

Translated English of Chinese Standard: HJ437-2008

Translated by: www.ChineseStandard.net

Email: Sales@ChineseStandard.net

HJ

National Environmental Protection Standard
of the People's Republic of China

HJ 437-2008

**Technical specification for on-board diagnostic (OBD)
system of compression ignition and gas fuelled
positive ignition engines of vehicles**

车用压燃式、气体燃料点燃式发动机与
汽车车载诊断（OBD）系统技术要求

Issued on: June, 24, 2008

Implemented on: July 01, 2008

Issued by: Ministry of Environmental Protection

Table of Contents

Foreword	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Type approval and application	10
5 Technical requirements and test	11
6 Access to OBD system information	22
7 Production consistency	23
8 Extension of type approval	23
Annex A (Normative) Materials submitted for type approval	25
Annex B (Normative) Type approval test of on-board diagnosis (OBD) system	28
Annex C (Normative) Malfunction indicator and fault code	36
Annex D (Normative) Diagnosis signal	39

Technical specification for on-board diagnostic (OBD) system of compression ignition and gas fuelled positive ignition engines of vehicles

1 Scope

This Standard specifies the technical specification and test method for on-board diagnostic (OBD) system - compression ignition engines and vehicles with such engines; and positive ignition engines and vehicles with such engines which are fuelled by natural gas (NG) or liquid petroleum gas (LPG).

This Standard applies to the type approval and production consistency inspection for the OBD system of the compression ignition (including gas fuelled positive ignition) engines; and the relevant vehicles of classes M2, M3, N1, N2 and N3 which are designed for speed greater than 25 km/h; and vehicles of class M1 which have total mass greater than 3500 kg.

For N1 and N2 vehicles fitted with compression ignition (including gas fuelled positive ignition) engines, if the OBD system type approval has been made in accordance with GB 18352.3-2005, *Limits and measurement methods for emissions from light-duty vehicles (III, IV)*, the type approval specified in this Standard may be omitted for their engines.

2 Normative references

The articles contained in the following documents have become part of this Standard through reference in this Standard. For the undated documents so quoted, the effective edition shall be applicable to this Standard.

GB 17691 Limits and measurement methods for exhaust pollutants from compression ignition and gas fuelled positive ignition engines of vehicles (China III IV V Stages)

GB 18352.3-2005 Limits and measurement methods for emissions from light-duty vehicles (China III IV Stages)

HJ 438-2008, Durability of emission control systems of compression ignition and gas fuelled positive ignition engines of vehicles

ISO 2575 Road vehicles -- symbols for controls, indicators and tell-tales

ISO 15031-3 Road vehicles -- Communication between vehicle and external equipment for emissions-related diagnostics -- Part 3: Diagnostic connector and related electrical circuits, specification and use

ISO 15031-4 Road vehicles -- Communication between vehicle and external equipment for emissions-related diagnostics -- Part 4: External test equipment

ISO 15031-5 Road vehicles -- Communication between vehicle and external equipment for emissions-related diagnostics -- Part 5: Emissions-related diagnostic services

ISO 15031-6:2005 Road vehicles -- Communication between vehicle and external test equipment for emissions-related diagnostics -- Part 6: Diagnostic trouble code definitions

ISO 15765-4 Road vehicles -- Diagnostics on Controller Area Networks (CAN) -- Part 4: Requirements for emissions-related systems

SAE J1939 Recommended Practice for a Serial Control and Communications Vehicle Network

SAE J1939-13 Off-Board Diagnostic Connector

SAE J1939-73 Application Layer -- Diagnostics

SAE J2012 Diagnostic Trouble Code Definitions

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in GB 17691 and HJ 438-2008, *Durability of emission control systems of compression ignition and gas fuelled positive ignition engines of vehicles* and the following terms and definitions apply.

