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NATIONAL STANDARD OF THE
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GB 3847-2018

Replacing GB 3847-2005, HJ/T 241-2005

Limits and measurement methods for emissions from diesel vehicles under free acceleration and lugdown cycle

柴油车污染物排放限值及测量方法（自由加速法及加载减速法）

Issued on: September 27, 2018

Implemented on: May 01, 2019

**Issued by: Ministry of Ecology and Environment;
State Market Regulatory Administration.**

Table of Contents

Foreword	4
1 Scope	6
2 Normative references	6
3 Terms and definitions.....	7
4 Inspection items	10
5 Inspection process and requirements	11
6 Appearance inspection	14
7 Inspection of on-board diagnostic system (OBD).....	15
8 Testing of emission pollutants.....	16
9 Requirements for data recording, storage, submission	18
10 Emission monitoring of in-use vehicles	19
11 Implementation of standards	20
Appendix A (Normative) Free acceleration method	21
Appendix B (Normative) Lugdown method.....	25
Appendix BA (Informative) Pre-inspection requirements of lugdown test for vehicles.....	49
Appendix BB (Normative) Test equipment technical requirements.....	52
Appendix C (Normative) Characteristics and installation requirements for opacity meter	60
Appendix D (Normative) Ringelmann smoke method	67
Appendix E (Normative) Inspection procedure of on-board diagnostic (OBD)	

system	74
Appendix EA (Normative) Technical requirements for OBD diagnostic instrument.....	78
Appendix EB (Normative) OBD inspection data item	81
Appendix F (Normative) Inspection report.....	83
Appendix G (Normative) Reporting data items in real time	91

Limits and measurement methods for emissions from diesel vehicles under free acceleration and lugdown cycle

1 Scope

This standard specifies the limits and measurement methods for emissions from diesel vehicles under free acceleration and lugdown cycle, as well as the method and judgment basis of appearance inspection and OBD inspection of diesel vehicle.

This standard is applicable to the inspection for new produced vehicle at end of production line, inspection for register vehicle, inspection for in-use vehicle.

This standard also applies to other vehicles equipped with compression ignition engines.

This standard does not apply to low-speed trucks and three-wheeled vehicles.

2 Normative references

The contents of this standard refer to the following documents or their terms. For undated references, the valid versions are applicable to this standard.

GB/T 5181-2001 Automotive emission - Terms and definitions

GB 7258 Safety specifications for power-driven vehicles operating on roads

GB 17691 Limits and measurement methods for exhaust pollutants from compression ignition and gas fueled positive ignition engines of vehicles

GB 17691-2018 Limits and measurement methods for emissions from diesel fueled heavy-duty vehicles (CHINA VI)

GB/T 17692 Measurement methods of net power for automotive engines

GB 18352 Limits and measurement methods for emissions of pollutants from light-duty vehicles

GB 19147 Automobile diesel fuels

Refers to the actually measured value of the output power of the drive wheel when the vehicle is running on the chassis dynamometer.

3.7

Maximum wheel power (MaxHP)

The maximum value of the wheel power as measured according to the measurement method as specified in this standard.

3.8

Optical absorption coefficient (k)

A coefficient which indicates the attenuation of the light beam by the unit length, which is the multiplying product of the number of particles n per unit volume, the average projected area a of the particles, the extinction coefficient Q of the particles.

3.9

Ringelmann blackness

A soot concentration representation method as obtained by comparing the emission pollutant's color with the Ringelmann concentration map, which is divided into 0 ~ 5 levels. There are six types of corresponding Ringelmann concentration maps, wherein the level 0 is all white, level 1 is 20% blackness, level 2 is 40% blackness, level 3 is 60% blackness, level 4 is 80% blackness, level 5 is total black.

3.10

Nitrogen oxide, NO_x

Refers to nitrogen oxides emitted from the exhaust pipe, including nitrogen monoxide (NO) and nitrogen dioxide (NO_2).

3.11

Engine maximum speed (MaxRPM)

In the test as specified in this standard, the maximum engine speed as measured when the accelerator pedal is in the fully open position.

3.12

Actual velocity of maximum wheel power (VelMaxHP)

Refers to the drum line speed at the maximum wheel power as actually

inspection for in-use vehicles, supervisory sampling inspections, inspections of in-use vehicles prior to the registration and transfer registration.

3.19

Supervision test

Refers to the sampling inspection of new produced vehicles before exit-factory, as well as the sampling inspection of the in-use vehicles centralized parking lots, maintenance sites and roads.

3.20

On-board diagnostic OBD system (OBD system)

Refers to the computer information system installed on the vehicle and engine. It belongs to the pollution control device and shall have the following functions:

- a) Diagnose faults that affect emissions performance;
- b) Display the faults through alarm system;
- c) Use the information as stored in the memory of the electronic control unit to determine the possible fault areas and provide offline communication of information.

3.21

Environmental information identification document VEID

Refers to the environmental information identification documents as specified in the “Announcement on the Publicity of Environmental Protection Information for Motor Vehicles and Non-Road Mobile Machinery” (GHGDQ [2016] No.3), including the enterprise’s declaration for compliance with the emission standards and stages of the vehicle, the basic vehicle information, the environmental inspection information, the information of pollution control device.

4 Inspection items

4.1 Vehicle environmental inspection items are as shown in Table 1.

4.2 The entry inspection of the new produced imported vehicles shall be carried out in accordance with the inspection items as specified in Table 1. It shall also comply with other standards and regulations.

6.2.2 Check whether the vehicle's pollution control device and the engine are consistent with the vehicle environmental identification document.

6.3 In-use vehicle

6.3.1 Check whether the condition of the vehicle under inspection is normal. If there is any abnormality, it shall request the owner to carry out maintenance.

6.3.2 Check whether the vehicle has burning engine oil or serious black smoke. If it is, it shall request the owner to carry out maintenance.

6.3.3 Check whether the appearance of the engine's exhaust pipe, exhaust muffler, exhaust aftertreatment device as well as the installation and fastening parts are in good condition. If there is corrosion, air leakage, damage or looseness, it shall request the owner to carry out maintenance.

6.3.4 Check whether the vehicle is equipped with an OBD system.

6.3.5 Determine whether the vehicle is suitable for lugdown testing. If it is not suitable (for example, full-time four-wheel drive and timely four-wheel drive that cannot manually switch between two-drive drive mode), it shall be marked. When carrying out the lugdown testing, it shall confirm that there is no foreign matter on the surface of the tire of the vehicle.

6.3.6 During the inspection of the change registration and transfer registration, it shall check whether the pollution control device is in good condition.

7 Inspection of on-board diagnostic system (OBD)

7.1 Offline of new produced vehicles

The automobile manufacturer shall check the OBD system's communication of each vehicle, to confirm that the OBD system's communication is normal before exit-factory.

