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ENVIRONMENTAL PROTECTION STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

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**Emissions control technical requirements of non-road diesel
mobile machinery**

非道路柴油移动机械污染物排放控制技术要求

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Emissions control technical requirements of non-road diesel mobile machinery

1 Scope

This standard specifies the technical requirements for pollutant emission control of the stage IV non-road diesel mobile machinery (hereinafter referred to as the machinery), the diesel engine it is equipped with, as well as the second diesel engine installed in the vehicle for carrying people (cargo) on the road.

This standard applies to the type inspection, production consistency inspection, emission compliance inspection, in-use compliance inspection and durability requirements, for the following (including but not limited to) machinery and diesel engines installed at non-constant speed, such as:

- Construction machinery (including excavation machinery, shoveling machinery, hoisting machinery, forklift trucks, compaction machinery, road construction and maintenance machinery, concrete machinery, excavation machinery, piling machinery, aerial work machinery, rock drilling machinery, etc.);
- Agricultural machinery (including tractors, combine harvesters, etc.);
- Forestry machinery;
- Airport ground handling equipment;
- Material handling machinery;
- Snow plow equipment;
- Industrial drilling equipment.

This standard applies to the type inspection, production consistency inspection, emission compliance inspection, in-use compliance inspection, durability requirements, for the following (including but not limited to) machinery and diesel engines installed at constant speed, such as:

- Air compressor;
- Generator sets;
- Fishing machinery (aerators, pond excavators, etc.);

requirements of Table D.1 of GB 17691-2018, shall be used. The urea aqueous solution (if applicable), that meets the requirements of GB 29518-2013, shall be used.

4.1.1.5 Diesel engine's labels shall be clear and easy to view; it may also be in the form of a two-dimensional code.

4.1.1.6 When the diesel engine is on the bench, AND the measured maximum net power and the rated net power are not in the same power range, meanwhile the requirements of power deviation in B.2 are not met, it shall implement the emission limits and technical requirements of the more stringent power range.

4.1.2 Type inspection of family (source machine)

4.1.2.1 During the diesel engine's type inspection, a source engine, that can represent the diesel engine type or family, is to be selected. If the selected model cannot fully represent the model or family, which is described in Appendix A of GB 20891-2014, an additional representative diesel engine shall be selected for the test.

4.1.2.2 The source machine (machinery) shall have the worst emission level in this family. The type inspection of the source machine (machinery) can be extended to all members of the family; other members of the family need not to be subject to type inspection.

4.1.2.3 The inspection agency shall seal up the ECU of the diesel engine during the type inspection, for future reference. After the diesel engine or machinery has been shut down for 5 years, it may not be retained.

4.1.2.4 The competent department of ecological environment may conduct confirmation inspection, according to Appendix J.

4.2 Change of product type

For any modification of diesel engine models or machinery, that has been type-tested, it shall not have adverse effects on pollutant emissions, AND still meet the requirements of this standard. If the changed items are public information, machinery manufacturers/importers shall disclose the information on the change of the product. If the changed items may affect the emission performance, the corresponding type inspection shall be carried out, AND the information of the product changes and type inspection results shall be disclosed.

4.3 Information disclosure

4.3.1 For the machinery within the scope of application of this standard, the machinery manufacturing/importing enterprises shall make information disclosure, in accordance with the requirements of Appendix A of GB 20891-2014, as well as Appendix A of this standard. Relevant content, which involves the secrets of diesel engine manufacturers, may be disclosed by diesel engine enterprises, after technical processing.

4.3.2 Every machine must have an environmental protection information label fixed; the environmental protection information label shall meet the requirements of Appendix I.

4.3.3 Each machine must have a unique machinery environmental protection code; the machinery environmental protection code shall meet the requirements of Appendix K.

4.4 Environmental production consistency and in-use compliance

4.4.1 Machinery and diesel engine manufacturers shall ensure the environmental protection production consistency of mass-produced machinery and diesel engines; provide relevant production consistency assurance materials, in accordance with the requirements of Appendix F. Manufacturers shall, in accordance with the provisions of this standard, ensure that the emissions of newly-produced machinery and diesel engines meet the standards; prepare relevant materials for self-examination of emissions from newly produced machinery and diesel engines, in accordance with the requirements of Chapter 7. The competent authority of ecological environment may carry out spot check, on the compliance of the newly produced machinery and diesel engines.

4.4.2 Machinery and diesel engine manufacturers shall ensure the in-use compliance of production machinery and diesel engines; prepare a relevant in-use compliance self-inspection plan, according to the requirements of Appendix G. Manufacturers of machinery and diesel engines shall ensure that the emissions of machinery in actual use meet the standards, in accordance with the provisions of this standard; prepare a self-inspection report on in-use compliance, according to the requirements of Chapter 8. The competent authority of ecological environment may carry out spot check, on the in-use compliance, according to the requirements of Chapter 8.

