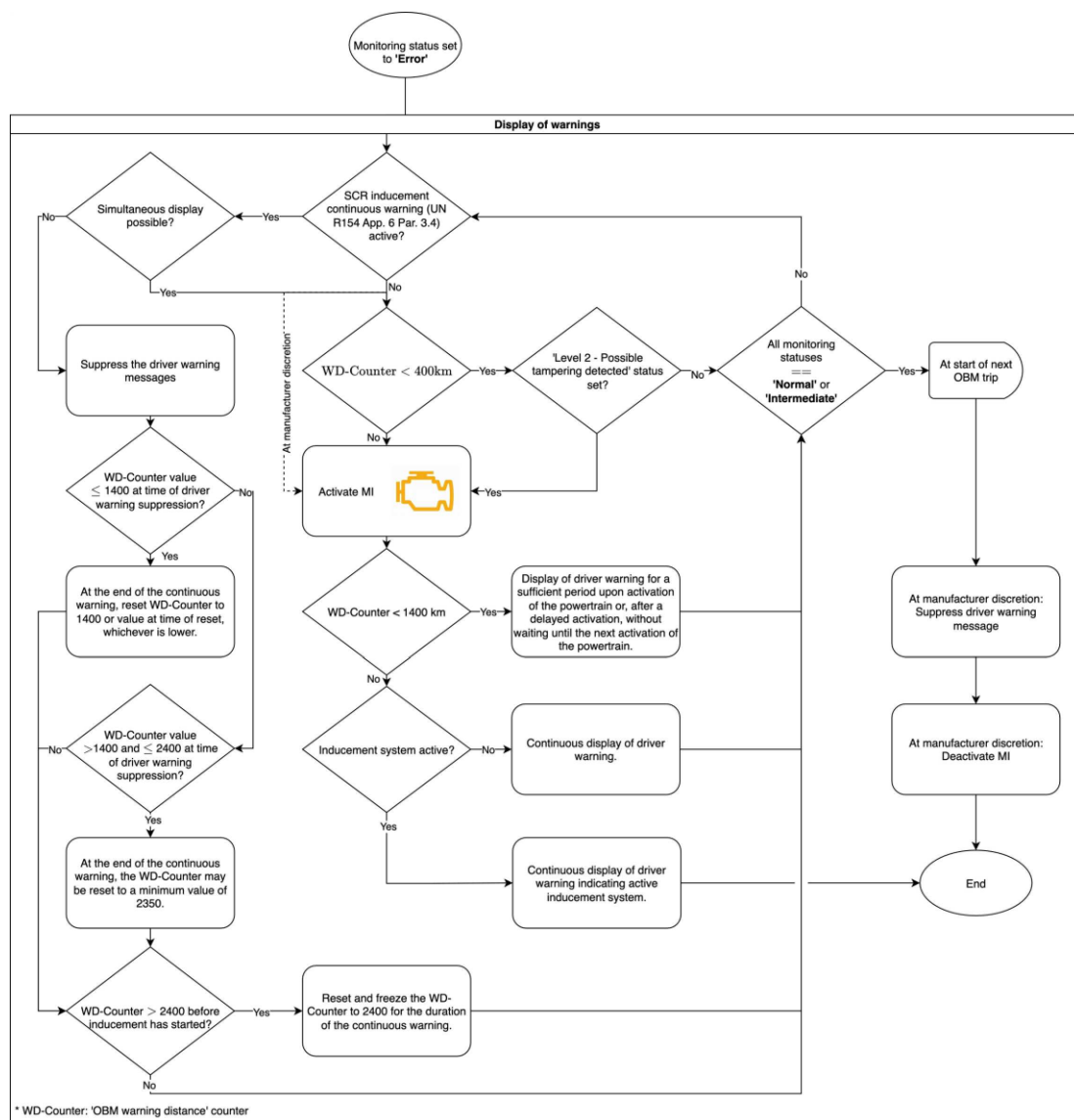


Figure 2

Operation of 'OBM warning distance' counter

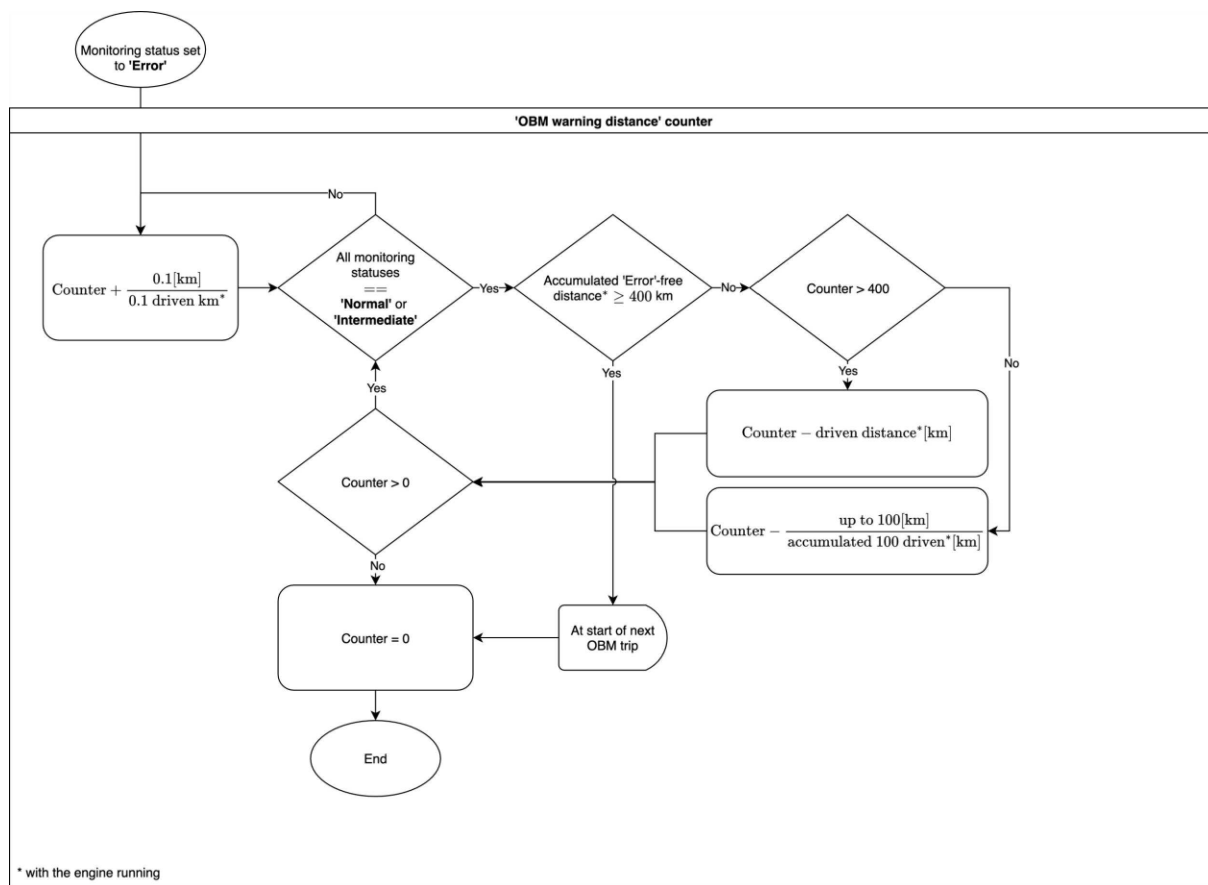


Figure 3

Inducement method to facilitate repairs