7.2 Registration

Check whether the vehicle has set the OBD interface according to the requirements, whether the OBD communication is normal, whether there is a fault code.

7.3 In-use vehicle

7.3.1 For in-use vehicles which are equipped with an OBD system, after finishing the appearance inspection, it shall carry out the OBD inspection. In the course of inspection of emission pollutants, it shall not disconnect the OBD diagnostic instrument.

report format is as shown in Appendix F of this standard.

8.2.5 [translator's note: should be 8.2.6] It is forbidden to use a failure strategy that reduces the effectiveness of the emission control device. All tampering for pollution control devices will lead to unqualified emission test.

9 Requirements for data recording, storage, submission

9.1 It shall use the computer system to automatically detect, record, transmit, save, judge the OBD inspection (if applicable) and emission pollutant testing information. Meanwhile it shall use the computer system to record and save the appearance inspection information. It shall automatically save the results of the instrument inspection and verification (including calibration) as required by the standard in the computer, to facilitate the inquiry by the competent authorities of the ecological environment. The recorded and saved content shall include at least the contents as listed in Appendix A, Appendix B, Appendix E, Appendix G.

If the pollutant testing results are negative or zero, it shall be recorded and reported as “undetected”.

9.2 The inspection agency shall transmit inspection information to the competent department of ecological environment in real time.

9.3 The competent department of ecological environment at a lower level shall, in accordance with the provisions of Appendix F and Appendix G, report the inspection information to the competent department of ecological environment at a higher level in real time or at specified period.

9.4 The retention period of paper archives of inspection reports shall be not less than 6 years. The retention period of electronic archives shall be not less than 10 years.

9.5 In the inspection (including OBD inspection and visual inspection), if a vehicle with a certain model is found to have emission which excessively exceeds limit, the competent department of ecological environment shall make a record and obtain evidence, fill out the “Environmental inspection record form for concentrated over-limit vehicle models” (Appendix F), report to the competent department of ecological environment of the State Council. At the same time, it shall report the recorded information to the competent department of ecological environment at the higher level and the relevant departments of public security traffic management and market supervision at the same level.

9.6 The inspection for the new produced vehicles at end of production line shall

When using the free acceleration method to carry out supervision test of the vehicle, it may use 1.1 times the limit values as specified in this standard for judgement.

10.3 In the course of registration inspection, it shall carry out appearance inspection, OBD inspection, emission pollutant testing. The environmental inspection of the vehicles of registration change or transfer shall follow the requirements of local government. However, it shall be subject to at least the inspection of the pollutant control device and the OBD inspection (if applicable).

10.4 For vehicles that are equipped with remote emission management on-board terminals and report relevant emission data to the competent authority of ecological environment in real time as required, the provincial competent authority of ecological environment may exempt the online environmental inspection according to the data submission conditions.

11 Implementation of standards

11.1 This standard has been implemented since May 1, 2019. The regular environmental inspection of vehicles as carried out nationwide shall be conducted by the lugdown method as specified in this standard. For vehicles that cannot be tested by the lugdown method, it may use the free acceleration method as specified in this standard.

11.1.1 The off-line inspection of new produced vehicles will be implemented from November 1, 2019.

11.1.2 Registration, OBD inspection and NO_x test of in-use vehicles are only conducted and reported from May 1, 2019, which will be implemented from November 1, 2019.

11.1.3 For the specific time to implement the limit value b as specified in this standard nationwide, the competent authority of ecological environment of the State Council will release it otherwise.

11.2 From the date of implementation of this standard, the existing relevant local emission inspection standards shall be abolished.

11.3 For the implementation of this standard, the competent department of ecological environment under the State Council is responsible for its supervision.

vehicles, wait at least 10 seconds after releasing the accelerator pedal.

A.4.3 When performing free acceleration measurement, it must, within 1 second, continuously step the accelerator pedal down to the final position, to allow the fuel supply system to reach the maximum fuel supply within the shortest time.

A.4.4 For each free acceleration measurement, before releasing the accelerator pedal, the engine must reach the fuel cut speed. For vehicles which use the automatic transmissions, it shall reach the rated engine speed (if it cannot reach this speed, it shall not be less than 2/3 of the rated speed).

During the measurement process, it shall monitor whether the engine speed inspection meets the test requirements (except for vehicles the engine speed of which cannot be measured). Meanwhile it shall record the engine speed data in time and report it.

A.4.5 Test result takes the arithmetic mean of the last three measurement results of free acceleration blackness.

A.5 Detection software

A.5.1 The detection system software shall be able to transmit, store and judge data with the computer, automatically print the inspection report, have the function of networking and automatic reporting.

A.5.1.1 The detection software shall have at least the following functions: automatically judge whether the vehicle's emission test result is qualified; automatically store the test data and ensure that it cannot be artificially falsified; the system shall perform self-test before each test; if the test condition is not met and the normal detection is affected, the system shall be able to alarm and self-lock, until the detection conditions restore to normal.

A.5.2 The detection software shall automatically record at least the following items.

A.5.2.1 Vehicle parameters

- Vehicle identification code (or VIN number) and engine number;
- Testing station and testing personnel's number;
- Testing report number;
- Testing date and time;
- Name, address, phone number of the vehicle owner;

Appendix B

(Normative)

Lugdown method

B.1 Overview

This Appendix specifies the technical requirements for the test procedures, test equipment, detection software, equipment inspection of the lugdown method.

B.2 Test method

B.2.1 Vehicle preparation

B.2.1.1 Requirements for vehicles and engines

Before the test, it shall check the technical condition of the vehicle, to determine whether the vehicle to be inspected can be subject to the subsequent emission testing. For the pre-inspection requirements of the vehicle, see Appendix BA. Place the vehicle to be inspected on the chassis dynamometer. Follow the specified lugdown testing procedure, to test the maximum wheel power and the corresponding engine speed and actual velocity of maximum wheel power (VelMaxHP), emission optical absorption coefficient k at the VelMaxHP point and the 80% and VelMaxHP point, as well as the nitrogen oxides at the 80% VelMaxHP point. The emission optical absorption coefficient shall be tested by the use of shunting type opacity meter.

The measured result of wheel power after correction during the lugdown process shall not be lower than 40% of the engine rated power as specified by the manufacturer, otherwise the test result is unqualified.

B.2.1.2 Test fuel

The vehicle to be tested shall use commercially available vehicle diesel oil in accordance with national standards. During actual test, it shall not replace the fuel in the fuel tank.

B.2.1.3 Vehicle's pre-inspection requirements

When carrying out inspection according to the Appendix BA, if the conditions of the vehicle under inspection is found to be too bad and not suitable for the lugdown test, the vehicle shall be maintained before being tested.

