

## Appendix 6: Regulations Governing Diesel Vehicles Equipped with OBD Systems

### 1. Definitions

- 1.1 Malfunction: When deterioration or failure of the vehicle's air pollution control equipment and related components results in pollution emissions failing to meet OBD control standards.
- 1.2 Malfunction simulation: Use of deteriorated or ineffective pollution prevention equipment and related components or electronic simulators to simulate the failure of equipment or components in the test project.
- 1.3 Malfunction indicator: The light indicator used to inform the vehicle driver of any failure in components or related equipment, detected by the OBD.
- 1.4 Continuous monitoring: Monitoring circuit continuity (e.g. lack of circuit continuity, circuit malfunction, and values exceeding normal operating values).
- 1.5 Driving Cycle: The vehicle driving process required for an OBD system to perform a comprehensive diagnostic assessment of air pollution control equipment and related components. This includes engine start-up, operation, a period of driving, followed by engine shutdown, and sufficient idle time before the next engine start. Any malfunctions occurring during this driving cycle should be diagnosed.

### 2. Functions and related testing items for OBD shall comply with the following provisions:

- 2.1 The OBD system shall be able to monitor and perform a periodical assessment of emission control equipment and related components. The frequency shall be one OBD monitoring assessment completed for each driving cycle.
- 2.2 The vehicle shall be equipped with a standardized OBD Malfunction Indicator Light (MIL) and malfunction code storage capability, and allow reading of malfunction codes via a connector. Said components and functions shall meet the relevant standards.
- 2.3 The OBD system shall perform a monitoring assessment of the pollution-related system or components, unless there is a likelihood of damage to the air pollution control equipment and related components, or any safety concerns, or the power take-off units are running.
- 2.4 OBD testing shall be performed on a test engine or vehicle that has completed the durability testing or the equivalent deterioration testing. In the case of a new vehicle, deterioration factors shall be applied to the new vehicle's OBD test results as the final OBD test results.
- 2.5 The applicant shall submit an OBD test plan pursuant to this Appendix. The applicant shall submit the same to the inspection organization for confirmation, and then the OBD test may be

performed only upon approval of the central competent authority.

The OBD test plan shall include the following items:

- 2.5.1 Unit conducting the test (including proof documents of its capability to perform a malfunction simulation and OBD tests).
  - 2.5.2 Test procedure, including flowchart and schedule for the malfunction simulation test.
  - 2.5.3 Test vehicle and description of vehicle configuration covered by the OBD family.
  - 2.5.4 Description of OBD test items, test equipment and methods for malfunction simulation.
  - 2.5.5 For the OBD related proof documents, please refer to the descriptions in paragraph 3.12 of Appendix 1 or paragraph 14 of Appendix 2.
  - 2.5.6 Other required supplemental documents.
- 2.6 The vehicle configurations produced by the same vehicle manufacturer with identical engine characteristics, emission control system, OBD monitoring functions and monitoring strategies may be categorized as the same OBD family. The test results of the representative vehicle with the highest emissions shall be taken as the test results for the OBD family.
- 2.7 Applicants who file applications not based on the engine family or file applications via an association of importers are allowed to perform at least one OBD circuit continuity test in the following manner.: The said circuit continuity test refers to the malfunction simulation for the specified items to be tested before the main test, in order to verify that the MIL, malfunction codes and freeze information comply with the OBD specifications during and after the main test. The simulation items may be the continuous monitoring emission control devices or systems. The main test shall comply with the following basic provisions:
- 2.7.1 After completion of the malfunction simulation, the engine shall be started 3 times consecutively, each time operating for at least 30 seconds; after the engine starts to operate, the engine shall be switched off and restart again. When the engine is in operation condition, with the consent of the central competent authority, the test vehicle may perform necessary test cycles.
  - 2.7.2 After the test is completed, the MIL must be verified to be operating and the malfunction codes verified to be consistent with the relevant simulation items, and the freeze data shall be recorded.
3. The threshold limits, scope, items, and In-Use Performance Ratio (IUPR) of the OBD system shall comply with the following provisions:

3.1 The OBD threshold limits are set as follows:

3.1.1 For light-duty commercial or passenger vehicles tested on a chassis dynamometer using the NEDC or WLTC driving cycle, the applicable OBD threshold limits (OTL) are as follows:

Category		CO mg/km	NMHC mg/km	NO <sub>x</sub> mg/km	PM mg/km
M1	GVW ≤ 3500 kg	1750	290	140	12
N1	RW ≤ 1305 kg	1750	290	140	12
	1305 kg < RW ≤ 1760 kg	2200	320	180	12
	1760 kg < RW	2500	350	220	12

3.1.2 For Heavy-Duty Diesel Engine Buses and Trucks tested on an engine dynamometer using the ETC or WHTC cycle, the OBD threshold limits are as follows:

Category		NO <sub>x</sub> OTL (mg/kWh)	PM OTL (mg/kWh)	Reagent quality and consumption NO <sub>x</sub> (mg/kWh)
HD Buses and Trucks	Trucks with GVW over 3500 kg or buses with more than 10 seats	1200	25	460

3.1.3 For deterioration/malfunction simulation test results, if the emission values for each pollutant exceed the applicable OBD threshold limits by no more than 120% of the applicable OBD threshold limits, the vehicle shall be deemed qualified.

3.2 OBD monitoring items and scope:

Prior to performing the following OBD monitoring item tests, the applicant shall confirm that the test vehicle complies with the applicable Emission Standards. The central competent authority may designate specific items for the applicant to conduct for the test:

3.2.1 Application for Light-Duty commercial or passenger vehicle Certificate of Conformity:

During new vehicle type approval stage, at least five OBD monitoring items shall be tested, which include the Catalytic Converter, Diesel Particulate Filter, Fuel-Injection System, and the deNO<sub>x</sub> and Diesel Particulate Filter combined system and other emission control systems or components.

3.2.1.1 Catalytic Converter: The system should be able to monitor the reduction in efficiency of catalytic converters in vehicles. The OBD must be able to detect deterioration or malfunction of the catalytic converter before tailpipe emissions exceed OBD threshold limits.

3.2.1.2 Particulate Filter: For vehicles equipped with a particulate

filter, the system should be able to monitor the functionality, integrity and reduction in efficiency of the particulate filter. The OBD must be able to detect deterioration or malfunction of the particulate filter before tailpipe emissions exceed OBD threshold limits.

3.2.1.3 Fuel Injection System: The fuel injection system's electronic fuel quantity and timing actuator(s) are monitored for circuit continuity and total functional failure. The system must be able to detect the deterioration or malfunction before the tailpipe emissions exceed OBD threshold limits.

3.2.1.4 A combination of deNOx and Diesel Particulate Filter (DPF) system: For vehicles equipped with this system, it should be able to monitor the reduction in efficiency of the DPF system. The OBD system must be able to identify the combined system's deterioration or malfunction before the NOx and PM emissions exceed OBD threshold limits.

3.2.1.5 Other emissions control equipment and related systems or components: Before any deterioration or malfunction of the emissions control-related power system or components results in any pollutant emission exceeding the OBD threshold limits, or causes any impact to the pollutant emissions not described in paragraphs 3.2.1.1 to 3.2.1.4 of this Appendix, the OBD system shall be able to diagnose such deterioration or malfunction. Such systems or components include those for monitoring and control of exhaust gas recirculation (EGR) system, air mass-flow, air volumetric flow (and temperature), turbo-charge boost pressure and inlet manifold pressure etc.

3.2.1.6 Other emissions control related components: The OBD system shall be able to diagnose the deterioration or malfunction of sensors, actuators or components related to the electronic signal input/output that affect the emissions control but are not described in paragraphs 3.2.1.1 to 3.2.1.4 of this Appendix. This portion, the continuity and rationality of electronic circuits, shall be monitored. The actuator must be actuated according to the instructions for the ECU.

3.2.2 Application for Heavy-Duty Bus and Truck Certificate of Conformity:

During new vehicle type approval stage, at least five OBD monitoring items shall be tested which include Catalytic Converter, Diesel Particulate Filter, deNOx System, Fuel

Injection System and other emission control systems or components.