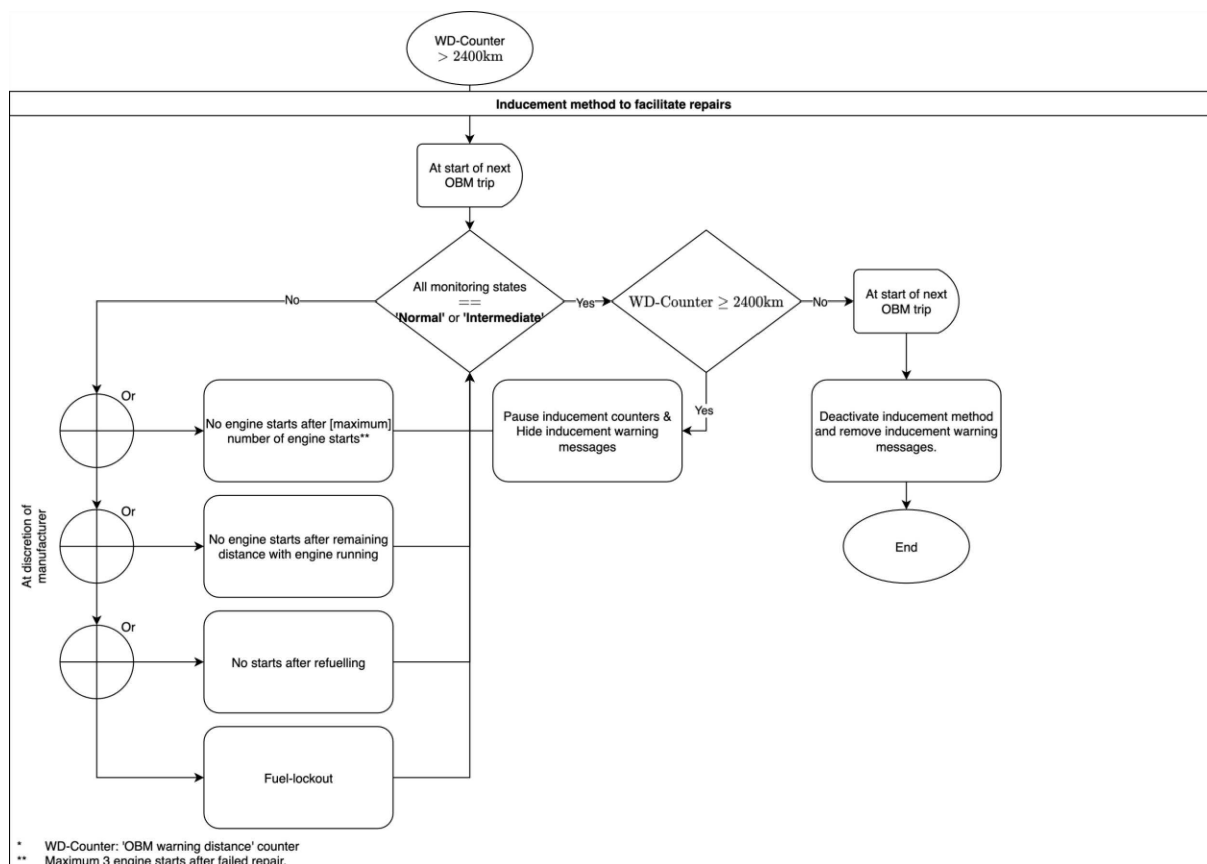


Figure 4

Operation of 'OBM distance since monitoring status reset' and 'OBM warning distance – lifetime' counters