3.1 Defeat strategy

Any of the below mentioned strategies is considered as the defeat strategy:

A kind of auxiliary emission control strategy (AECS) which enables that, under reasonable and normal operating conditions, a vehicle has an emission control efficacy lower than that under the basic emission control strategy (BECS); or

A kind of basic emission control strategy (BECS) which may differentiate the type approval test condition from other operating conditions. When the engine or the vehicle operates under the operating condition other than the type approval test condition, the emission control efficacy is lower than that of type approval level; or

The OBD system may differentiate the type approval test condition from the other operating conditions. When the engine or the vehicle operates under the operating condition other than the type approval test condition, it provides the monitoring level lower than that of type approval (in a timely and accurate way).

3.2 deNO_x system

It refers to the deterioration or failures of the emission control system (including the electrical failures), which may cause the emission exceeding the limits specified in sub-clause 5.1.3 or cause the emission exceeding the limits specified in sub-clause 5.1.3 due to the exhaust after-treatment system unable to reach the working range of its normal functions (if appropriate); or any case that the OBD system itself is incapable of fulfilling the monitoring requirements of this Standard. In addition, the manufacturer may consider the deterioration and failures - of which emission is not exceeding the limits specified in sub-clause 5.1.3 - as malfunction.

3.11 Major functional failure

The permanent or temporary malfunctions in the exhaust after-treatment system. These malfunctions will immediately-or-upcoming cause increasing in the engine system gas emission or in PM pollutant emission, and the increasing of such emissions is unable to be correctly estimated by the OBD system.

3.12 Malfunction indicator (MI)

When any emission-related component and part which is connected to the OBD system of the OBD system itself becomes defective, A visual indicator which may clearly prompt the vehicle driver.

3.13 OBD-engine family

A group of engine systems, having the same OBD system design parameters, which manufactured by the manufacturer in accordance with sub-clause 8.1, at the time of type approval of the OBD system.

3.14 Reagent

A kind of medium stored in the on-board reservoir, which is supplied to the exhaust after-treatment system (as needed) according to the requirements of the emission control system.

3.15 Warm-up cycle

The process -- that the engine runs sufficiently until the coolant temperature is higher than that at the time of engine start by 22 K and it reaches a minimum temperature of 343 K (70 °C).

3.16 Access

OBTAIN all the emission-related OBD data via the standard serial diagnosis interface. These data include all the fault codes for examination, diagnosis, maintenance or repair of the vehicle emission-related components and parts.

3.17 Deficiency

In the vehicle on-board system, there are no more than 2 independent components or

information or the special technical secret of the manufacturers or the component suppliers, but they shall not illicitly conceal the necessary technical information.

4 Type approval and application

4.1 Application of type approval

The application of OBD system type approval shall comply with GB 17691, clause 4. The manufacturer shall simultaneously provide the information as required in annex A of this Standard, as relevant.

4.2 Test of type approval

The OBD system type approval shall be carried out in accordance with those specified in annex B.

A representative engine model (see GB 17691, clause 9) from the OBD-engine family shall be selected and used for the OBD system verification test; or the OBD system test reports of the source-engine of the OBD-engine family shall be submitted to the type approval body to apply for extension approval, to replace the actual verification test of the OBD system.

4.3 Type approval

The type test shall be carried out as specified in sub-clause 4.2 and the engine/vehicle models which satisfy the requirements of clause 5 shall be type approved.

4.4 Type approval of OBD system with deficiency

4.4.1 If the OBD system has one or more deficiencies which do not fully satisfy the requirements of this Standard, the manufacturer may still apply type approval with the type approval body.

4.4.2 When the type approval body is considering such request, it shall confirm the feasibility and reasonableness of the deficiency requirements provided by the manufacturer. The type approval body shall examine the information provided by the manufacturer. The manufacturer shall in detail specify but not limited to technical feasibility; time of procurement and delivery; lead time (including engine design and gradual adoption; and phase-out interval of electronic control unit programming); effectiveness that the OBD system meets the requirements of this Standard; the various efforts made by the manufacturer for meeting the requirements of this Standard; and accepting all the contents derived from the standards.