Vehicles that cannot be tested by the lugdown method, such as compact multi-drive axle vehicles or full-time four-wheel drive vehicles, may be tested by the free acceleration method. For the in-use vehicles which are equipped with

If necessary, it may use the method for testing the mass of the drive axle to judge whether the chassis dynamometer can withstand the mass of the drive axle of the vehicle under testing.

B.2.2.1.2.4 In the preparation of testing, it shall pay special attention to the following:

B.2.2.1.2.4.1 For non-full-time four-wheel drive vehicles, it shall select the driving mode according to the type of driving of the vehicle;

B.2.2.1.2.4.2 For vehicles with compact multi-drive axles, or full-time four-wheel drive vehicles, it shall not carry out the lugdown test. It shall carry out the free acceleration emission testing.

B.2.2.1.2.5 The Appendix BA describes in detail the pre-inspection requirements for the vehicle. If the pre-inspection is unqualified or there is a faulty vehicle, the testing can only be carried out after the maintenance is qualified.

B.2.2.2 Inspection of testing system

B.2.2.2.1 The purpose of the inspection of testing system is to determine whether the chassis dynamometer can meet the power requirements of the vehicle to be tested and to check whether the working state of the testing system is normal.

B.2.2.2.2 If the vehicle to be tested passes the pre-inspection procedure as specified in B.2.2.1, the tester shall drive the vehicle to be tested onto the chassis dynamometer as follows:

- a) Lift the lift plate of the dynamometer and check whether the drum is securely locked.
- b) Carefully drive the vehicle onto the chassis dynamometer and place the drive wheel in the center of the drum.

Caution: Unless otherwise the dynamometer allows for two-way operation, it must drive along the direction as specified for the dynamometer. Otherwise, it may damage the chassis dynamometer. When the drive wheel is above the drum surface, it is prohibited to use the reverse gear.

- c) Lower the lift plate of dynamometer down, release the drum brake. After the lift plate is completely lowered down, slowly drive the tested vehicle to allow its wheel to completely coincide with the test drum.
- d) Lightly step on the brake pedal to stop the wheel and turn off the engine.
- e) Follow the recommendations of the dynamometer manufacturer to wedge

the dynamometer being loaded, so that the transmission components of the vehicle reach the normal working temperature.

B.2.3.1.4 [translator's note: should be B.2.3.1.5] Turn off the engine. Place the transmission at neutral position. Place the sampling probe of the opacity meter in the atmosphere, check the zero scale and full scale of the opacity meter. After the inspection is completed, insert the sampling probe into the exhaust pipe of the vehicle to be tested. Be careful to connect the opacity meter. The insertion depth of the sampling probe shall not be less than 400 mm. It shall not use the sampling probes that are too large, to avoid excessive influence on the exhaust back pressure of the vehicle under test, thereby affecting the output power. During the testing process, it shall control the temperature and pressure of the sample gas within the specified range. If necessary, the sampling tube may be properly cooled, but care must be taken not to cause condensation in the measurement chamber.

B.2.3.2 Test procedure

B.2.3.2.1 Before the formal testing begins, the tester shall follow the steps below, to enable the control system to obtain the initial data required for automatic testing:

- a) Turn on the engine. Set the transmission to neutral position. Gradually increase the accelerator pedal's opening until it reaches the maximum. Keep it at the maximum opening state. Record the maximum engine speed at this time. Then release the accelerator pedal, to return the engine to the idle state.
- b) Use the forward gear to drive the vehicle to be tested. Select the appropriate gear position. When the accelerator pedal is in the fully open position, the speed indicated by the dynamometer is closest to 70 km/h, but not more than 100 km/h. For vehicles equipped with automatic transmissions, care shall be taken not to measure under overspeed gear. The automatic test procedure for lugdown is as detailed in B.4.

B.2.3.2.2 The computer automatically analyzes the data obtained according to the above steps, to determine whether the subsequent testing can be continued. The vehicle as determined to be unsuitable for testing is not allowed to perform the lugdown testing.

B.2.3.2.3 After confirming that the motor vehicle can perform the emission testing, switch the chassis dynamometer to the automatic testing state.

- a) The process of lugdown test must be fully automated. The specific requirements are as shown in the test software description in B.4. Throughout the testing cycle, the computer control system automatically controls the lugdown process of the dynamometer.

dynamometer and park it at the designated location after obtaining a clear departure instruction.

B.3 Test equipment

B.3.1 Composition of test equipment

The test equipment mainly includes a chassis dynamometer, an opacity meter, a NO_x analyzer, an engine speed sensor, which are centrally controlled by a central control system.

B.3.1.1 Requirements for chassis dynamometer

B.3.1.1.1 Chassis dynamometer is mainly composed of drum, power absorption unit (PAU), inertia simulation device, etc.

B.3.1.1.2 The dynamometer shall have a fixed permanent sign. The sign shall indicate the following: dynamometer manufacturer's name, production date, model number, serial number, dynamometer type, maximum allowable axle mass, maximum absorbed power/vehicle speed, drum's diameter, drum's width, basic moment of inertia, power requirements.

B.3.1.2 Chassis dynamometer for the emission test of light-duty vehicle shall be capable of testing vehicles which have a maximum uniaxial mass of not more than 2000 kg. The power absorption range of the PAU shall be such that a vehicle with a maximum total mass of 3500 kg can complete the lugdown test. When the test vehicle speed is more than or equal to 70 km/h, it can continuously and stably absorb the power of 56 kW for more than 5 min. When the time interval is not more than 3 min, it can continuously finish more than 10 absorptions of the power of 56 kW.

B.3.1.3 The chassis dynamometer for the heavy-duty vehicle test shall be capable of testing vehicles which have a maximum uniaxial mass of not more than 8000 kg or a maximum total mass of not more than 14000 kg. The power absorption range of the PAU shall be such that a heavy-duty vehicle which has a maximum total mass of not more than 14000 kg can complete the lugdown test. When the test vehicle speed is more than or equal to 70 km/h, it can continuously and stably absorb the power of 120 kW for more than 5 min. When the time interval is not more than 3 min, it can continuously finish more than 10 absorptions of the power of 120 kW.

The chassis dynamometer used to test the vehicles which have a maximum uniaxial mass of 11000 kg shall be capable of testing single-axis drives or multi-axis drive vehicles which have a wheelbase of 1.17 ~ 1.52 m. Under any setting conditions of wheelbase, the tolerance of drum's center distance shall not exceed 1.3 cm. For multi-axis drive vehicles, the drum speeds corresponding to the front and rear axles shall be matched, or otherwise the maximum speed

testing of light-duty vehicle shall be calculated according to the formula of B.3.1.5.2. The deviation shall be between -6.5 mm and 12.7 mm. The inner span and outer span of the drum shall meet the safety requirements of the working condition test of light-duty vehicle.