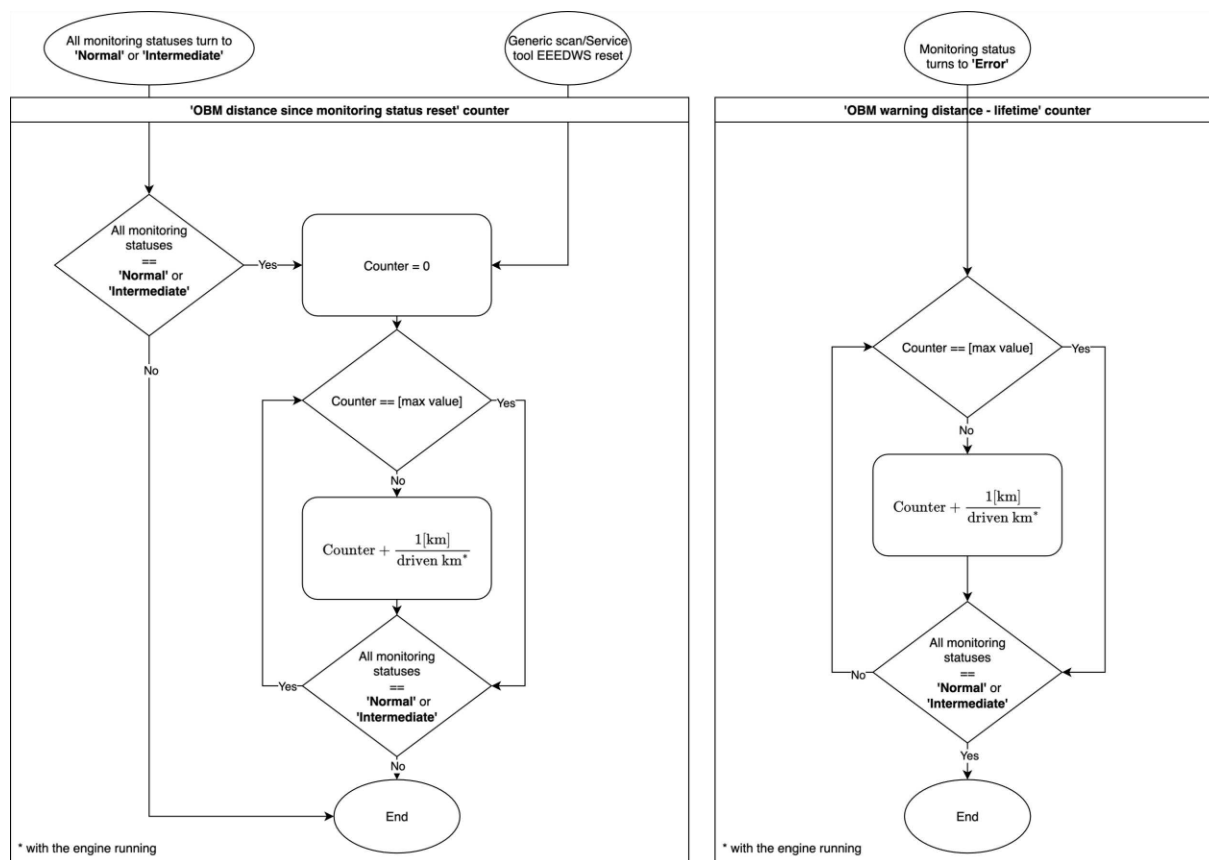
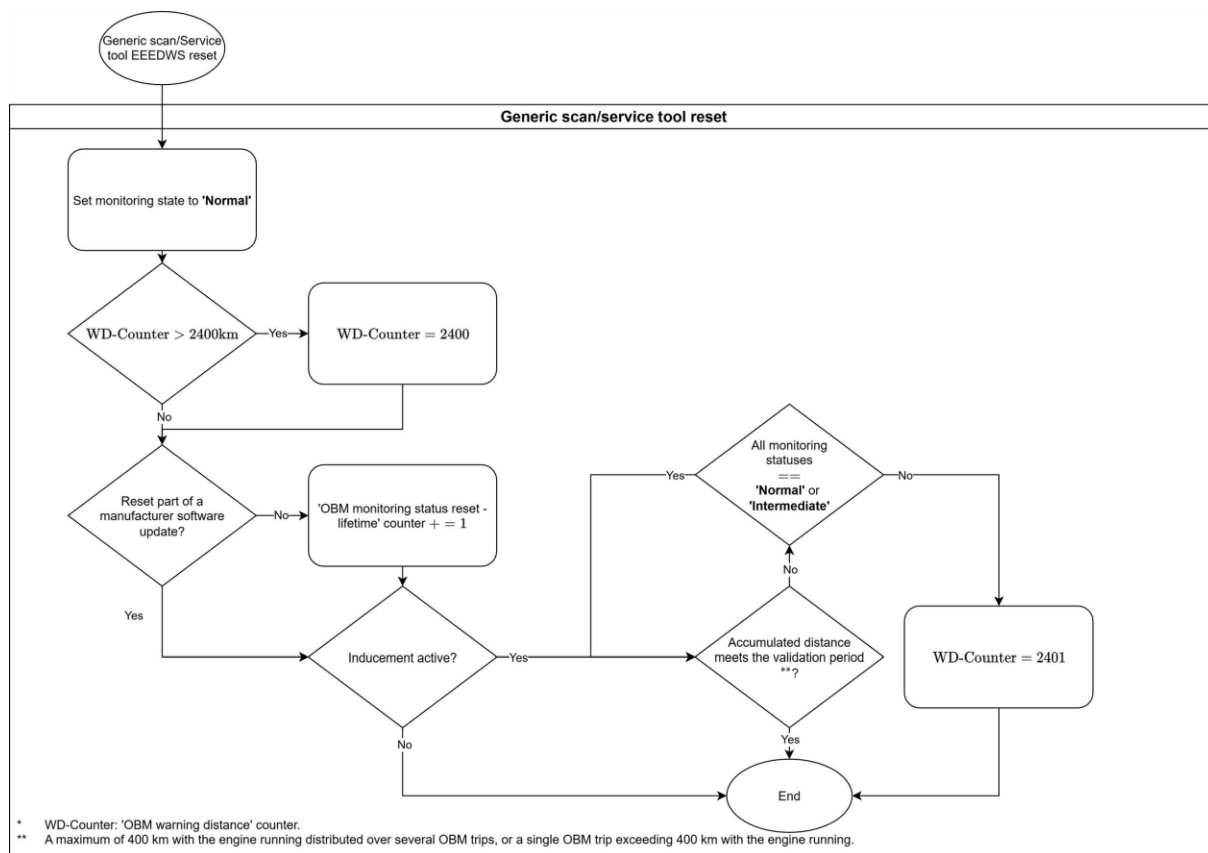


Figure 5

OBM reset using a generic scan tool / service tool

ANNEX III

DECLARATION OF COMPLIANCE

1. **Introduction**

- 1.1. This annex sets out the requirements for providing and formatting the Declaration of Compliance with OBM, EVP and in-vehicle display of environmental data requirements.
- 1.2. Templates for the Declaration of Compliance and the related demonstration form are found in Appendix 1 and Appendix 2, respectively.

2. **Attribution of OBM family identifier**

- 2.1. Manufacturers shall define OBM families and attribute a unique OBM family identifier.
- 2.2. Each of the OBM families shall be attributed a unique identifier using the following format:

OM-nnnnnnnnnnnnnnn-WMI

where:

- (a) 'nnnnnnnnnnnnnnnn' is a string with a maximum of fifteen characters, restricted to using the characters 0-9, A-Z and the underscore character '_'.
 - (b) 'WMI' (world manufacturer identifier) is a code that identifies a manufacturer in a unique manner defined in ISO 3780:2009.
- 2.3. The WMI owner shall ensure (i) that the combination of the string 'nnnnnnnnnnnnnnnn' and the WMI is unique to the OBM family; and (ii) that the string 'nnnnnnnnnnnnnnnn' is unique within that WMI.
 - 2.4. Small-volume manufacturers shall attribute OBM family identifiers and use the declaration format in Appendix 1 for the purposes of declaring compliance with EVP and in-vehicle display of environmental data requirements.

3. **Attribution of OBM declaration number**

- 3.1. Manufacturers shall attribute a unique declaration number to each Declaration of Compliance according to Appendix 1 using the following format:

OM-nnnnnnnnnnnnnnn-WMI/xxxx

where:

- (a) *OM-nnnnnnnnnnnnnnn-WMI* is the OBM family identifier of the OBM family covered by the declaration.
 - (b) *xxxx* is the sequential number starting at 0000 for the first declaration, which is increased with every update of the declaration.
- 3.2. The Manufacturer shall supply the applicable OBM declaration number in each declaration and its updates as shown in Appendix 1.