4.4.3 The type approval body will not accept deficient application which has no diagnosis monitoring.

4.4.4 The type approval body will not accept deficient application that the manufacturer has not considered the limits specified in sub-clause 5.1.3.

deNO_x-particulate filter is activated when it is normally not-active).

5.2.3 In order to monitor malfunctions and minimize the risk of wrong indication of malfunctions, the OBD system may contain the devices of measurement, sensing, or response to variables of operation (for example, speed, engine revolution, selected shift gear position, temperature, intake pipe pressure or any other parameters, etc.).

5.2.4 Access to the OBD system for the purpose of engine examination, diagnosis, and repair and maintenance shall be unrestricted and standardized. All the emission-related fault codes shall be identical to those specified in sub-clause D.8.5 of annex D.

5.3 Requirements of OBD1 stage

5.3.1 When the OBD systems of all the diesel engines and the vehicles fitted with diesel engine are defective such that the emission exceeds the corresponding limit specified in sub-clause 5.1.3, they shall display the malfunction of relevant components or systems and reminder the driver of the existence of such malfunction.

5.3.2 In order to meet the requirements of OBD1 stage, the OBD system shall monitor:

5.3.2.1 Full removal of catalytic converter (if fitted) installed in the independent shell, which may be a part of the deNO_x or PM catcher system;

5.3.2.2 Reduction in deNO_x system efficiency (if fitted, only for NO_x emission);

5.3.2.3 Reduction in PM catcher system (if fitted, only for PM emission);

5.3.2.4 Reduction in combined deNO_x-particulate filter (if fitted, for NO_x and PM emissions);

5.3.3 Major functional failure

5.3.3.1 As alternatives as required in sub-clauses 5.3.2.1 to 5.3.2.4, the following major functional failures of the exhaust after-treatment system may be monitored for the OBD1 stage of the diesel engines:

- a) Catalytic converter (if fitted) installed in the independent shell, which may be a part of the deNO_x or PM catcher system;
- b) deNO_x system (if fitted);
- c) PM catcher (if fitted);
- d) Combined deNO_x-particulate filter (if fitted).

5.3.3.2 Major functional failure of deNO_x system. For example, the deNO_x system being fully removed or replaced with a false system (i.e. man-made major functional failure), lack of necessary reagent in the deNO_x system, electrical malfunction of the

ignition engines and the vehicles fitted with such engine are defective such that the emission exceeds the corresponding limit specified in sub-clause 5.1.3, they shall display the malfunction of relevant components or systems and reminder the driver of the existence of such malfunction.

When communication interface (hardware and communication) exchanges information between the engine electronic control unit (EECU) and the other power drive or the vehicle electronic control unit, the OBD system shall consider the influence on the normal emission control function. The OBD system shall monitor the communication integrity (e.g. communication bus etc.) between the EECU and the medium providing connection to the electronic control unit of the vehicle's other components.

5.4.2 In order to meet the requirements of OBD2 stage, the OBD system shall monitor:

5.4.2.1 Reduction in efficiency of the catalytic converter (if fitted) installed in the independent shell, which may be a part of the deNO_x or PM catcher system;

5.4.2.2 Reduction in efficiency of deNO_x system (if fitted, only for NO_x emission);

5.4.2.3 Reduction in efficiency of PM catcher (if fitted, only for PM emission);

5.4.2.4 Reduction in efficiency of combined deNO_x-particulate filter (if fitted, for NO_x and PM emissions);

5.4.2.5 Power interruption of communication interface between the engine electronic control unit (EECU) and the other power train or vehicle electrical or electronic systems such as transmission electronic control unit (TECU).

5.4.3 The manufacturer may show the type approval body with demonstration that a certain component or system need not be monitored. After the system or component is fully failed or is removed, the engine emission will not exceed the limits specified in sub-clause 5.1.3 when cyclic test is made with ETC. But this does not apply to the EGR, deNO_x system, PM catcher, and combined deNO_x-particulate filter.