4.4.3 Machinery and three-wheeled vehicles, which are equipped with diesel engines with rated net power of 37 kW and above, shall be inspected for compliance of newly produced machinery and in-use compliance, in accordance with the requirements of 5.7.6 and GB 36886-2018. For machinery and three-wheeled vehicles, which are equipped with diesel engines with a rated net power of less than 37 kW, they shall be inspected for compliance of newly produced machinery and in-use compliance, in accordance with the requirements of GB 36886-2018. For machinery with multiple operating modes, inspection of compliance of newly produced machinery and in-use compliance inspection shall be carried out, in various modes.

5 Technical requirements and tests

5.1 General requirements

5.1.1 Requirements for base emission control strategies

fuel consumption of the diesel engine, at the same time; record the measurement results.

5.3.3 When conducting the test, in accordance with the test procedures in Appendix B of GB 20891-2014 and Appendix B of this standard, if any reactant is used, the manufacturer shall ensure that the average NH₃ emission of the diesel engine, in the NRTC and NRSC cycles, does not exceed the limit requirements in Table 2 of the Amendment sheet of GB 20891- 2014.

5.4 Non-standard cycle emission requirements

5.4.1 The requirements for non-standard cycle emissions apply to all diesel engines, which have electronically controlled fuel systems, for machinery use.

5.4.2 The non-standard cyclic emission test requirements shall be carried out, after the non-road steady cycle test conditions are completed, in accordance with the non-standard cyclic emission requirements, which are specified in Appendix B.

5.4.3 At least 3 random load and rotational speed points shall be selected for testing, in the emission area of non-standard cycle; the running sequence of the above test points shall also be randomly determined. The test shall be carried out, according to the requirements of the non-road steady cycle, BUT the specific emission of various pollutants (excluding PN) shall be calculated separately, for each test point. The specific emission of each test point shall not exceed twice the limit in Table 2 of the Amendment sheet of GB 20891-2014.

5.5 Durability requirements

5.5.1 Durability requirements shall, in addition to meeting the requirements of Appendix BD of GB 20891-2014, also meet the requirements of 5.5.2 ~ 5.5.4.

5.5.2 In the process of determining the deterioration factor or the deterioration correction value, the rated net power and maximum net torque, at each test node, shall meet the provisions of Appendix B.2.

5.5.3 One of the two test cycles, in B.3.8.1 and B.3.8.2 (only hot start cycle) of GB 20891-2014, can be used to determine the degradation coefficient or degradation correction value, at each time node. Another test cycle required emissions testing, each at the beginning and end of the durability test. The determined deterioration factor or deterioration correction value is applicable to two cycles; the pollutant discharge, at each node of the durability test, shall not exceed the limit specified in Table 2 of GB 20891-2014. A constant speed diesel engine requires only a non-road steady cycle.

5.5.4 Diesel engine manufacturers can choose the deterioration factor, which is specified in Table 2, as the alternative durability deterioration factor. The specific emission of each pollutant is multiplied by the deterioration factor, which is determined in Table 2; the result shall not exceed the limit specified in Table 2 of GB 20891-2014. For models that have passed the type inspection, using the deterioration factor specified

6.2 The inlet pressure drop shall not exceed the pressure drop, which is specified in Appendix A of GB 20891-2014, for diesel engines that have been type-tested;

6.3 The exhaust back pressure shall not exceed the back pressure, which is specified in Appendix A of GB 20891-2014, for diesel engines that have been type-tested;

6.4 The power, which is absorbed by the auxiliary parts, as required for the operation of the diesel engine, shall not exceed the absorbed power of the auxiliary parts, which are specified in Appendix A of GB 20891-2014, for the diesel engine that has been type-tested.

6.5 The characteristics of the exhaust aftertreatment system shall be consistent with those in the diesel engine's type inspection in Appendix A of GB 20891-2014.

6.6 For a diesel engine which is type-tested as an independent technical assembly, when it is installed on the machine, the emission control diagnostic system shall meet the requirements of the diesel engine manufacturer.

7 Emission compliance requirements and inspection of newly produced machinery (diesel engine)

7.1 General requirements

7.1.1 Machinery manufacturers shall take measures, to ensure production consistency, in accordance with the requirements of Appendix F.

7.1.2 The production consistency check shall be carried out, on the basis of Appendix A, as well as the information disclosure materials in Appendix A of GB 20891-2014.

7.1.3 The machinery used for the test shall be randomly selected; the machinery manufacturer shall not make any adjustments to the selected machinery (including the update of the ECU software).

7.1.4 In principle, no running-in is required for the machine. If required by the machinery manufacturer, the running-in can be carried out according to the running-in specification; however, it shall not exceed 5 hours, AND the extracted machinery shall not be adjusted in any way.