4. **Supply of OBM family identifiers**

- 4.1. The OBM family identifier shall be supplied as follows:
 - 4.1.1. Affixed in the header of the Declaration of Compliance as shown in Appendix 1. Any new OBM family should give rise to a 'first declaration' by the manufacturer as shown in Appendix 1.
 - 4.1.2. Included in the transparency list under point 3.2.1 of Annex II to Implementing Regulation (EU) 2025/1706.

Appendix 1

MANUFACTURER'S DECLARATION OF COMPLIANCE WITH OBM, EVP AND IN-VEHICLE DISPLAY OF ENVIRONMENTAL DATA REQUIREMENTS

- ☐ First declaration [new OBM family] ⁽¹⁾
- ☐ Update of first declaration [existing OBM family] ⁽²⁾

Submitted to the granting Type Approval Authority on: -[date]--

OBM family identifier: [.....] ⁽²⁾ - **OBM declaration number:** [.....] ⁽³⁾

(Manufacturer):

(Address of the manufacturer):

Declares that:

- (1) For the Vehicle Type(s), Family(ies) or other vehicle descriptor(s) ⁽⁴⁾ listed in Annex II to this declaration are in compliance with the Regulation (EU) 2024/1257 and its implementing legislation relating to OBM, EVP and in-vehicle display of environmental data;
- (2) The OBM information documentation in Annex III to this declaration describing the detailed technical criteria attached to this declaration is correct and complete for all vehicles to which this declaration applies; Annex IV to this declaration lists any exemptions applicable to these vehicles related to the OBM provisions laid down in Implementing Regulation (EU) 2025/1707;
- (3) A simple demonstration of the functioning of the OBM has been performed with the granting type approval authority as described in Annex I to this declaration (workflow process), when applicable below:
- (4) ☐ first declaration [demonstration is performed, where applicable]
- (5) ☐ update of first declaration or small volume manufacturer vehicle [demonstration is not applicable]:
(please mention which situation is applicable, i.e.: update, small-volume manufacturer or other(s))
- (6) Applicable Emission sub-character(s) are the following (see table 3 of Appendix 6 of Annex I to Commission Implementing Regulation (EU) 2025/1706:
- (7) ☐ first declaration: ⁽⁵⁾
- (8) ☐ update of first declaration: ⁽⁶⁾

Done at [..... Place ⁽⁷⁾]

On [..... Date]

[Name and signature of Person authorised by the Manufacturer or Manufacturer's Representative ⁽⁸⁾]

⁽¹⁾ To be completed by manufacturer - Delete what is not applicable. Complete if necessary.

⁽²⁾ To be completed by manufacturer - Delete what is not applicable. Complete if necessary.

⁽³⁾ To be completed by manufacturer - Delete what is not applicable. Complete if necessary.

⁽⁴⁾ To be completed by granting type-approval authority.

⁽⁵⁾ Emission character(s) to be inserted on this line.

⁽⁶⁾ Emission character(s) to be inserted on this line (should be identical to the information provided as part of the corresponding "first declaration").

⁽⁷⁾ Established in the Union.

⁽⁸⁾ 'Manufacturer's representative' means any natural or legal person established in the Union who is duly appointed by the manufacturer to represent the manufacturer before the type-approval authority or the market surveillance authority and to act on the manufacturer's behalf in matters covered by the Regulation, as defined in Article 3(41) of Regulation (EU) 2018/858.

Attachments:

Annex I: Completed Demonstration Form (see Appendix 2 to Annex III of Implementing Regulation (EU) 2025/1707

Annex II: List of Vehicle Type(s), Family(ies) or other vehicle descriptor(s) to which this declaration applies, and which constitute the OBM family, with indication of applicable sub-characters in accordance with Commission Implementing Regulation (EU) 2025/1706, Annex I, Appendix 6, Table 3

Annex III: Additional OBM documentation

Annex IV: list of any exemptions applicable to these vehicles related to the OBM provisions laid down in this Regulation

Appendix 2

DEMONSTRATION FORM

SIMPLE DEMONSTRATION OF THE FUNCTIONING OF THE OBM SYSTEM WORKFLOW DESCRIPTION AND STEPS

1. Preliminary steps and conditions for the simple demonstration of the functioning of the OBM system:

- ☐ the demonstration is based on a single OBM trip.
- ☐ the demonstration is performed on a vehicle that is free of faults or tampering that prevent adequate emissions control or monitoring and justify a repair.
- ☐ the demonstration is performed on a vehicle that is covered by the declaration referred to in Article 12(1) and included in Appendix 1 to Annex III.

2. The demonstration covers the verification of the functionality of the following elements:

- ☐ the OBM system provides unrestricted access to OBM data stored in the vehicle and to time-resolved nitrogen oxides (NO_x) emissions signals and other auxiliary signals to support emissions testing from the vehicle's standard OBD port according to Article 10 of Implementing Regulation (EU) 2025/1707.
- ☐ the EEEDWS has assigned the OBM monitoring status of NO_x and particulate matter (PM) in accordance with Article 4(1)(a) of Implementing Regulation (EU) 2025/1707.
- ☐ the OBM system has performed the evaluation of exhaust emissions of NO_x at the end of an OBM trip, with no accuracy requirements verified at the time of demonstration.

3. The demonstration is not applicable ⁽¹⁾:

- ☐ Small-volume manufacturer exemption (Article 8 of Regulation (EU) 2024/1257).
- ☐ Update of existing declaration.

⁽¹⁾ If the box below is ticked, points 1 and 2 should not be completed.

ANNEX IV

METHODS FOR IN-SERVICE CONFORMITY CHECKS AND MARKET SURVEILLANCE OF OBM SYSTEMS

This Annex sets out the in-service conformity (ISC) methodology for checking the conformity of the NO_x and PM emissions monitoring performed by OBM systems, and market surveillance methods for the verification of compliance with the general requirements of OBM systems.

PART A

In-service conformity checks of OBM systems

1. INTRODUCTION

- 1.1. In-service conformity checks of OBM systems shall ensure that the OBM system present in a sample of vehicles belonging to the same OBM family as defined in point 2 performs calculations of distance-specific emissions of NO_x with reasonable accuracy and that no systematic underestimation of emissions occurs.
- 1.2. In-service conformity checks shall also ensure that OBM systems are capable of detecting exceedances of at least 2,5 times the relevant exhaust emission limit values set out in Annex I of Regulation (EU) 2024/1257 for both NO_x and PM.
- 1.3. In-service conformity checks shall be performed by vehicle manufacturers and granting type-approval authorities.
- 1.4. In-service conformity checks may be performed by the Commission and recognised third parties.
- 1.5. In-service conformity checks shall have no minimum frequency requirements.

2. OBM FAMILY DEFINITION

- 2.1. For the purposes of in-service conformity testing of OBM systems, an OBM family shall consist of vehicles that are covered by the same declaration of compliance in accordance with Annex III.