5.4.4 The monitoring requirements specified in sub-clauses 5.3.5 to 5.3.8 shall be complied with.

5.5 Requirements for ensuring proper operation of NO_x emission control measures (called NO_x control)

5.5.1 General requirements

5.5.1.1 During type approval, the manufacturer shall specify the characteristics of the reagent consumed by the exhaust after-treatment system if the engine system needs reagent.

5.5.1.2 During type approval, the manufacturer shall show the inspection body with

allowed that the manufacturer indicates them with an un-erasable fault code "High NO_x - Reasons not known". In addition, in the maintenance materials the manufacturer shall give details how the repair-man troubleshoots them when code "High NO_x - Reasons not known" is displayed.

5.5.3.4 When the NO_x emission exceeds the limit of 7.0g/(kW·h) specified in sub-clause 5.1.3, the torque limiter shall be activated to reduce the engine performance in accordance with the requirements specified in sub-clause 5.5.5, which shall alert the driver. In addition, in accordance with the requirements of sub-clause 5.5.3.2, when the torque limiter is active, the malfunction indicator shall continue to alert the driver and the un-erasable fault code shall be stored in accordance with sub-clause 5.5.3.3.

5.5.3.5 If the NO_x emission is only controlled by EGR instead of exhaust after-treatment system, the manufacturer may use alternative method to meet the requirements of sub-clause 5.5.3.1 with respect to determination of the NO_x emission level. During the type approval, the manufacturer shall demonstrate that, compared with the requirements of sub-clause 5.5.3.1, the alternative method adopted to determine the NO_x emission level is identical and has sufficient accuracy, capable of attaining the same results in accordance with the requirements specified in sub-clauses 5.5.3.2, 5.5.3.3, and 5.5.3.4.

5.5.4 Control of reagent

5.5.4.1 Where it is necessary to use reagent to meet the requirements of this Standard, a special mechanical or electronic indicator shall be fitted on the vehicle dashboard to inform the driver of the reagent remained in the reservoir. Such indicator shall be installed as close as to the oil level indicator. The reagent reservoir indicator shall send alarm if:

- a) The reagent remained in the reservoir is lower than 10% of the reservoir capacity or lower than 10%-higher of manufacturer-selected value.
- b) The manufacturer thinks that the service distance of the reagent remained in the reservoir is shorter than that of the fuel oil remained in the tank.

5.5.4.2 When the reagent reservoir is used up, the malfunction indicator shall be activated in accordance with sub-clause C.1.5 of annex C, along with the torque limiter activated in accordance with sub-clause 5.5.5.

5.5.4.3 The manufacturer may adopt an alternative to the method specified in sub-clause 5.5.3 in accordance with sub-clauses 5.5.4.4 to 5.5.4.11.

5.5.4.4 The engine system shall have such a way to confirm the characteristics of the liquid reagent, the characteristics shall be proposed by the manufacturer and be recorded on the vehicle.

5.5.4.5 If the characteristics of the reagent in the reservoir fail to meet the minimum

5.5.5.3 When the torque limiter is activated, the engine torque will never exceed:

60% of maximum engine torque for vehicles with $N_3 > 16,000$ kg, $M_1 > 7,500$ kg; M_3/III and $M_3/B > 7,500$ kg;

75% of maximum engine torque for vehicles with $N_1, N_2, N_3 \leq 16,000$ kg; $3,500$ kg $< M_1 < 7,500$ kg; $M_2, M_3/I, M_3/II, M_3/A$, and $M_3/B \leq 7,500$ kg.

5.5.5.4 When the engine is running at idle speed and if the condition for activation of the torque limiter is disappeared, the torque limiter shall be automatically restored to the disabled condition. If there is no reason to change the activation status of the torque limiter, the limiter shall not be restored to the disabled condition.

5.5.5.5 It is not allowed to recover the torque limiter to the disable condition using switch or service tools.

5.5.5.6 The torque limiter shall not be used for military vehicles, rescue vehicles, fire pumper trucks and ambulance. The permanently disabled condition of the torque limiter can only be set by the manufacturer. And, the engine, for the special purposes, in the engine family shall be assigned with special identification.