7.2 Self-inspection of compliance of newly produced machinery (diesel engine)

7.2.1 Machinery manufacturers shall formulate self-inspection procedures by themselves; conduct self-inspection on emission compliance of newly produced machinery by family, including self-inspection items, self-inspection methods, sampling methods, sampling proportions, etc. The self-inspection plan and results are made public.

7.2.2 The machinery emission's self-inspection shall be tested, in accordance with the provisions of Appendix E of this standard and GB 36886-2018.

7.2.3 The machinery manufacturer shall make detailed records and archives of the machinery self-inspection test. The record files shall be kept for at least 5 years. The competent department of ecological environment may check the test records, as needed.

7.2.4 Machinery manufacturers are not required to conduct self-inspection for each machinery family, BUT the self-inspected machinery family shall be sufficiently representative, to ensure that other families can also meet the standards. When the information is disclosed, the manufacturer shall conduct a reasonable engineering evaluation of the emission performance of each family, under reasonable operating and applicable environmental conditions; at the same time, declare that other machinery families also meet the requirements of 5.7.6 of this standard.

7.2.5 If it is difficult to carry out self-inspection of the machinery, before leaving the factory, it shall explain the reasons. It may carry out a self-inspection of the compliance of the newly produced machinery, in the period of use of not exceeding 500 h; explain to the competent department of ecological environment.

7.2.6 Newly produced diesel engines shall be subject to the self-inspection of emission compliance, according to the sampling and methods specified in 6.2 of GB 20891-2014, based on the test items specified in 5.2 of this standard.

7.3 Supervision and spot check on compliance of newly produced machinery (diesel engine)

7.3.1 Inspection of basic emission configuration

Check the basic configuration of emission. If the inspected key components of machinery emission control or emission control strategy are inconsistent with the content of the information disclosure, it will be deemed that the machinery inspection of this model has failed.

7.3.2 Check the enterprise's self-inspection

Check the self-inspection plan, self-inspection process, self-inspection records, self-inspection results of machinery manufacturers.

7.3.3 Functional check of emission control strategy

Randomly take 3 machines, from the mass-produced machines. If more than 2 machines meet the requirements of Appendix C (if applicable) and Appendix D (if applicable), it will be judged as qualified. If more than one diagnostic system cannot be effectively accessed, OR it is found that there is no diagnostic interface, it will be judged as unqualified.

In-use compliance shall be checked, under normal use conditions, within the effective life period, according to the provisions of Appendix G of this standard. The in-use compliance inspection includes the self-inspection of the machinery and diesel engine manufacturers, which are specified in 8.2.1, as well as the supervisory spot-check of the competent department of ecological environment, which is specified in 8.2.2.

8.2.1 Self-inspection of manufacturer

8.2.1.1 The diesel engine manufacturer shall formulate a self-inspection plan for in-use compliance, within 18 months after the first sale of the machinery, which is installed with the diesel engine; disclose the information of the self-inspection plan and self-inspection results. For the self-inspection of the in-use compliance of diesel engine manufacturers, it shall be carried out on the basis of diesel engine family. It is not necessary to conduct self-inspection for each family, BUT the family of self-inspection shall be sufficiently representative, to ensure that other families can also meet the standards.

8.2.1.2 The machinery manufacturer shall formulate an in-use compliance self-inspection plan, at the same time. The self-inspection plan shall be based on the machinery family. Self-inspection may not be carried out for each family, BUT the self-inspection shall be sufficiently representative, to ensure that other families also meet the standard. When the information is disclosed, the manufacturer shall conduct a reasonable engineering evaluation of the emission performance of each family, under reasonable operating and applicable environmental conditions; at the same time, declare that other machinery family also meet the requirements of 5.7.6 of this standard.

8.2.1.3 The in-use compliance self-inspection plan includes the test schedule and sampling plan, etc. It is prepared in accordance with the requirements of Appendix A of GB 20891-2014 and Appendix A of this standard, for supervision and inspection by the competent ecological environment department.

8.2.1.4 Diesel engine manufacturers shall conduct self-inspection of in-use compliance, according to the self-inspection plan. It shall try to select machinery from different machinery manufacturers for testing. The in-use compliance's self-inspection report of diesel engine family shall be disclosed, AND can be used as a part of the in-use compliance self-inspection report of the machinery manufacturer.

8.2.1.5 Machinery manufacturers shall conduct self-inspection of in-use compliance, according to the self-inspection plan; information shall be disclosed on the in-use compliance self-inspection report of machinery.

8.2.2 Supervisory spot-check by the competent department of ecological environment

8.2.2.1 The competent authority may supervise and spot-check the in-use compliance of a certain model (diesel engine family), according to the in-use compliance test procedures, which are specified in Appendix G; record the purchase, maintenance,

manufacturer's participation and other information.