3. VEHICLE SELECTION CRITERIA AND ELIGIBILITY FOR TESTING

- 3.1. The granting type-approval authority and other relevant entities shall collect necessary information to determine which OBM families to check. Anonymous OBM data submitted by manufacturers to authorities according to Article 11 shall be considered.
- 3.2. In-service conformity checks of OBM systems shall be performed for a period of up to 200 000 km or 10 years, whichever comes first.
- 3.3. In addition to the eligibility criteria for in-service conformity checks from Article 14, the applicable technical vehicle selection criteria will be those laid out in Annex II to Implementing Regulation (EU) 2025/1706.

4. OBM IN-SERVICE CONFORMITY TESTS

- 4.1. The in-service conformity checks of OBM systems shall be performed by means of a laboratory or on-road emissions test. For on-road tests with PEMS equipment, the validation procedure laid down in Annex 6 of UN Regulation No 168 shall be followed.
- 4.2. The tests shall be performed in such a manner that the emissions and distances covered by the emissions test and the corresponding OBM trip are the same.

- 4.3. The checks shall be performed on a sample of vehicles belonging to the same OBM family, and the results shall be evaluated according to the evaluation method described in paragraph 5. Each vehicle tested shall contribute, at most, two results to the verification described in paragraph 5.1 and two results to the verification described in paragraph 5.2 (one result for PM and one result for NOx).
- 4.4. In-service conformity checks of OBM systems shall be conducted in parallel with the ISC tests for verifying compliance with tailpipe emission limits, as outlined in Annex II to Implementing Regulation (EU) 2025/1706. The same emissions test (RDE or Type 1) shall support both testing methodologies.
- 4.5. As an alternative method, the in-service conformity checks of OBM systems according to paragraph 1.1 may be performed using any on-road trip longer than 40 minutes and 20 kilometres which complies with the ambient and dynamic trip conditions laid down in points 8.1 and 8.2 of UN Regulation No 168, with a maximum speed of 160 km/h. If a part of the test or the entire test is performed outside of extended conditions, or if the maximum speed is exceeded, the test shall be considered invalid.
- 4.6. A vehicle with at least one monitoring status of exhaust emissions set to 'Intermediate' prior to testing shall undergo a pre-conditioning procedure. During this pre-conditioning, the vehicle shall be driven for at least 40 minutes and 20 kilometres with the internal combustion engine running. The pre-conditioning shall include at least 5 consecutive minutes in which the vehicle shall be driven with a velocity of 90 km/h or higher. After preconditioning, the powertrain shall be deactivated, and all the monitoring statuses of exhaust emissions shall be read. Vehicles shall be eligible for ISC testing if none of the monitoring statuses is set to 'Error'.
- 4.7. A vehicle with an 'OBM distance since monitoring status reset' (parameter 1.51 of Annex I) value of less than 400 km shall undergo pre-conditioning as described in paragraph 4.6 until this parameter exceeds 400 km.

5. EVALUATION OF TEST RESULTS

- 5.1. The results of the emissions test shall be used to check the accuracy of the calculation of distance-specific exhaust emissions of NOx performed by the OBM system according to Article 6.
- 5.2. If the results of the emission test are equal or greater than 2,5 times the relevant exhaust emission limit values set out in Annex I of Regulation (EU) 2024/1257 for either NOx or PM, the results of the emissions test shall be used to verify that the OBM system can detect such exceedances. This verification shall not apply to tests performed using the alternative method described in paragraph 4.6.
- 5.3. At the end of the emissions test, the value reported by the OBM system for the 'Distance-specific NOx' for the OBM trip (parameter 2.5 of Annex I) and the distance-specific NOx emissions value for the trip as measured by the emissions laboratory or PEMS equipment shall be recorded and compared.
- 5.4. The distance-specific NOx emissions value for the trip as measured by PEMS equipment shall be calculated by dividing the cumulated NOx mass emissions over the trip by the total trip distance. The PEMS margin correction from paragraph 4 of Annex 11 to UN Regulation No 168 and the corrections from paragraph 5 of Annex 7 to the same Regulation shall apply.
- 5.5. Neither the value from the OBM system nor the value measured by the emissions laboratory or PEMS equipment shall be modified by any other correcting factors.

6. STATISTICAL PROCEDURE FOR OBM IN-SERVICE CONFORMITY

- 6.1. Prior to the performance of the first OBM ISC test for an OBM family, the manufacturer, accredited laboratory or technical service ('party') shall notify the intent of performing in-service conformity testing of a given OBM family to the granting type-approval authority. Upon this notification, the granting type-approval authority shall open a new statistical folder to process the results for the OBM family to process the results for that particular party or that pool of parties.

- 6.2. Test results from two or more accredited laboratories or technical services may be pooled for the purposes of a common statistical procedure.
- 6.3. The pooling of test results shall require the written consent from all the interested parties providing test results to a pool of results, and a notification to the granting type-approval authority prior to the start of testing.
- 6.4. One of the parties pooling test results shall be designated as leader of the pool and be responsible for data reporting and communication with the granting type-approval authority.
- 6.5. The sample size in a statistical folder shall be ten vehicles.

7. COMPLIANCE ASSESSMENT

- 7.1. The decision regarding the compliance of an OBM family according to paragraphs 1.1 and 1.2 shall be made according to Appendix 1.
- 7.2. The decision regarding the compliance of an OBM family according to paragraph 1.1 shall be made every time that the sample size is reached, and the number of vehicles in the sample shall be reset to zero thereafter.
- 7.3. The decision regarding the compliance of an OBM family according to paragraph 1.2 shall be made when the emissions test result is equal or greater than 2,5 times the applicable emission limit for PM or NOx.
- 7.4. The durability multipliers for adjusting exhaust emission limits under Annex 1 of Regulation (EU) 2024/1257 shall apply during additional lifetime.

8. REPORTING, CORRECTIVE AND ADMINISTRATIVE MEASURES

- 8.1. If an OBM family is found to be non-compliant, type-approval authorities shall require the manufacturer to take measures in accordance with Chapter XI of Regulation (EU) 2018/858. The granting type-approval authority may extend the investigations to vehicles in service of the same manufacturer belonging to other ISC families with the same OBM system which are likely to be affected by the same non-compliance.
- 8.2. The OBM system compliance testing shall be part of the annual report by the granting type-approval authority.

PART B

Market surveillance of OBM systems

9. INTRODUCTION

- 9.1. OBM market surveillance checks shall ensure that the OBM system of vehicles placed in the market complies with the general requirements laid out in Articles 3 to 10.
- 9.2. Market surveillance tests of OBM systems shall have no minimum frequency requirements.