5.5.6 Operation of emission control and monitoring system

5.5.6.1 The emission control and monitoring system shall be ensured to operate normally at:

- a) An ambient temperature ranging from 266 to 313 K (-7 to 40°C);
- b) An elevation lower than 1600 m;
- c) Engine coolant temperature higher than 343 K (70°C).

The above monitoring conditions do not apply to monitoring the reagent remained in the reagent reservoir, which shall be monitored under any service condition.

5.5.6.2 If the limp home mode (LHM) strategy is activated to cause the torque lower than that specified in sub-clause 5.5.5.3, the emission control and monitoring system may be not-operating.

5.5.6.3 If the default emission mode is activated, the emission control and monitoring system shall be kept operating in accordance with the requirements of sub-clause 5.5.

5.5.6.4 Among four OBD test cycles, the incorrect NO_x control measure shall be able to be monitored.

5.5.6.5 The calculation method, used in the electronic control unit (ECU) for the corresponding relationship of actual NO_x concentration vs. NO_x emission [g/(kW·h)] during ETC testing cycle, shall not be considered as the failure strategy.

5.5.6.6 If the engine auxiliary emission control strategy (AECS) has been recognized

When the vehicle emission control system is operating under the above conditions and the conditions other than those specified in sub-clause 5.5.6.1, the OBD system performance will be reduced to a certain extent, with the possibility that the emission exceeds the corresponding limits specified in sub-clause 5.1.3 before the OBD system sends the malfunction alarm signal to the driver, which is permissible.

5.6.2 The OBD system shall not be able to be interrupted. It can only be allowed to be temporarily interrupted in case of one or several following interruption conditions.

5.6.2.1 If the OBD system monitoring capacity is affected by the low level of the oil tank, the OBD system may be interrupted. The OBD system may be interrupted if the oil tank level is lower than 20% of nominal capacity.

5.6.2.2 During auxiliary emission control strategy specified in GB 17691, the affected OBD system may be interrupted.

5.6.2.3 When the safety or LHM strategy is activated, the affected OBD system may be interrupted.

5.6.2.4 For a vehicle designed with a power take-off unit, the affected OBD system may be interrupted only if the power take-off unit is activated and the vehicle is not moved.

5.6.2.5 During the cyclical recovery of the exhaust after-treatment system (i.e. PM catcher, deNO_x system, and combined deNO_x-particulate filter), the affected OBD system may be temporarily interrupted.

5.6.2.6 When the OBD system is operating under the conditions other than those specified in sub-clause 5.6.1, if it is able to be demonstrated that such operating condition will limit the OBD system monitoring (including the modeling) capacity, the affected OBD system may be temporarily interrupted.

5.6.3 If there is risk for safety or causing malfunction of a certain component for evaluation of such component, such evaluation will not require for the OBD system.

5.7 The enabling and disabling of the malfunction indicator as well as storage and clearance of the fault codes shall comply with annex C.

5.8 The diagnosis signals shall comply with annex D.

5.9 For installation of engine OBD system on a vehicle, the equipment fitted on the vehicle shall be in accordance with:

5.9.1 Sub-clauses C1.1, C.1.2, C.1.5 of annex C with respect to requirements for malfunction indicator (MI) and additional alerting way (if applicable);

5.9.2 Sub-clause D.8.3.1 of annex D with respect to provisions for use of on-board diagnosis tools (if applicable);

6.2.3 In the type approval and in-service vehicle inspection procedure, if non-conformance of such provisions is found, the type approval body shall take proper measures to ensure attainment of the repair and maintenance information.

7 Production consistency

7.1 If the administrative type approval body does not think that the production quality of a certain vehicle model may possibly meet the requirements, the body shall arbitrarily take a sample engine from the products produced in batch to carry out the test stated in annex B. The test may be carried out on an engine which has been operated for 100 h and below.