- 3.2.2.1 Catalytic Converter: For vehicles equipped with a catalytic converter, the system should be able to monitor the reduction in efficiency of the catalytic converter. The OBD must be able to identify catalytic converter deterioration or malfunction before the NO<sub>x</sub> emission exceeds the OBD threshold limit.
- 3.2.2.2 Diesel Particulate Filter: The system should be able to monitor the reduction in efficiency of a diesel particulate filter. The OBD system must be able to detect deterioration or malfunction of a Diesel Particulate Filter before PM emissions exceed the OBD threshold limit.
- 3.2.2.3 The deNO<sub>x</sub> system: It should be able to monitor the reduction in efficiency of the deNO<sub>x</sub> system. The OBD system must be able to detect the deNO<sub>x</sub> system's deterioration or malfunction before the NO<sub>x</sub> emission exceeds the OBD threshold limit.
- 3.2.2.4 A combination of deNO<sub>x</sub> and Diesel Particulate Filter (DPF) system: For vehicles equipped with this system, the OBD system should be able to monitor the reduction in efficiency of the DPF system. The OBD system must be able to identify the combined system's deterioration or malfunction before the NO<sub>x</sub> and PM emissions exceed the OBD threshold limits.
- 3.2.2.5 The OBD system should be able to monitor the continuity and rationality of electronic circuits between the ECU and the other power systems, vehicle electronics or electronic systems and components (such as transmission control interface), and also identify the deterioration or malfunction status, if any.
- 3.2.2.6 The fuel-injection system electronic fuel quantity and timing actuator(s) are monitored for circuit continuity (open or short circuit) and total functional failure. The OBD system should be able to diagnose the malfunction status before any regulated pollutant emissions caused thereby exceed the OBD threshold limits.
- 3.2.2.7 Other emissions control equipment and related system or components: Before any deterioration or malfunction of the emissions control related power system or components result in any pollutant emission exceeding the OBD threshold limits, or causes any impact to the pollutant emissions, which is not described in paragraphs 3.2.2.1 to

3.2.2.6 of this Appendix, the OBD system shall be able to diagnose such deterioration or malfunction. Such systems or components include those for monitoring and control of exhaust gas recirculation (EGR) system, air mass-flow, air volumetric flow (and temperature), turbo charged boost pressure and inlet manifold pressure, sensors and actuators for deNOx system and for electronic controlled active regeneration DPF system.

3.2.2.8 Other emissions control related components – The OBD system shall be able to diagnose the deterioration or malfunction of sensors, actuators or components related to the electronic signal input/output that affect the emissions control but are not described in paragraphs 3.2.2.1 to 3.2.2.6 of this Appendix. This portion, the continuity and rationality of electronic circuits shall be monitored. The actuator must be actuated according to the instructions for the ECU.

3.2.2.9 For engines using an exhaust after-treatment system requiring the use of a consumable reagent to achieve the intended reduction of regulated pollutants, the OBD system shall monitor:

- (1) Lack or insufficient supply of consumable reagent.
- (2) Whether the quality of consumable reagent is in compliance with the specifications (shall comply with provisions of Annex II to the EU Directive 2005/55/EC).
- (3) Consumption of reagent or injection reaction.

The other requirements include Regulation (EU) No. 595/2009-related directives and Chapter C, Table 1 of Appendix 9 of Annex I to Regulation (EU) No. 582/2011 and the subsequent related directives.

### 3.3 OBD In-Use Performance Ratio (IUPR):

During the vehicle's in-service stage, the OBD system shall be able to monitor and store OBD IUPR related information. The related specifications shall follow the OBD in-use performance requirements under the EU Regulation (EC) No. 715/2007 or (EU) No. 595/2009 and the related subsequent directives (including UN/ECE Regulation No. 83 or No. 49). When filing an application, the applicant shall specify that the monitored items, declaration of OBD monitoring conditions, monitoring conditions and the OBD IUPR comply with the following requirements:

#### 3.3.1 Light-Duty commercial or passenger vehicle:

To confirm that the in-use vehicle's OBD IUPR fulfill the

following requirements:

- 3.3.1.1 The mean of IUPR for each major component or system shall  $\geq 0.336$ .
- 3.3.1.2 Subject to the test vehicles selected in accordance with paragraph 4.3.2 of Appendix 4 and paragraph 4.4.1 of Appendix 4, for at least for 50% of the test vehicles, their OBD IUPR test results for each major component or system shall comply with said OBD IUPR requirements.
- 3.3.1.3 The major components or systems referred to in the preceding paragraphs 3.3.1.1 and 3.3.1.2 are as follows:
  - (1) Catalyst;
  - (2) Oxygen (O<sub>2</sub>)/Exhaust gas sensor; including secondary O<sub>2</sub> sensor.
  - (3) Exhaust Gas Recirculation (EGR) system.
  - (4) Variable Valve Timing (VVT) system.
  - (5) Diesel Particulate Filter (DPF).
  - (6) NO<sub>x</sub> after-treatment system (such as NO<sub>x</sub> adsorbent catalyst, NO<sub>x</sub> reagent/catalyst system).
  - (7) Turbo/Supercharger Boost System.
- 3.3.1.4 The OBD IUPR shall comply with Euro 6-2 provisions under the EU Regulation (EC) 715/2007 and the subsequent related directives.
- 3.3.2 Heavy-Duty Bus or Truck:

To confirm that the in-use vehicle's OBD IUPR fulfills the following requirements:

  - 3.3.2.1 The mean of IUPR for each major component or system shall  $\geq 0.1$ .
  - 3.3.2.2 Subject to the test vehicles selected in accordance with paragraph 4.3.2 of Appendix 4 and paragraph 4.4.1 of Appendix 4, for at least for 50% of the test vehicles, their OBD IUPR test results for each major component or system shall comply with said OBD IUPR requirements.
  - 3.3.2.3 The OBD IUPR related specifications shall be in accordance with provisions of EU Regulation (EC) No 595/2009 and Annex X to Commission Regulation (EU) 582/2011 and the subsequent related directives.

#### 4. Other provisions

- 4.1 A sequence of diagnostic checks must be initiated at each engine start and completed at least once to verify the OBD system's functionality and provide the correct test conditions.
- 4.2 The test engine or vehicle, environmental temperature, pressure, test equipment (such as chassis dynamometer), test fuel, and the instrument panel facing the driver seat shall be equipped with a

malfunction indicator light (MIL), OBD storage and trouble code retrieval method, OBD storage and diagnostic information retrieval method, OBD standardized interface, and other OBD related provisions that shall comply with the following requirements:

4.2.1 For the light-duty commercial or passenger vehicle: The OBD system shall comply with Euro 6-2 requirements under the EU Regulation (EC) No. 715/2007 and the subsequent related directives.

4.2.2 Heavy-duty bus and truck: The other requirements include Regulation (EU) No. 595/2009-related directives and Chapter C, Table 1 of Appendix 9 of Annex I to Regulation (EU) No. 582/2011 and subsequent related directives.

5. The OBD related testing requirements and application process shall comply with the following provisions:

5.1 Application for Light-Duty commercial or passenger vehicle Certificate of Conformity:

5.1.1 The application method if no OBD certificate of conformity issued by any country designated by the central competent authority is made available:

The applicant shall apply for an OBD test plan pursuant to this Appendix, and submit the same to the inspection organization for confirmation, and then the OBD test may be performed only upon approval of the central competent authority. The test laboratory eligible to perform the OBD test shall fulfill the following eligibility requirements and the central competent authority may also send personnel to the laboratory to supervise the testing (including verification of the vehicle inspection, testing, preparation or sales adjustment process). The applicant shall be responsible for test vehicle acquisition, test equipment, testing and supervision related fees.

5.1.1.1 The test report issued by the OBD inspection and testing organization designated by the central competent authority shall comply with the OBD functionality and test requirements in accordance with the Euro 6-2 provisions under the EU Regulation (EC) No. 715/2007 and subsequent related directives, and the OBD threshold limits shall also comply with paragraph 3.1.1 of this Appendix.

5.1.1.2 The OBD test laboratory shall issue the OBD test report based on the testing method in accordance with the Euro 6-2 provisions under the EU Regulation (EC) No. 715/2007 and subsequent related directives, and also once the EU member state or UK issued new vehicle

configuration Certificate of Conformity in accordance with EU Regulation (EC) No. 715/2007 and the subsequent related directives as a proof to show that the laboratory has the test equipment and capabilities sufficient to perform the test governed by said directives, and the OBD threshold limits also comply with paragraph 3.1.1 of this Appendix.