10. VEHICLE SELECTION CRITERIA AND ELIGIBILITY FOR TESTING

- 10.1. Market surveillance authorities shall select the vehicles to be tested based on a risk assessment. They shall consider anonymous OBM data submitted from manufacturers to authorities.

10.2. Market surveillance tests shall be performed for as long as vehicles are in use.

11. COMPLIANCE ASSESSMENT

11.1. Market surveillance authorities shall perform an assessment of compliance of vehicles with the general requirements of OBM systems and of the EEEDWS.

11.2. As part of this verification of general requirements, market surveillance authorities shall verify the integrity of OBM data from its production to its submission by the vehicle manufacturer. This verification may be performed by tracing OBM datasets from selected test trips by means of their hash values, or through other appropriate methods.

12. REPORTING, CORRECTIVE AND ADMINISTRATIVE MEASURES

12.1. If an OBM family is found to be non-compliant, market surveillance authorities shall proceed in accordance with Chapter XI of Regulation (EU) 2018/858.

12.2. The market surveillance authority may extend the investigations to vehicles in service of the same manufacturer belonging to other OBM families with the same OBM system which are likely to be affected by the same non-compliance.

Appendix 1

Compliance criteria for an OBM family**1. Compliance criteria according to Part A, paragraph 1.1**

Where 10 pairs of a distance-specific NOx emissions value from an emission test and a 'Distance-specific NOx' value for the corresponding OBM trip are available, the compliance of the OBM family with the accuracy requirements for the calculation of distance-specific exhaust emissions of NOx can be established based on the differences between the pairs.

If an emissions test result is equal or greater than 2,5 times the applicable emission limit for PM or NOx, or if the OBM monitoring status for NOx (parameter 1.47) changes to 'Error' following the test, the distance-specific NOx emissions value from such emission test and the 'Distance-specific NOx' value for the corresponding OBM trip shall not count toward the 10 pairs for the calculation of compliance criteria described in this paragraph.

Δ shall be calculated as the average difference between the distance-specific NOx emissions from emissions test results ($NOx_{emissions,i}$) and the 'Distance-specific NOx' for the OBM trip ($NOx_{OBM,i}$) for all valid tests:

$$\Delta = \frac{1}{10} \sum_{i=1}^{10} (NOx_{emissions,i} - NOx_{OBM,i})$$

σ shall be calculated as the root-mean-square of the differences over all tests:

$$\sigma = \frac{1}{9} \sqrt{\sum_{i=1}^{10} (NOx_{emissions,i} - NOx_{OBM,i})^2}$$

The OBM family shall be compliant in the following cases:

- If Δ is equal or smaller than zero.
- If Δ is greater than zero but smaller than 30 % of the applicable NOx limit, and σ is less than 50 % of the applicable NOx limit.

In any other case, the OBM family shall be non-compliant, and the procedure of paragraph 7 shall apply.

2. Compliance criteria according to Part A, paragraph 1.2

If the emissions test result is equal or greater than 2,5 times the applicable emission limit for PM or NOx, specific compliance criteria shall apply based on the results of the single test. The results from such tests shall not be considered for compliance according to Part A, paragraph 1.1.

The OBM family shall be compliant in the following cases:

- When the emissions test result is equal or greater than 2,5 times the applicable emission limit for PM:
 - If the OBM monitoring status for PM is set to 'Error' following the OBM trip corresponding to the emissions test.
- When the emissions test result is equal or greater than 2,5 times the applicable emission limit for NOx:
 - If the OBM monitoring status for NOx is set to 'Error' following the OBM trip corresponding to the emissions test.

- If the OBM monitoring status for NO_x is not set to 'Error' after the OBM trip corresponding to the emissions test, and the difference between the distance-specific NO_x emissions measured during the emissions test and the 'Distance-specific NO_x' for the OBM trip (parameter 2.5 of Annex I) is equal to or less than 30 % of the distance-specific NO_x emissions measured during the emissions test (i.e., the OBM system does not underreport NO_x emissions during the test by more than 30 %).

In any other case, the OBM family shall be non-compliant, and the procedure of paragraph 8 shall apply.

ANNEX V

ENVIRONMENTAL VEHICLE PASSPORT**1. Introduction**

- 1.1. This Annex describes the requirements related to the environmental vehicle passport (EVP). It provides the format and data about the vehicle type to be covered, as well as the off-board communication methods for the EVP.

2. Data requirements

- 2.1. Each EVP shall include, as a minimum, the fields listed in the tables in Appendix 1 to this Annex, where applicable.
- 2.2. Where available, the EVP shall use the fields from the vehicle's certificate of conformity (CoC) referred to in Article 36(1) of Regulation (EU) 2018/858 corresponding to the field identifiers from Annex VIII of Commission Implementing Regulation (EU) 2020/683.
- 2.3. Unless otherwise specified, manufacturers shall use the same units used in the vehicle's Certificate of Conformity (CoC).

3. EVP issuance and update**3.1. Initial issuance**

- 3.1.1. Manufacturers shall issue an EVP for each vehicle and deliver it to the purchaser together with the vehicle, extracting the relevant data from sources, such as the certificate of conformity and the type-approval documentation. EVP issuance and delivery methods shall use digital means.

3.2. EVP updates

- 3.2.1. Manufacturers shall ensure that EVP data reflect updates in the relevant CoC fields.

4. Data format and off-board communication methods for the EVP**4.1. QR code requirements**

- 4.1.1. Manufacturers shall ensure that EVP data are available for display through a QR code.

- 4.1.2. The QR code shall be printed or engraved visibly, legibly, and indelibly on the vehicle. Gaining access to the QR code shall not require any disassembly. The location of the QR code shall be clearly described in the vehicle owner's information manual.

- 4.1.3. As an alternative to the requirements set out in paragraph 4.1.2, the QR code may be displayed in a suitable in-vehicle display. In that case, the QR code shall be accessible by the user through no more than five selectable screens or submenu selections from the home or default display screen.

- 4.1.4. The QR code shall be in high contrast to the background colour and of a size that is easily readable by a commonly available QR code reader, such as those integrated in hand-held communication devices.

4.2. Display and accessibility of EVP

- 4.2.1. EVP data provided through a website shall be accessible to persons with disabilities, in accordance with Directive (EU) 2019/882 of the European Parliament and of the Council.
 - 4.2.2. EVP data shall be accessible via a secure web link. The QR code referred to in paragraph 4.1 shall direct the user directly to a unique, vehicle-specific webpage or to a generic landing page allowing for interoperability with other digital product passports. When the QR code directs the user to a generic landing page, onward navigation may require users to enter the vehicle identification number (VIN) to gain access to the vehicle-specific EVP data.
 - 4.2.3. Access to EVP data shall not require additional software, user registration or the provision of any other data besides the vehicle's VIN.
 - 4.2.4. EVP data shall be available in the official languages of the Union institutions.
 - 4.2.5. EVP data may be available in other languages.
-

Appendix 1

Environmental vehicle passport parameters

Table 1

General vehicle information

Parameter	CoC field identifier
Approval Certificate number	0.11 (b).
Date approval granted	0.11 (b).
Make (Trade name of manufacturer)	0.1.
Vehicle Identification Number (VIN)	0.10.
Date of manufacture of the vehicle	0.11.
Commercial name	0.2.1.