7.2 If such engine conforms to the test requirements stated in annex B, it is considered that the OBD system production consistency meets the requirements.

7.3 Should the engine sampled from the in-batch products fails to meet the test requirements stated in annex B, additional four engines shall be arbitrarily taken from the products produced in batch to carry out the test stated in annex B. The test may be carried out on an engine which has been operated for 100 h and below.

7.4 If at least 3 of 4 engines conform to the test requirements stated in annex B, it is considered that the OBD system production consistency meets the requirements.

7.5 During inspection or supervision of re-inspection, if it is found that a certain engine model fails to meet the requirements of the above-mentioned production consistency inspection, the type approval body shall urge the manufacturer to take every necessary measure to restore the production consistency as soon as possible. Otherwise, the type approval of such engine model shall be withdrawn.

7.6 The vehicle manufacturer shall take production consistency assurance measures to ensure that the OBD system on each vehicle can normally operate when it is shipped from the factory.

8 Extension of type approval

8.1 Determination of OBD-engine family

8.1.1 Each basic design parameter defined for the OBD system of the OBD-engine family shall be same within the family.

8.1.2 If a group of engine systems is considered as OBD-engine family, the following basic parameters shall be the same:

- a) OBD monitoring method;
- b) Malfunction detection method.

Annex B

(Normative)

Type approval test of on-board diagnosis (OBD) system

B.1 Overview

This annex describes the inspection procedure of the engine-fitted OBD system functions. The OBD system functions are tested through simulation of the malfunction of the emission-related system in the engine electronic control system or in the emission control system.

B.1.1 Deteriorated components or systems

In order to verify the effective monitoring of the emission exceeding the corresponding limits specified in sub-clause 5.1.3 caused by failure to the emission control systems or components, the manufacturer shall provide the deteriorated components and/or electronic devices used for simulation of malfunctions.

For the type approval of the OBD1 stage, the emission shall be tested with ESC test cycles. The emission caused by the deteriorated components or devices shall not be greater than 1.2 times of the corresponding limit specified in sub-clause 5.1.3.

For the type approval of the OBD2 stage, the emission shall be tested with ETC test cycles. The emission caused by the deteriorated components or devices shall not be greater than 1.2 times of the corresponding limit specified in sub-clause 5.1.3.

For the type approval ensuring the NO_x control measures, the testing shall be carried out with ETC test cycles. The emission caused by the deteriorated components or devices shall not be greater than the corresponding NO_x limit, specified in sub-clause 5.1.3, plus 1g/ (kW·h).

B.1.1.1 If it may be determined that - after the deteriorated components or devices is fitted onto the engine, it is impossible to compare with the corresponding limit specified in sub-clause 5.1.3 (e.g. failure to reach the statistical conditions confirming the ETC test cycles) - the type approval body may think that the malfunction of such assembly or device can meet the requirements if the manufacturer may provide technical demonstration.

B.1.1.2 If aging assembly or device is installed on the engine, so that the full-load curve or partial full-load curve (measured from the normally operating engine) cannot be obtained during the test, the type approval body may think that the malfunction of such assembly or device can meet the requirements if the manufacturer may provide technical demonstration.

be carried out for the test engine in accordance with those specified in sub-clause B.6.1. Before completion of the test, MI shall be activated under any condition given in sub-clauses B.6.3.1.2 to B.6.3.1.10. During type approval test, under the condition that the malfunction simulation is made on different systems or components, there must not have more than 4 malfunctions.

If the type approval test is approved according to the OBD-engine family, and the engines applied for approval don't belong to the same engine family, the type approval body may increase the number of malfunctions occurred in the test to, as a maximum, four times of the engine family number in the OBD-engine family. Before the maximum test number of the malfunction test is reached, the type approval body may decide reduction in tests at any time.

B.6.3.1.2 If the engine is fitted with independent catalytic converter which may be a part of the deNO_x system or PM catcher, it shall be replaced with the deteriorated or defective catalyzer or simulated with electronic instrument (if applicable).