B.3.1.5.2 Requirements for the center distance of the drum

$$A = (620 + D) \times \sin 31.5^\circ$$

Where:

A - Center distance of the drum, mm;

D - Diameter of drum of chassis dynamometer, mm

B.3.1.5.3 The surface of the drum shall ensure that the tire does not slip. The speed measurement accuracy is stable. It shall minimize the friction and noise of the tire.

B.3.1.5.4 Chassis dynamometer shall use double-drum or triple-drum structure. The flywheel is connected with the front drum. The coupling of the front and rear drums can be mechanical or electric. The speed ratio is 1:1. The synchronization accuracy is ± 0.3 km/h.

B.3.1.6 Other requirements

B.3.1.6.1 The dynamometer shall be equipped with a limit device. The limit device shall ensure that the horizontal and vertical forces do not significantly affect the emission result and can achieve safe limit of position under any reasonable operating conditions of the vehicles, without damaging the vehicle.

B.3.1.6.2 It shall be equipped with a vehicle cooling fan. When the engine's temperature is too high, it shall start the cooling fan.

B.3.1.6.3 The dynamometer shall have a drum speed measuring device. Within the vehicle's speed measurement range, the measurement accuracy shall reach ± 0.2 km/h.

B.3.1.6.4 The installation of the dynamometer shall ensure that the tested vehicle is in a horizontal position ($\pm 5^\circ$) on the dynamometer. During the test, the vehicle shall not be subject to vibrations that may hinder the normal operation of the vehicle.

B.3.1.6.5 It shall be equipped with an automatic acquisition system for environmental parameters. The accuracy requirements for environmental parameter measurement are as follows: atmospheric temperature, $\pm 1^\circ\text{C}$, relative humidity, $\pm 3\%$, atmospheric pressure, ± 1.0 kPa.

caused the failure. At the same time, it shall terminate the testing process and print the testing results “Testing failed: an error occurs in the specified inspection item ...”.

B.4.1.3 If the vehicle passes the pre-inspection, the testing software allows the subsequent testing to begin.

B.4.1.4 As an option, the software provides the operator with the following operational wizards:

- a) Prompt the tester of the operation items as appeared in the subsequent testing;
- b) Drive the vehicle into the chassis dynamometer; apply safety limit to the vehicle;
- c) Connect the engine’s speed sensor and check whether it is working properly;
- d) Remind the tester not to insert the sample probe of the opacity meter into the exhaust pipe before performing the zero and span check on the opacity meter.

B.4.1.5 If the zero/span point calibration function of the software-controlled opacity meter is included in the testing system, it shall perform the calibration first. Otherwise, it shall remind the tester to check the manual zero/span point calibration. To avoid the failure of automatic calibration, it shall set an optional manual operation in the software, to remind the operator to perform manual zero/span point calibration, to input the manual calibration results in the corresponding check dialog box. If the zero/span point check of the opacity meter fails, the testing procedure will be aborted and it will output “Testing paused – opacity meter error”.

B.4.1.6 As an option, the testing system shall prompt the tester to insert a sampling probe of the appropriate diameter and open the vehicle’s cooling fan.

B.4.1.7 Prompt the tester to enter the parameters required to be entered in B.6.2 of this standard. Unless otherwise specified, it requires using the legal unit of measurement.

B.4.1.8 The computer-controlled measuring instrument shall automatically complete the testing of ambient temperature, atmospheric pressure, ambient humidity. The result (which shall be the average of all test results during the test) shall be automatically entered into the parameter table. The environmental parameter measurement sensor must be installed in an environment that is consistent with the tested vehicle.

Minimum required wheel power = Engine rated power × (100% - power loss percentage)

If there are no special requirements, the default value of the power loss percentage is 50%.

Before PAU loading, input the engine rated speed and the engine rated power to determine the maximum force at the drum surface and the PAU's absorbed power. Before testing the pollutants, confirm whether the drum and PAU can receive this force and power. If the maximum force or power exceeds the dynamometer's testing capability, it will abort the testing procedure and output the following information: "Testing paused: The required absorbed power/force exceeds the dynamometer's testing capability".

B.4.2.7 If it passes the above testing, the testing control system will automatically control the PAU to start the lugdown process.

B.4.2.8 First start the power sweep from the recorded MaxRPM speed, to obtain the engine speed at the actual peak power.

B.4.2.9 If the dynamometer controller is operating in speed control mode, it shall use the parameters as specified in B.4.2.10 ~ B.4.2.15.

B.4.2.10 In the speed control mode, when the drum speed is greater than the calculated VelMaxHP, the speed change rate shall not exceed ± 0.5 km/h/s. If the drum speed is lower than the calculated VelMaxHP, the speed change rate shall not exceed ± 1.0 km/h/s.

B.4.2.11 During the power sweep, the change rate of the drum shall not exceed ± 2.0 km/h/s.

B.4.2.12 It is usually allowed to have a stabilization time of 1 s for each speed change segment and record the relevant data.

B.4.2.13 At the last moment of each speed change segment, record engine speed, drum line speed, drum surface braking force (used to calculate absorbed power), optical absorption coefficient k, nitrogen oxides and carbon dioxide values; display the true trajectory of the absorbed power as a function of time, as well as the relationship between the optical absorption coefficient k, the nitrogen oxides, the carbon dioxide and the engine speed; store these data in the data area, so as to reproduce the above curve.

B.4.2.14 It shall, in the setup menu of the main program, set the default value of the stabilization time.

B.4.2.15 If using the dynamic sweep method to perform the power sweep of the engine, it must start sweep when the engine speed is MAXRPM. Meanwhile it

same order: 80% of true VelMaxHP and VelMaxHP. During the transition between the two test conditions, the change rate of drum speed must not exceed 2 km/h/s.

B.4.3.5 Use the optical absorption coefficient k as measured at the above two tested speed segments as well as the data of NO_x , engine speed, drum line speed, wheel power as measured at the 80% VelMaxHP point as the testing results. At each testing point, before taking the reading, the drum speed shall be stabilized for at least 3 s. Whilst for the optical absorption coefficient k and NO_x , engine speed and wheel power, it requires reading the average value within 9 s after the drum speed is stabilized.

B.4.3.6 During the sampling period, the drum speed needs to be stable within $\pm 0.5\%$ of the target value. The settling time and sampling time shall be variable parameters in the setup menu of main program, to meet the time delay difference of the sampling system due to the difference between engine and exhaust system.