Table 2

Vehicle family identifiers

Parameter	CoC field identifier
PEMS family identifier	0.2.3.3.
OBM family identifier	Reserved
Battery durability family identifier	Reserved

Table 3

Powertrain data

Parameter	CoC field identifier
Maximum net power (internal combustion engine)	27.1.
Maximum net power (electric motor)	27.3.

Table 4

Pollutant emissions data

Parameter	CoC field identifier
(WLTP highest values) CO, NO _x , NMHC, THC, THC+NO _x , Particles (mass), Particles (number)	48.

Table 5

CO₂ emissions /fuel consumption /electrical energy data

Description	CoC field identifier
CO ₂ emissions/fuel consumption/electric energy consumption, WLTP values (Low, Medium, High, Extra high, and Combined)	49.1.
Electric range of pure electric vehicles Electric range	49.2.
Charge sustaining CO ₂ emissions/fuel consumption of OVC-HEV: WLTP values (Low, Medium, High, Extra high, City, Combined)	49.4.
Charge depleting CO ₂ emissions/fuel consumption of OVC-HEV: WLTP values (Combined)	
Electric consumption of OVC-HEV: WLTP values (Low, Medium, High, Extra high, City, Combined)	
CO ₂ emissions/fuel consumption/electric consumption of OVC-HEV: WLTP values (Weighted, combined)	
Equivalent range of OVC-HEV: Equivalent All electric Range	49.5

ANNEX VI

IN-VEHICLE DISPLAY OF ENVIRONMENTAL DATA

1. Methods for in-vehicle display of environmental data

- 1.1. Environmental data shall be accessible by the user through no more than five selectable screens or submenu selections from the home or default display screen. Screens used to separate EVP data as pages or tabs shall not be counted for the five selectable screens or submenu.
- 1.2. Environmental data shall be displayed with appropriate resolution and in the applicable units in accordance with Appendix 1.
- 1.3. Where the specification of the vehicle does not include a display suitable for displaying the environmental data, manufacturers shall make environmental data available via a suitable alternative method, including an off-board application to be installed in hand-held communication devices linked to the vehicle systems via appropriate methods. Data available through the alternative method shall be the same data that would be displayed through an in-vehicle display and follow the same display methods.
- 1.4. When using the alternative method, the manufacturer shall maintain the alternative method for 20 years after the date of manufacture of the vehicle.
- 1.5. In addition to the parameter names listed in Appendix 1, manufacturers may support the presentation of data parameters to the user in addition to numeric values, using suitable info graphics or pictograms. Manufacturers may use modified names for the parameters listed in Appendix 1 to facilitate their display.
- 1.6. Environmental data shall be available in the same languages that are used for the vehicle interface.

2. Parameters to be displayed inside the vehicle

- 2.1. The parameters listed in Appendix 1 to this Annex shall be made available to the vehicle user using an appropriate in-vehicle display.
- 2.2. Where a direct correspondence between a parameter from Appendix 1 and a parameter that is calculated by the OBM system or the OBFCM device, the appropriate reference is indicated in the tables of Appendix 1.
- 2.3. Where special rules apply to the calculation or display of certain parameters, these are specified in paragraphs 2.5 to 2.10.
- 2.4. Parameters not applicable to the powertrain type installed in the vehicle may be omitted from in-vehicle display. Vehicles not equipped with an OBM system or OBFCM device may omit the display of the relevant parameters.

2.5. Lifetime NOx exhaust emissions

- 2.5.1. The lifetime NOx value displayed to the user shall be calculated by dividing the parameter 'NOx mass (lifetime)' (Annex I, parameter 3.1) by the parameter 'Total distance travelled – OBM (lifetime)' (Annex I, parameter 3.4). The units shall be converted to mg/km:

$$\text{Lifetime NOx exhaust emissions (mg/km)} = \frac{\text{NOx mass (lifetime)(kg)} * 10^6}{\text{Total distance travelled – OBM (lifetime)(km)}}$$

2.6. Lifetime fuel consumption values

- 2.6.1. The lifetime fuel consumption value displayed to the user shall be calculated based the 'Total fuel consumed – (lifetime)' parameter ((Annex I, parameter 3.2) and the Total distance travelled – OBFCM (lifetime) (Annex I, parameter 3.3).

$$\text{Lifetime fuel consumed (l/100km)} = \frac{\text{Total fuel consumed – (lifetime)(l)}}{(\text{Total distance travelled – OBFCM(lifetime)/100})(km)}$$

2.7. Lifetime electrical energy consumption values

- 2.7.1. The lifetime electrical energy consumption value displayed to the user shall reflect the energy consumed by the vehicle, including that used for non-propulsion purposes in units of kWh/100 km.

- 2.7.2. Example: the lifetime electrical energy consumption displayed to the user may be calculated based on 'Energy storage total accumulated energy throughput (lifetime)', (Annex I, parameter 5.11), the 'Total discharge energy in V2X [kWh] (lifetime)' (Annex I, parameter 5.9) and 'Current battery lifetime distance' (Annex I, parameter 5.3) values.

$$\text{Lifetime electrical energy consumption (kWh/100km)} = \frac{\text{Energy storage total accumulated energy throughput (lifetime)(kWh)} - \text{Total discharge energy in V2X [kWh] (lifetime) (kWh)}}{(\text{Current battery lifetime distance/100})(km)}$$

- 2.7.3. When the vehicle employs technologies such as battery swapping capabilities that may affect the calculation of the lifetime electrical energy consumption values, manufacturers shall make appropriate calculations to ensure lifetime electrical energy consumption values shown to the user reflect the energy consumption consumed by the vehicle.

2.8. Last trip NOx exhaust emissions

- 2.8.1. The last trip NOx exhaust emissions displayed to the user shall be derived from the 'Distance specific NOx', parameter (Annex I, parameter 2.5). The data displayed shall represent the value as defined in Annex I paragraph 2.7.

- 2.8.2. When the applicable 'OBM trip distance' is less than 10 km, the values used may be displayed in mg.