5.1.2 The application method if the OBD certificate of conformity issued by any country designated by the central competent authority is made available:

5.1.2.1 If the applicant has obtained an EU member state or UK-issued new vehicle configuration Certificate of Conformity in accordance with the EU Regulation (EC) No. 715/2007 and related directives (including UN/ECE Regulation No. 83), and the OBD threshold limits comply with paragraph 3.1.1 of this Appendix, and the functionality and test requirements thereof comply with Euro 6-2 related provisions and are accepted by EU member states, the applicant may be deemed to satisfy the requirements under this Appendix.

5.1.2.2 If the applicant has obtained the new vehicle configuration Certificate of Conformity issued by the US-EPA in accordance with the CFR Title 40 Part 86, and the OBD threshold limits and the functionality and test requirements thereof are also accepted by EU member states, the applicant may be deemed to satisfy the requirements under this Appendix.

5.2 Application for Heavy-Duty Bus and Truck Certificate of Conformity:

5.2.1 The application method if no OBD certificate of conformity issued by any country designated by the central competent authority is made available:

The applicant shall submit an OBD test plan pursuant to this Appendix. The applicant shall submit the same to the inspection organization for confirmation, and then the OBD test may be performed only upon approval of the central competent authority. The test laboratory eligible to perform the OBD test shall fulfill the following eligibility requirements and the central competent authority may also send personnel to the laboratory to supervise the testing (including verification of vehicle inspection, testing, preparation or sales adjustment process). The applicant shall be responsible for the test vehicle acquisition, test equipment, testing and supervision related fees.

The OBD test laboratory shall comply with the test report issued based on the test methods under Regulation (EU) No.

595/2009-related directives and Chapter C, Table of Appendix 9 of Annex I to Regulation (EU) No. 582/2011. Meanwhile, the laboratory should have obtained an EU member state or UK-issued new vehicle configuration Certificate of Conformity in accordance with Regulation (EU) No. 595/2009 and related directives (including UN/ECE Regulation No. 49), which is sufficient to prove that the laboratory has the test equipment and capabilities to complete the OBD test governed by said directives, and the test value meets Article 5 of the Emission Standards and also Regulation (EU) No. 595/2009-related directives, and Chapter C, Table 1 of Appendix 9 of Annex I of Regulation (EU) No. 582/2011 and related directives, and the OBD threshold limits also comply with paragraph 3.1.2 of this Appendix.

5.2.2 The application method if the OBD certificate of conformity issued by any country designated by the central competent authority is made available:

5.2.2.1 If the applicant has obtained an EU member state or UK-issued new vehicle configuration Certificate of Conformity in accordance with Regulation (EU) No. 595/2009 and related directives (including UN/ECE Regulation No. 49), and the OBD threshold limits comply with paragraph 3.1.2 of this Appendix, and the functionality and test requirements thereof comply with the Regulation (EU) No. 595/2009 and Chapter C, Table 1 of Appendix 9 of Annex I of Regulation (EU) No. 582/2011 and related directives and be accepted by the EU member states, the applicant may be deemed to satisfy the requirements under this Appendix.

5.2.2.2 If the applicant has obtained the new vehicle configuration Certificate of Conformity issued by the US-EPA in accordance with the CFR Title 40 Part 86, and the OBD threshold limits and the functionality and test requirements thereof are also accepted by the EU member states, the applicant may be deemed to satisfy the requirements under this Appendix.

6. If the engine family vehicles for which the applicant applies for the Certificate of Conformity are unable to comply with all OBD requirements preliminarily, the following principles shall apply:

6.1 The applicant, after considering the feasibility of technology, the timing of vehicle phase-in and phase-out schedule for the production, or any relevant special circumstances (such as computer program upgrades), which may lead to the unreliability of the On-Board

Diagnostics (OBD) monitoring function, may submit an application stating that the on-board diagnostic system (OBD) temporarily fails to fully comply with the regulations. Upon approval of the central competent authority, the applicant's OBD system may be exempted from compliance with OBD-related requirements temporarily.

- 6.2 The monitoring of the primary OBD monitoring items, such as Catalytic Converter, Diesel Particulate Filter, deNOx system, Fuel Injection System and EGR, shall not be waived.
- 6.3 For vehicles using alternative clean fuels (such as natural gas, liquefied petroleum gas, methanol, and ethanol), if the usage of the alternative clean fuel may reduce the reliability of OBD monitoring functions, the applicant may request to be exempted by the competent authority from specific monitoring requirements. However, alternative clean fuel engine vehicles shall still be equipped with an OBD system.