B.4.4 Turn-off PAU and vehicle

B.4.4.1 After the lugdown process is over, the control system shall prompt the driving tester to release the accelerator pedal and switch to neutral, but it does not allow to use the vehicle brakes. Once the dynamometer's sensor senses that the braking force has decayed by more than 50%, the control system will switch the dynamometer's controller to the speed control mode and stop the drum at a change rate of 5 km/h/s.

B.4.4.2 Before prompting the driver to turn off the engine, allow the vehicle to be in idle state for at least 1 min. The control system shall automatically record the idle speed data.

B.4.5 Determination of pass/fail

B.4.5.1 Calculation of NO_x measurement results

The emission test results shall be humidity corrected. It calculates the arithmetic mean of 9 s in succession.

The calculation formula of the measurement result is as follows:

$$C_{\text{NO}_x} = \frac{\sum_{i=1}^9 C_{\text{NO}_x} \times k_H(i)}{9}$$

Where:

C_{NO_x} - Average concentration of NO_x emissions, 10^{-6} ;

B.4.6.1 After starting the lugdown program, the control system will detect the drum surface braking force, engine speed, drum speed data at a sampling frequency of not less than 10 Hz; calculate the ratio of engine speed to drum speed in real time. When the testing process and the load on the motor vehicle change, the change of this ratio shall not exceed 3% ~ 5%.

B.4.6.2 During the lugdown test, from the power sweep to the end of emission test, the driver shall not manually change the gearbox position. This can be judged by the ratio of the engine speed to the drum speed. If during normal testing period, the system monitors the change of this ratio beyond $\pm 5\%$, it can be considered that there is a manual shift operation. At this time, it shall remind the driver that the testing is invalid. Release the accelerator pedal to start the lugdown emission test again.

B.4.6.3 During the testing period, if the above ratio suddenly changes (for example, the drum speed suddenly becomes slow whilst the engine speed does not decrease or rises) and the surface braking force of drum decreases suddenly, it indicates that there is slip between the tire and the drum. In this case, the control system shall reduce the PAU current, until the tire and drum begin to lugdown, and the ratio between the engine speed and the drum speed returns to normal. If the calibration program does not return the testing condition to the normal level within 3 seconds, the program will set the PAU current to zero. In addition, as a safety measure, the control system will flash the display to inform the tester to switch the PAU's relay, to cut off the power. In order to prevent the vehicle from flying out of the chassis dynamometer under the action of inertial force, the driver can release the accelerator pedal to suspend the testing only when the PAU current is cut off.

B.4.6.4 During the lugdown testing process, for any reason, if the operating driver tries to release the accelerator pedal, the testing will be interrupted in advance. In this case, the automatic test program considers that the test has been aborted. It can also confirm the abort by locking the appropriate check box on the screen or by touching the button.

B.4.6.5 System user operation authority is divided at least into three levels: supervision level, maintenance level, operation level. Among them, the supervision level has the highest authority and is used by the competent department of ecological environment; the maintenance level has the second highest authority and is used by equipment maintenance personnel; the operation level has the lowest authority and is used by the testing equipment administrators. The maintenance level and operation level do not have the core function authorities such as the access to the underlying database or modification of limit values, which must be used under the authorization of supervision level.

B.4.7 Turn off the testing system

the following information. Use the network to transmit it to the central database (including both qualified and unqualified testing results).

B.6.2.1 Record of testing parameters

- Vehicle identification number (VIN number) and engine number;
- Testing station and tester number;
- Testing system number;
- Testing date and time;
- Name, address, phone number of the vehicle owner;
- Vehicle's license plate number / registration date;
- Accumulated mileage;
- Vehicle category, manufacturing plant;
- Number of cylinders and engine displacement;
- Gearbox type;
- Vehicle's reference mass / maximum total mass;
- Engine rated power;
- Engine rated speed;
- Fuel/fueling system;
- Intake mode (naturally aspirated, turbocharged or supercharged & intercooled);
- Number of exhaust pipes;
- Emission standards achieved.

B.6.2.2 Parameters of testing environment

- Relative humidity (%);
- Ambient temperature (°C);
- Atmospheric pressure (kPa).

B.6.2.3 Lugdown testing results

Appendix BA

(Informative)

Pre-inspection requirements of lugdown test for vehicles

BA.1 Pre-inspection requirements

The contents of this Appendix are pre-inspection requirements before testing. The inspection can be divided into two parts: vehicle identification and safety inspection. Vehicles that fail to pass the pre-inspection are not allowed to be tested.

BA.2 Confirmation of vehicle identity

The tester carefully inspects the vehicle, to confirm whether the vehicle is in compliance with the vehicle's driving license. If the identity of the vehicle cannot be confirmed, it is not allowed to participate in the test.

BA.3 Safety inspection

The purpose of the safety inspection is to evaluate whether the vehicle is suitable for the lugdown test. The tester shall thoroughly check the condition of the vehicle. If the following conditions or defects occur, it shall not carry out testing.

BA.3.1 Instrument (the following instruments are not working properly)

BA.3.1.1 Odometer failed

BA.3.1.2 Low engine oil pressure

BA.3.1.3 Coolant temperature gauge failed

BA.3.1.4 Air brake valve's pressure relatively low

BA.3.2 Vehicle brake failed

BA.3.3 Motor vehicle's body and structure

BA.3.3.1 Driver cannot open the door in a short time

BA.3.3.2 Any part of the vehicle body is in contact with the wheel or drive axle

BA.3.3.3 In the course of loading and unloading, body parts may damage the testing equipment

BA.3.4 Engine system

Appendix BB

(Normative)

Test equipment technical requirements

BB.1 Chassis dynamometer

BB.1.1 Determination of basic inertia

The equipment manufacturer shall explain the method by which the equipment manufacturer determines the basic inertia of the dynamometer and submit the test results, to verify that the basic inertia of the dynamometer meets the requirements of this standard.

The basic inertia of the dynamometer and the diameter of the drum shall meet the requirements of Appendix B of this standard. The difference between the basic inertia as indicated on the nameplate and the actually measured inertia shall not exceed $\pm 2\%$.

BB.1.2 Determination of power absorption range of dynamometer

BB.1.2.1 Equipment manufacturers must provide the dynamometer's curve of absorbed power and torque as well as the methods for determining the power absorption range.

BB.1.2.2 Test system of light-duty vehicles

For the chassis dynamometers for light-duty vehicles, the power absorption unit shall be able to stably absorb at least 56 kW of power at 70 ± 1 km/h. Each steady-state test cycle lasts for at least 3 minutes (5 cycles in total, with a test interval of 10 min); the power absorption unit shall always meet the requirements.

Test method: Use the above method to carry out test. Select appropriate vehicle which has an axle weight of less than 1750 kg. Select the appropriate gear. Allow the throttle to full open and control the speed stably at 70 km/h. Check whether the dynamometer's reading can reach more than 56 kW.