B.6.3.1.3 If the engine is fitted with deNO_x system (including any sensor as part of the system), it shall be replaced with the deteriorated or defective deNO_x system, or USE electronic instruments to simulate the deteriorated or defective deNO_x system, in such a way that the emission exceeds the NO_x limit specified in sub-clause 5.1.3 (if applicable).

However, if the engine OBD system only monitors the major functional failure of the deNO_x system, in the deNO_x system test, the malfunction indicator (MI) shall be tested for activation under any of the following conditions and it is not necessary to test the emission.

- a) The system is fully removed, or the original system is replaced with a simulative system;
- b) Lack of the reagent needed for the deNO_x system;
- c) Electrical malfunction of the components (e.g. sensor, actuator, metering control device) of the deNO_x system, including any electrical malfunction of the reagent heating system (if applicable);
- d) The reagent feed system malfunction of the deNO_x system (e.g. lack of air supply, clogged nozzle, metering pump malfunction);
- e) Heavily damaged system.

B.6.3.1.4 If the engine is fitted with PM catcher, the PM catcher is fully removed or replaced with deteriorated or defective PM catcher in such a way that the emission exceeds the PM limit specified in sub-clause 5.1.3 (if applicable).

However, if the engine OBD system only monitors the major functional failure of the PM catcher, in the deNO_x system test, the malfunction indicator (MI) shall be tested for activation under any of the following conditions and it is not necessary to test the

B.6.3.1.7 DISCONNECT any other emission-related engine component which is connected to the electronic control unit so that its emission exceeds the limit specified in sub-clause 5.1.3.

B.6.3.1.8 When it is demonstrated to meet the requirements of sub-clauses B.6.3.1.6 and B.6.3.1.7, and agreed by the type approval body, the manufacturer may adopt proper steps to demonstrate. At the time of disconnection occurrence, the OBD system shall display malfunction.

B.6.3.1.9 SIMULATE the abnormal EGR flow or the malfunction of inoperative EGR so that its emission exceeds the NO_x limit specified in sub-clause 5.1.3 (if applicable).

B.6.3.1.10 Power interruption of communication interface between the engine electronic control unit (EECU) and other power train or vehicle electrical or electronic systems such as transmission electronic control unit (TECU) (if applicable).

B.6.3.2 Verification of NO_x emission control and monitoring system

B.6.3.2.1 As a part of Clause 4 "type approval application", according to the requirement of B.6.3.2.2 ~ B.6.3.2.8, the manufacturer shall verify the conformance to sub-clause 5.5 through the engine bench test.

B.6.3.2.2 For the approval according to the engine family or OBD-engine family, if the manufacturer show the type approval body with demonstration that the emission control and monitoring systems are similar in the family, an engine model (source engine) may be selected from the family to carry out the verification test of the emission control and monitoring system.

Demonstration may be made to the type approval body with introduction to such elements as calculation method and functional analysis etc.

Agreed by the type approval body, the source engine may be selected by the manufacturer.

B.6.3.2.3 The verification test of the emission control and monitoring system consists of the following three stages:

Selection: One malfunction of the emission control and monitoring system or a kind of control measure abnormal operating condition is selected by the type approval body from the list of the abnormal operating condition provided by the manufacturer.

Verification: The NO_x emission is measured from the ETC test cycles operated on the engine test bed to verify the influence degree of the abnormal operating conditions.

Validation: The reaction of the system to the malfunction (reduction in torque, alarm signal etc.) is validated through four operating OBD test cycle.