8.2.2.2 The competent authority may carry out functional inspection of the on-board terminal.

8.2.2.3 If the competent authority confirms that a certain model (diesel engine family) does not meet the requirements of this standard, the manufacturer shall take corrective measures, in accordance with the provisions of 8.2.3 of this standard and Appendix G.5.

8.2.2.4 The competent department of ecological environment randomly selects 3 machines. If the test results of 2 or more machines meet the requirements of 5.7.6 or GB 36886-2018 for category II limit, it will be judged as qualified; otherwise it will be unqualified.

8.2.3 Corrective actions for non-compliances

8.2.3.1 The manufacturer shall submit a corrective measure plan as required AND implement it as planned.

8.2.3.2 The rectification measures shall be applicable to all diesel engines or in-use machinery, which belong to the same machinery (family); extended to the diesel engine models (family) and machinery (family) of the manufacturer, that may be affected by the same defect.

8.2.3.3 The manufacturer shall keep the environmental protection recall, maintenance or modification records of each machine or diesel engine, for at least 10 years.

9 Environmental protection information label for machinery

9.1 Machinery enterprises shall install a machinery environmental protection information label, for each machine, during production or before import. The label shall meet the following requirements:

- a) The label cannot be removed, without destroying the label or damaging the machinery appearance;
- b) The label remains legible throughout the life of the machine;
- c) The parts, that fix the machinery environmental protection information label, shall generally not need to be replaced, during the whole life of the machinery;
- d) The location of the label shall be clearly visible.

9.2 The machinery environmental protection information label shall also meet other requirements of Appendix I.

9.3 Three-wheeled vehicles shall implement the regulations on the on-vehicle list of

Appendix A

(Normative)

Type inspection materials

A.1 Overview

Machinery shall provide the following information, which shall be disclosed by the machinery manufacturer or importer.

A.2 Basic information

A.2.1 Machinery model:

A.2.2 Machinery name:

A.2.3 Environmental protection code of machinery or vehicle identification number (VIN):

A.2.4 Production date:

A.2.5 Trademarks:

A.2.6 Machinery family:

A.2.7 Machinery classification:

A.2.8 Emission stage:

A.2.9 Identification method and location of machinery:

A.2.10 Location of machinery's environmental protection information label:

A.2.11 Marking location for environmental protection code of machinery or VIN code:

A.2.12 Location of diagnostic interface:

A.2.13 Name of machinery manufacturer:

A.2.14 Address of machinery manufacturer:

A.2.15 The name and address of the legal person of the machinery manufacturer:

A.2.16 Name of machinery importer (if applicable):

A.2.17 Address of machinery importer (if applicable):

A.2.18 Name and address of the legal person of the machinery importer (if applicable):

A.3 Attached documents

A.3.1 Basic characteristics of key components or systems, which are related to the emission of pollutants in machinery (if applicable)

A.3.2 Information on emission control strategies

A.3.2.1 The manufacturer or importer of machinery or diesel engines shall prepare the detailed descriptions on the technical points of the machinery that affect emissions, diesel engine's emission control strategies, anti-tampering measures, methods of diesel engine systems to directly or indirectly control emissions-related variables, the driver alarm system and the drivability limiting system required in Appendix C and Appendix D, into a file package, which can include two parts:

- a) Official file: It shall be disclosed to the competent department of ecological environment; it can be provided to relevant parties as needed.
- b) Extended file: It shall be kept confidential. The extended documents shall be disclosed to the competent department of ecological environment, OR kept by the machinery manufacturer; however, it shall be ensured that these documents can be checked at any time, when the validity of the type inspection is confirmed.

A.3.2.2 The file shall describe the functional operation of the drivability limiting system, which is required by Appendix C and Appendix D, including parameters required to retrieve system-related information. This material shall be disclosed to the competent department of ecological environment.

A.3.2.3 The extended file package shall include all operational information, on the auxiliary emission control strategy (AECS) and base emission control strategy (BECS), including descriptions of AECS revision parameters, AECS operating boundary conditions, possible activation of AECS and BECS instructions, etc. The extended file shall also include the descriptions, on the control logic of the fuel system, the timing strategy, all switching points during all working conditions. It shall also include a complete description of the drivability limiting system, which is required in Appendix C and Appendix D, including associated monitoring strategies.

A.3.2.4 The self-inspection plan for the compliance of newly produced machinery, which is formulated in accordance with 7.2.1.

A.3.2.5 The self-inspection plan for in-use compliance, which is formulated in accordance with 8.2.1.1.

A.3.3 For the diesel engine model or family, that is to be type-tested as an independent technical assembly, the following materials shall also be submitted:

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