BB.1.2.3 Test system of heavy-duty vehicles

For the chassis dynamometers for heavy-duty vehicles, the power absorption unit shall be able to stably absorb at least 120 kW of power at 70 ± 1 km/h. Each steady-state test cycle lasts for at least 3 minutes (5 cycles in total, with a test interval of 15 min); the power absorption unit shall always meet the requirements.

The test of internal friction loss power (including bearing's friction loss, etc.) of the dynamometer shall be carried out in the range of 10 km/h ~ 100 km/h (at least 10 km/h ~ 80 km/h). Each 10 km/h forms a speed measurement segment. Use this test to calculate the relationship curve between the speed and the friction loss power, which is used to correct the measured power of the chassis dynamometer.

In the additional loss test, the indicator power IHP of the dynamometer shall be set to zero. The additional loss power $PLHP_{v1}$ (kW) at the speed V is calculated according to the following formula:

$$CCDT_v = \frac{(DIW) \times (V_{v+10}^2 - V_{v-10}^2)}{2000 \times ACDT}$$

Where:

DIW - The inertial weight of all rotating parts of dynamometer, kg;

V_{v+10} - Vehicle speed $V+10$, m/s;

V_{v-10} - Vehicle speed $V-10$, m/s;

ACDT - The actual time that the dynamometer slides from $V+10$ to $V-10$, s.

BB.1.6 Load accuracy test

Set the load to 10 kW, 20 kW, 30 kW, respectively as the IHP_{v1} value to set the dynamometer, to make the dynamometer perform the taxi test of 100 - 10 km/h (at least 80 - 10 km/h), to calculate the taxiing time:

$$CCDT_v = \frac{DIW \times (V_{v+10}^2 - V_{v-10}^2)}{2000 \times (IHP_v + PLHP_v)}$$

Where:

DIW - The inertial weight of all rotating parts of dynamometer, kg;

V_{v+10} - Vehicle speed $v+10$, m/s;

V_{v-10} - Vehicle speed $v-10$, m/s;

IHP_v - The indicated power at speed v , kW;

$PLHP_v$ - Additional loss power of dynamometer at v , kW.

For a 30 kW taxiing, the taxiing time must be within $\pm 4\%$ of the nominal time (CCDT). For a 10 and 20 kW taxiing, the setting must be within $\pm 2\%$ of the

BB.3.1.1 The analyzer shall perform a high-concentration gas calibration every 24 hours and use a low-concentration gas to make inspection.

BB.3.1.2 During the single-point inspection, when using the low-concentration standard gas for inspection, the difference between the analyzer's reading and the standard gas shall not exceed the accuracy requirement in Table B.1; otherwise the analyzer will automatically lock and it cannot be used for testing. When it is not executed within the time limit, the exhaust gas analyzer shall also be automatically locked. The composition of gas used for single-point inspection is specified as follows:

- Zero standard gas:

$$\text{O}_2 = 20.8\%$$

$$\text{NO} < 1 \times 10^{-6}$$

$$\text{NO}_2 < 1 \times 10^{-6}$$

- Low-concentration standard gas:

$$\text{NO} = 300 \times 10^{-6}$$

$$\text{NO}_2 = 60 \times 10^{-6}$$

- High-concentration standard gas:

$$\text{NO} = 3000 \times 10^{-6}$$

$$\text{NO}_2 = 600 \times 10^{-6}$$

BB.3.1.3 During the single point inspection, when injecting the high-concentration standard gas into the analyzer for inspection, it shall calculate and inspect the response time (T_{90} and T_{10}) of the NO_x analyzer sensor at the same time:

When the response time of the NO_x sensor exceeds the specified value by more than 2 s, that is, $T_{90, \text{NO}_x} \geq 6.5$ s or $T_{10, \text{NO}_x} \geq 6.7$ s, the inspection is considered to be unsuccessful, then it shall lock the emission analyzer.

BB.3.1.4 When the single point inspection fails, it shall adjust and linearize the emission analyzer.

BB.3.2 Five-point inspection

BB.3.2.1 When the single-point inspection fails, the exhaust gas analyzer shall be maintained or re-linearized, then subject to a five-point inspection. The standard gas for the five-point inspection shall comply with the relevant provisions of the national standards and has the standard reference substance

$$\text{NO}_2 = 60 \times 10^{-6}$$

- Low-to-medium-concentration standard gas:

$$\text{NO} = 900 \times 10^{-6}$$

$$\text{NO}_2 = 160 \times 10^{-6}$$

- Medium-to-high-concentration standard gas:

$$\text{NO} = 1800 \times 10^{-6}$$

$$\text{NO}_2 = 300 \times 10^{-6}$$

- High-concentration standard gas:

$$\text{NO} = 3000 \times 10^{-6}$$

$$\text{NO}_2 = 600 \times 10^{-6}$$

The deviation of the gas distribution for the standard gas (span gas) and zero air shall be within $\pm 1\%$ of the specified value. The ratio tolerance is $\pm 5.0\%$.

BB.3.3 Other requirements

Each time the analyzer is repaired, it must pass the five-point inspection before it can be used for testing.

BB.4 Speed sensor for diesel engine

The diesel engine's speed sensor for the lugdown test shall be easy to install and free from interference from vibration or other acoustic signals when the diesel engine is running.

The following tests shall be performed on the confirmation of the speed sensor:

- 1) Connect the tested speed sensor to a vehicle which is equipped with a four-cylinder diesel engine;
- 2) Place a piece of reflective sheet for the optical tachometer on the rotating part of the engine. The ratio of the speed of the rotating part to the crankshaft shall be known (other methods can also be used, such as obtaining the engine speed value from the diagnostic interface);
- 3) Under the idle condition, use the tachometer of the tested equipment and an optical tachometer which has an accuracy of ± 1 r/min to simultaneously measure the engine speed and record the reading;
- 4) When the engine speed is 1500 r/min, 2000 r/min, 2500 r/min, 3000 r/min,

Appendix C

(Normative)

Characteristics and installation requirements for opacity meter

C.1 Scope

This Appendix specifies the technical conditions and installation & use requirements for opacity meters used in the tests as described in Appendix A and Appendix B.

C.2 Basic technical requirements for opacity meter

C.2.1 The gas to be tested shall be enclosed in a container whose inner surface is not reflective.

C.2.2 When determining the effective length of the optical path through which the gas passes, it shall consider the possible effects of the device which protects the light source and the photovoltaic cell. The effective length of the optical path shall be noted on the instrument.

C.2.3 The display of opacity meter shall have two units of measurement, one is the unit of absolute optical absorption coefficient, from 0 to tend to ∞ (m^{-1}) and the other is the linear division of opacity, from 0 to 100%. The range of the two measurement units shall be 0 when the light is completely passed, and the full scale when it is totally sheltered.