2.9. Last trip fuel consumption

- 2.9.1. The last trip fuel consumption displayed to the user shall be derived from the 'Fuel consumed volume – OBM trip', parameter (Annex I, parameter 2.6) and the 'OBM trip distance' parameter (Annex I, parameter 2.2).

$$\text{Last trip fuel consumption (l/100km)} = \frac{\text{Fuel consumed volume – OBM trip (l)}}{(\text{OBM trip distance/100})(\text{km})}$$

- 2.9.2. When the applicable 'OBM trip distance' is less than 10 km, the values used may be displayed at the manufacturer's discretion in non-distance specific units (l).

2.10. Last trip electrical energy consumption

- 2.10.1. The last trip electrical energy consumption displayed to the user shall be derived from the 'Net electrical energy consumed – OBM trip', parameter (Annex I, parameter 2.7) and the 'OBM trip distance'. parameter (Annex I, parameter 2.2).

$$\text{Last trip electrical energy consumption (kWh/100 km)} = \frac{\text{Electrical energy consumption (kWh)}}{(\text{OBM trip distance/100})(\text{km})}$$

- 2.10.2. When the applicable 'OBM trip distance' is less than 5 km, the values used may be displayed at the manufacturer's discretion in non-distance specific units (kWh).

Appendix 1

Parameters to be displayed inside the vehicle

Table 1

Lifetime data

Parameter	Reference	Unit	Resolution
Lifetime NOx exhaust emissions	Annex VI, paragraph 2.5	mg/km	1
Lifetime fuel consumption ⁽¹⁾	Annex VI, paragraph 2.6	l/100 km ⁽¹⁾	0,1
Lifetime electrical energy consumption ⁽¹⁾	Annex VI, paragraph 2.7	kWh/100 km ⁽¹⁾	0,1
Virtual distance V2X	Annex I, parameter 5.4	km	1
Traction battery state of health (SOCE)	Annex I, parameter 5.1	%	1

Table 2

Recent trip data

Parameter	Reference	Unit	Resolution
Last trip NOx exhaust emissions	Annex VI, paragraph 2.8	mg/km	1
Last trip fuel consumption ⁽¹⁾	Annex VI, paragraph 2.9	l/100 km ⁽¹⁾	0,1
Last trip electrical energy consumption ⁽¹⁾	Annex VI, paragraph 2.10	kWh/100 km ⁽¹⁾	0,1

Table 3

Euro 7 NOx exhaust emission limit

Parameter	Reference	Unit
NOx emission limit	Table 1 of Annex I to Regulation (EU) 2024/1257	mg/km

Notes

- (1) Under 'Lifetime fuel consumption', 'Last trip fuel consumption', 'Lifetime electrical energy consumption' and 'Last trip electrical energy consumption', manufacturers may provide users with the option to display these parameters in appropriate alternative units including mpg, km/l, km/kWh.

ANNEX VII

MANIPULATION DEVICES AND MANIPULATION STRATEGIES**1. INTRODUCTION**

- 1.1. This Annex specifies the documentation that ensures the proper monitoring and enforcement of rules related to manipulation devices and manipulation strategies. It aims to strengthen emissions control mechanisms, enhance transparency, and ensure that vehicles comply with regulatory requirements. It provides specifications for methodologies, tests and procedures that relate to data integrity, such as manipulation of data related to sensors, fuel or electric energy consumption, electric range or battery durability. In particular, this Annex covers manipulation devices and manipulation strategies related to OBM, OBFCM, OBD, EVP and any other data integrity related aspects under this Regulation.
- 1.2. Specifications for tests, methods and procedures that relate to exhaust and evaporative emissions are provided for in Implementing Regulation (EU) 2025/1706.

2. GENERAL REQUIREMENTS

- 2.1. Referring to the provisions of Articles 3(41) and 3(42) of Regulation (EU) 2024/1257, (i) manipulation devices and manipulation strategies related to emissions (exhaust, evaporative or other); and (ii) manipulation devices and manipulation strategies related to data integrity should be distinguished.
- 2.2. Manufacturers shall not introduce software or calibration updates that manipulate data related to sensors, fuel or electric energy consumption, electric range or battery durability. The handling of such data in the manner required by Regulation (EU) 2024/1257 and its implementing acts shall not constitute manipulation.
- 2.3. Manufacturers shall disclose any software and calibration updates affecting the integrity of data related to sensors, fuel or electric energy consumption, electric range or battery durability to the granting type-approval authority.
- 2.4. Manufacturers shall ensure that all data reported to regulators and consumers accurately reflects in-use performance.
- 2.5. Manufacturers shall not manipulate data from the OBM systems or OBFCM devices before submission to authorities or dissemination to other parties. The handling of such data in the manner required by Regulation (EU) 2024/1257 and its implementing acts shall not constitute manipulation.
- 2.6. Manufacturers shall ensure transparent communication and technical cooperation with type-approval authorities and provide any necessary clarification regarding OBM and OBFCM data. Manufacturers shall address any questions or concerns raised by the type-approval authorities in a timely and transparent manner.

3. TECHNICAL REQUIREMENTS – DOCUMENTATION

- 3.1. Manufacturers shall provide all relevant information and documentation that relate to data integrity, including as regards manipulation of data related to sensors, fuel or electric energy consumption, electric range or battery durability as part of the Documentation Package (Formal Documentation Package and Extended Documentation Package) that is described in Appendix 2 of Annex IV to Commission Implementing Regulation (EU) 2025/1706.

4. ROLES AND RESPONSIBILITIES

- 4.1. Roles and responsibilities of manufacturers

- 4.1.1. Manufacturers shall comply with general and technical requirements as well as with documentation requirements of this Annex to ensure the absence of manipulation devices and manipulation strategies related to emissions under the scope of this Regulation at the stage of the type-approval and market surveillance during the lifetime of the vehicle. They shall cooperate with type-approval authorities and market surveillance authorities.
 - 4.2. Roles and responsibilities of type-approval authorities
 - 4.2.1. Type-approval authorities shall cooperate with market surveillance authorities and facilitate type-approval documentation and support market surveillance authorities in the performance of their duties, as appropriate.
 - 4.2.2. Type-approval authorities shall monitor data collected from On-Board Monitoring (OBM) systems and On-Board Fuel Consumption Monitoring (OBFCM) devices to identify any potential errors, inconsistencies, or indications of data integrity issues. Where concerns arise, type-approval authorities shall engage with manufacturers, request clarifications or corrective actions as necessary, and ensure that any identified discrepancies are addressed.
 - 4.3. Roles and responsibilities of market surveillance authorities
 - 4.3.1. Market surveillance authorities may conduct periodic screening tests to detect manipulation devices and manipulation strategies related to data integrity.
 - 4.3.2. If a manipulation device or strategy related to data integrity is identified, market surveillance authorities shall proceed in accordance with Chapter XI of Regulation (EU) 2018/858.
-