B.6.3.2.3.1 For the selection stage, the manufacturer shall provide the type approval body with description of any potential NO_x control measure abnormal operation and

Annex C

(Normative)

Malfunction indicator and fault code

C.1 Activation of malfunction indicator (MI)

C.1.1 The OBD system shall be fitted with a malfunction indicator (MI) which may quickly alert the driver. In addition to indicate the driver with emergency or LHM program as stated in sub-clause C.1.2, the malfunction indicator (symbol or light) can only be used for indication of the emission-related malfunctions, not for any other purposes. The safety related information has the extremely highest priority. Under all the reasonable lighting conditions, the MI shall be visible. When the MI is activated, a symbol (the light or symbol on the dashboard) conforming to ISO 2575 (symbol serial number F01 or F22) shall be displayed. A vehicle shall not be fitted with more than one emission-related MI for the general purposes. It is allowed to use an independent device for the special purposes (e.g. the braking system, buckling seat belt, lube oil pressure, needs of maintenance, or indicating lack of required reagent of the deNO_x system. Use of a red malfunction indicator shall be permitted.

C.1.2 The malfunction indicator (MI) is used to inform the driver of necessary emergency maintenance of the vehicle. In addition, the vehicle dash-board may display proper message to inform the driver of necessary emergency maintenance of the vehicle.

C.1.3 For a malfunction indicator (MI) program which can be only activated with a pre-processing cycle (i.e. three continuous OBD test cycles), the manufacturer shall provide data and/or engineering evaluation to sufficiently demonstrate that such monitoring system is able to effectively and timely monitoring the deterioration of the components. A program of which activation requiring average more than 10 OBD test cycles shall not be accepted.

C.1.4 As long as the engine is running in the defaulted emission mode, the malfunction indicator (MI) shall be activated. If the basic monitoring is not be able to be carried out for the OBD system itself in accordance with this Standard, the malfunction indicator (MI) shall also be activated.

C.1.5 Another obvious warning mode may be used simultaneously when the malfunction indicator is activated. For example, in addition to the activation of the malfunction indicator (MI), the flashing way of the malfunction indicator (MI) shall be provided or a symbol conforming to ISO 2575 (symbol serial number F24) shall be activated.

C.1.6 When the vehicle ignition switch has been moved to "ON" position, but the

Annex D

(Normative)

Diagnosis signal

D.1 Once the first malfunction of any component or system is detected, the "frozen frame" of the current engine operating data shall be stored in the computer based memory. The stored engine operating conditions shall include, but not limited to, the calculated load value, engine revolution, coolant temperature, air intake manifold pressure (if applicable), and the fault code causing the data to be stored. The manufacturer shall select the most suitable operating condition which is good to effective repair and maintenance as the frozen frame to be stored.

D.2 Only REQUIRE one set of frozen frame data. The necessary frozen frame shall be accurately described. And the required minimum frozen data may be read with a general diagnosis instrument specified in sub-clauses D.8.3 and D.8.4. If the fault code initiating the storage status is cleared as specified in sub-clause C.4, annex C, the simultaneously stored engine status data may also be cleared.

D.3 Except the required frozen frame data and information, if the electronic control unit has information or the information is able to be determined with electronic control unit, at least the following signals shall be able to be accessed via the standard diagnosis series interface: fault code, engine coolant temperature, oil injection timing, air intake temperature, air inlet manifold pressure, air flow rate, engine revolution, throttle position sensor output value, calculated load value, speed, and fuel oil pressure. These signals shall be provided in a standard unit in accordance with those specified in clause D.8. The actual signals shall be able to be clearly differentiated from the defaulted value or LHM signal.

D.4 For a certain on-board evaluation test of the full emission control system, the separate status code or ready-for-use code shall be stored in the electronic control unit to correctly identify the active emission control system and those of which corresponding diagnosis evaluation needs to be done with further operation of the vehicle. For the continuously controlled and monitored items, it is not necessary to store the ready-for-use code. When the vehicle ignition switch is ON and OFF, the ready-for-use code shall not be set as "Not ready for use" status. The internal setting process of the "Not ready for use" status shall be used to all of such code, instead of individual code.

D.5 The requirements (OBD1+NO_x control, OBD2+ NO_x control) that the on-board diagnosis (OBD) system may meet at the time of vehicle type approval shall be able to be read out via the standard diagnosis series interface in accordance with those specified in clause D.8.

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----