C.3 Structural requirements

C.3.1 General

The smoke meter shall be designed to ensure that, under steady speed conditions, the opacity of the smoke as filled into the smoke chamber is uniform.

C.3.2 Smoke chamber and opacity meter

C.3.2.1 The effect of diffuse reflection light due to internal reflection or diffusion on the photocell shall be minimized. It may also use the inner surface which is decorated with matte black lining as well as a suitable overall arrangement.

C.3.2.2 The optical characteristics of the opacity meter shall be such that when the chamber is filled with flue gas which has an optical absorption coefficient close to 1.7 m^{-1} , the combined effect of reflection and diffusion shall not exceed one unit of linearity. .

C.3.3 Light source

C.3.6 Adjustment and inspection of measuring instruments

C.3.6.1 The circuitry of the photocell and display instrument shall be adjustable, so that when the beam passes through a chamber filled with clean air or through a chamber of the same characteristics, the pointer can be reset to zero.

C.3.6.2 When the light source is turned off, regardless of whether the measuring circuit is open or closed, the reading of the optical absorption coefficient shall approach to ∞^{-1} . When the measuring circuit is turned back on, the reading shall remain at approaching to ∞^{-1} .

C.3.6.3 It shall place a shade screen in the smoke chamber for intermediate inspection. The screen represents a gas which has a known optical absorption coefficient k , the k value is $1.6 \sim 1.8 \text{ m}^{-1}$. It is determined according to the method as described in C.3.5.1. The k value must be known and its accuracy is within 0.025 m^{-1} . This inspection is to verify that when the shade screen is inserted between the light source and the photocell, the reading on the display instrument of opacity meter does not differ by more than 0.05 m^{-1} .

C.3.7 Response of opacity meter

C.3.7.1 The response time of the measuring circuit shall be $0.9 \sim 1.1 \text{ s}$, that is, after inserting the shade screen to totally cover the photocell, the time required for the pointer of display instrument to deflect to 90% of the full scale.

C.3.7.2 The damping of the measuring circuit shall be such that after the input has undergone any transient (e.g. insertion of a calibration shade screen), the amplitude of the initial deflection of the pointer on the linear scale as exceeding the final stable reading shall not exceed 4% of this reading.

C.3.7.3 The response time of the opacity meter due to physical phenomena in the smoke chamber is the time elapsed from the time the gas enters the smoke chamber to the time when it completely fills the smoke chamber, which shall not exceed 0.4 s .

C.3.8 Tested gas and sweep air pressure

C.3.8.1 The difference between the pressure of the exhaust gas in the smoke chamber and the atmospheric pressure shall not exceed 735 Pa .

C.3.8.2 For a gas which has an optical absorption coefficient of 1.7 m^{-1} , the change of the optical absorption coefficient as caused by the pressure fluctuation of the tested gas and the sweeping air shall be not more than 0.05 m^{-1} .

C.3.8.3 The opacity meter shall be fitted with suitable means, to measure the pressure in the smoke chamber.

located on a section where the flue gas is distributed evenly. For this purpose, the probe shall be placed as far as possible downstream of the exhaust pipe and, if necessary, on the extension tube. If an extension tube is used, no air is allowed to enter the interface.

C.5.3 The sampling system shall ensure that the pressure of the sample gas in the opacity meter is within the limits as specified in C.3.8.1 at all engine speeds. This can be checked by recording the pressure of sample gas when the engine is in idle speed and maximum no-load speed. The back pressure as measured at the probe's opening in the exhaust pipe shall not exceed 735 Pa.

C.5.4 The various pipes connecting the opacity meter shall also be as short as possible. The piping shall be tilted up from the sampling point to the opacity meter and shall avoid sharp bends that can cause soot to accumulate. It may install a bypass valve upstream of the opacity meter, to separate the opacity meter from the exhaust stream when not measured.

C.6 Metering performance requirements of opacity meter

C.6.1 Reading of opacity meter

- Display range: 0 ~ 99%
- Resolution: 0.1%
- Maximum allowable error: $\pm 2.0\%$
- Repeatability: $\pm 1.0\%$
- Zero drift: Within 30 minutes, the drift of the smoke meter must not exceed $\pm 1.0\%$.

C.6.2 Optical absorption coefficient

- Display range: 0 ~ 9.99 m^{-1}
- Resolution: 0.01 m^{-1}

C.6.3 The difference between the value of the optical absorption coefficient k of the instrument and the value of the optical absorption coefficient k calculated by the formula using the value of the instrument's opacity reading N shall not exceed 0.05 m^{-1} .

C.6.4 The response time of the smoke meter's measurement circuit is, when using the opaque screen to totally shade the light which passes through the dark path, the time required for the instrument from 10% full scale to 90% full scale. The response time is 1.0 s $\pm$ 0.1 s.

Appendix D

(Normative)

Ringelmann smoke method

D.1 General requirements

This Appendix specifies the Ringelmann smoke method for determining the exhaust smoke of diesel vehicles, including the location and conditions of observation, methods of observation, calculation methods, specifications of the standard Ringelmann smoke chart, technical requirements of Ringelmann smoke meter.

D.2 Terms and definitions

D.2.1 Plume

Airflow which is exhausted from the vent of diesel vehicles.

D.2.2 Ringelmann number

A value for evaluating the blackness of the plume, which is obtained by comparing the observed blackness of the plume with the Ringelmann smoke chart.

D.2.3 Ringelmann smoke chart

The standard Ringelmann smoke chart consists of 14 cm × 21 cm pictures of different numbers, except that the all-white and all-black represent Ringelmann number 0 and 5 respectively, the rest 4 numbers are determined according to the percentage of the area of the black-lines to all-area, wherein the number 1 represents that the percentage of the area of black-line is 20%, the number 2 represents that the percentage of the area of black-line is 40%, the number 3 represents that the percentage of the area of black-line is 60%, the number 4 represents that the percentage of the area of black-line is 80%.

D.3 Principle

Place the Ringelmann smoke chart in an appropriate position, compare the exhaust smoke of the diesel vehicle with the blackness on the chart, to determine the blackness of the exhaust plume from diesel vehicle.

D.4 Instruments and equipment

D.4.1 The Ringelmann smoke chart as specified in clause D.7.

maximum Ringelmann number of the exhaust during the observation process as Ringelmann smoke value.

D.5.3.2 When using the Ringelmann smoke meter to observe the exhaust smoke, record the maximum reading of the Ringelmann smoke meter as the Ringelmann smoke value.

D.6 Quality assurance and quality control

D.6.1 It shall use the Ringelmann smoke chart which complies with the requirements of the specification, pay attention to the keeping the surface clean and tidy. In the process of use, if the Ringelmann smoke chart is stained or faded, it shall replace it with a new picture in time.

D.6.2 Before the observation, flatly fixe the Ringelmann smoke chart on the bracket or the flat plate. The material of the bracket is required to be strong and light. The color of the bracket or the flat plate shall be soft and natural, which shall not interfere with the observation. Do not add any overlay on the surface of the chart when using it, so as not to affect the clarity of the surface.

D.6.3 The blackness of the exhaust as identified by vision is the effect of reflected light. The reading of observed exhaust blackness depends not only on the blackness of the exhaust itself, but also on the uniformity and brightness of the sky, the wind speed, the size of the exhaust pipe (diameter and shape of the outlet's cross-section), the illumination and angle during observation. During field observation, pay sufficient attention to these factors.

D.6.4 The white picture of Ringelmann number 0 can provide an indication of the illumination, which is used to reveal any shading and uneven illumination on the chart. It can also help to spot the stain on the chart.

D.6.5 During the observation process, carefully prepare the observation records, fill the record form as required, calculate the observation results.

D.6.6 Except for the testing where the emission standards have other provisions or special requirements, generally the observation of the exhaust blackness shall be performed where the non-road mobile machinery equipped with diesel engines is under the normal stable operating conditions.

D.7 Ringelmann smoke chart

D.7.1 The standard Ringelmann smoke chart consists of five pictures of different blackness, which can be accurately printed by the black-lines of determined width and the rectangular grid of determined spacing on a white background. In each picture, the grid accounts an area of 14 cm × 21 cm, each grid has a length of 10 mm and width of 10 mm. The grid of each picture consists of 294 small cells. The Ringelmann number is determined by the percentage of

E.3.3 Inspection of OBD diagnostic instrument

For vehicles that meet the CHINA IV and CHINA V emission standards, the tester shall, after finishing the inspection of the fault indicator of clause E.3.2, turn on the OBD diagnostic instrument. Use the fast inspection function of the OBD diagnostic instrument, without needing manual operation. The OBD diagnostic instrument shall automatically output the testing results to the data management system of computer. According to the output results and the states of the fault indicator, make judgement of the vehicle, with reference to Figure E.1.

E.3.3.1 The engine shall be fully warmed up. For example, the oil temperature as measured at the engine oil dipstick hole shall be at least 80 °C. When it is impossible to measure the temperature due to vehicle structure, it may use other methods to make the engine be at normal operating temperature. Keep the engine at idle state. Connect the OBD diagnostic instrument to the OBD interface.

E.3.3.2 After the OBD diagnostic instrument is correctly connected to the vehicle's diagnostic interface, if the communication fails for two consecutive attempts, the tester shall confirm whether the OBD system of the diagnostic instrument and other vehicles can communicate normally (the communication inspection shall meet the requirements for the vehicle model which uses the ISO 15765-4/SAE J1850/ISO-9141-2/ISO-14230-4 communication protocol which is specified in EA2.1 as the communication protocol of the scan tool; the diagnostic or emission critical powertrain control unit (DEC-ECU) correctly responds the PID \$00 request of mode \$01 as sent by the scanning tool according to the time specified in the respective communication protocol). If it can communicate normally with other vehicles, it shall further query the OBD inspection record of the vehicle, as well as the OBD inspection record of the same vehicle model as the vehicle. If there is the OBD communication qualification record of the vehicle or the OBD communication qualification record of the same model of vehicle, it is determined that the OBD inspection of the vehicle is unqualified. If the communication qualification record is not found, the OBD inspection of the tested vehicle is completed, the OBD inspection is judged to be qualified, meanwhile record non-qualification in the communication inspection result. If the OBD communication inspection record (at least 5 sets) of the same model is unqualified, it shall be reported as a problem model according to Table F.4.

E.3.3.3 Check that the status of the fault indicator on the instrument panel is consistent with the status of the fault indicator as obtained by the OBD diagnostics. If the status is consistent and the fault indicator is off, this inspection item is qualified. If the status is consistent and the fault indicator is on, it is judged that the vehicle has emission-related fault, the vehicle is unqualified, which requires re-inspection after maintenance. If the status is

Appendix EA

(Normative)

Technical requirements for OBD diagnostic instrument

EA.1 Overview

The OBD Diagnostics, as a tool necessary to communicate with the OBD system to acquire and display data and information, must meet the functional technical requirements as specified in ISO 15031-4 and SAE J1978.

EA.2 Basic functions

EA.2.1 It shall support at least the communication protocols such as ISO 9141-2, SAE J1850, ISO 14230-4, ISO 15765-4, ISO 27145.

EA.2.2 It can establish communication with the vehicle's OBD system, provide the communication connection interface for the OBD system's diagnostic service. The communication interface with the vehicle shall meet the requirements of ISO 15031-3 and ISO 27145.

EA.2.3 The information structure of the OBD diagnostic instrument shall comply with the information structure in ISO 15031-5, ISO 27145 and the diagnostic fault code in ISO 15031-6.

EA.2.4 It can continuously obtain, convert and display OBD fault codes as related to vehicle's emissions. It shall display fault codes and fault information as described in ISO 15031-6.

EA.2.5 It can obtain and display the readiness status information of each component/system as specified by SAE J1979. The completion of diagnostic items is described as below: The completion of the supported diagnostic items shall be described as finished or unfinished; the completion of unsupported diagnostic items shall be described as non-applicable.

EA.2.6 It can acquire and display current data streams as related to emissions.

EA.2.7 It can acquire the status of the fault indicator.

EA.2.8 It can acquire and display the frozen frame data that generates faulty storage.

EA.2.9 It can acquire and display basic vehicle information, including vehicle VIN, CALID, CVN (if applicable), etc.

EA.2.10 According to the requirements of ISO 15031-5 and ISO 27145, acquire

Appendix EB

(Normative)

OBD inspection data item

For each inspection, whether it is passed or not, the system must automatically record and collect the following data items and submit them as required.

EB.1 Vehicle information

- Vehicle identification number VIN;
- OBD requirements for type inspection (e.g., EOBD, OBDII, CN-OBD-6);
- Vehicle's cumulative mileage (ODO).

EB.2 OBD-related information

If the following information is applicable, it shall record all emission-related control unit's information as read out under Mode 9 in SAE J1979.

- Name of control unit;
- CAL ID of control unit;
- CVN of control unit.

EB.3 Fault and fault code

It shall include the following information of all faults. The fault codes follow the requirements of ISO 15031-6, ISO 2745, SAE J2012.

- Fault code;
- Mileage after the MIL light is on.

EB.4 Description of ready status

It shall include the descriptions of all unready items.

- Description of the fault diagnosis unit;
- Ready status.

EB.5 IUPR-related data

Each IUPR rate shall record the name of the monitoring item, the number of

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