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ANNEX I

SCOPE, DEFINITIONS, SYMBOLS AND ABBREVIATIONS, ENGINE MARKINGS, SPECIFICATIONS AND TESTS, SPECIFICATION OF CONFORMITY OF PRODUCTION ASSESSMENTS, PARAMETERS DEFINING THE ENGINE FAMILY, CHOICE OF THE PARENT ENGINE

1. SCOPE

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2. DEFINITIONS, SYMBOLS AND ABBREVIATIONS

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2.1.
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2.8a.
2.8b.
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2.8c.
2.8d.
2.9.
2.10.
2.11.

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- 2.12.
- 2.13.
- 2.14.
- 2.15.
- 2.16.
- 2.17.
- 2.18. Symbols and abbreviations
 - 2.18.1. Symbols for test parameters
.....
 - 2.18.2. Symbols for chemical components
.....
 - 2.18.3. Abbreviations
.....
- 3. ENGINE MARKINGS
 - 3.1.
 - 3.1.1.
 - 3.1.2.
 - 3.1.3.
 - 3.1.4.
 - 3.2.
 - 3.2.1.
 - 3.2.2.
 - 3.2.3.
 - 3.2.4.
 - 3.3.
 - 3.4.
 - 3.4.1.
 - 3.4.2.
 - 3.5.
 - 3.6.
 - 3.7.

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4. SPECIFICATIONS AND TESTS

4.1. CI engines

4.1.1. General

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4.1.2. Specifications concerning the emissions of pollutants

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4.1.2.1.

4.1.2.2.

4.1.2.3.

4.1.2.4.

Engines for use in other applications than propulsion of inland waterway vessels, locomotives and railcars:

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Engines for propulsion of inland waterway vessels

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Engines for propulsion of locomotives

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Engines for propulsion of railcars

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4.1.2.5.
Engines for use in other applications than propulsion of locomotives, railcars and inland waterway vessels

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Engines for propulsion of railcars

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Engines for propulsion of locomotives:

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4.1.2.6.
Engines for use in other applications than propulsion of locomotives, railcars and inland waterway vessels

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4.1.2.7.

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4.1.2.8.

4.2. SI engines

4.2.1. General

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4.2.2. Specifications concerning the emissions of pollutants.

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4.2.2.1.

4.2.2.2.

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4.2.2.3.

4.3. Installation on the mobile machinery

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4.3.1.

4.3.2.

5. SPECIFICATION OF CONFORMITY OF PRODUCTION ASSESSMENTS

5.1.

5.2.

5.2.1.

5.2.2.

5.2.3.

5.2.4.

5.2.5.

5.3.

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5.3.1.

5.3.2.

5.3.2.1.

5.3.2.2.

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5.3.3.

5.3.4.

6. PARAMETERS DEFINING THE ENGINE FAMILY

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6.10.

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7. CHOICE OF THE PARENT ENGINE

7.1.

7.2.

8. TYPE APPROVAL REQUIREMENTS FOR STAGES IIIB AND IV

8.1.

8.2. **Definitions**

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8.2.1.

8.2.2.

8.3. **General requirements**

8.3.1. *Requirements for base emission control strategy*

8.3.1.1.

8.3.1.2.

8.3.2. *Requirements for auxiliary emission control strategy*

8.3.2.1.

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8.3.2.2.

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8.3.2.3.

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8.3.2.4.

8.3.2.5.

8.3.3. *Documentation requirements*

8.3.3.1.

.....

8.3.3.2.

8.4. **Requirements on NO_x control measures for Stage IIIB engines**

8.4.1.

8.4.2.

8.4.3.

8.4.4.

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8.4.5.

8.4.6. *Use and maintenance requirements*

8.4.6.1.

.....

.....

8.4.7. *Reagent control (where applicable)*

8.4.7.1.

.....

8.4.7.2.

.....

8.5. **Requirements on NO_x control measures for Stage IV engines**

8.5.1.

8.5.2.

8.5.3.

8.5.4.

8.5.5.

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8.6. **Control area for stage IV**

.....

8.6.1. *Demonstration requirements*

.....

8.6.2. *Test requirements*

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.....

8.7. **Verifying Emissions of Crankcase Gases for stage IV engines**

8.7.1.

8.7.2.

8.7.3.

8.7.3.1. *Crankcase emissions*

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9. SELECTION OF ENGINE POWER CATEGORY

- 9.1.
- 9.2.

Appendix 1

Requirements to ensure the correct operation of NO_x control measures

1. Introduction

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- 1.1. *Definitions and abbreviations*
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2. General requirements

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- 2.1. *Required information*
 - 2.1.1.
 - 2.1.2.
 - 2.1.3.
- 2.2. *Operating conditions*
 - 2.2.1.
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.....
- 2.3. *Reagent freeze protection*
 - 2.3.1.
 - 2.3.1.1.
 - 2.3.2.

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- 2.3.2.1.
- 2.3.2.2. Design criteria for a heated system
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- 2.3.2.2.1.....
- 2.3.2.2.2. After the soak period in paragraph 2.3.2.2.1, the machine/engine shall be started and operated at 266 K (– 7 °C) ambient temperature or lower as follows:
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- 2.3.2.2.3.....
- 2.3.2.3.
- 2.3.3.
- 2.3.3.1.
- 2.3.3.2.
- 2.4. *Diagnostic requirements*
- 2.4.1.
- 2.4.2. Requirements for recording Diagnostic Trouble Codes (DTCs)
- 2.4.2.1.
- 2.4.2.2.
- 2.4.2.3.
- 2.4.3. Requirements for erasing Diagnostic trouble codes (DTCs):
.....
- 2.4.4.
- 2.4.5.
- 2.4.6. NCD engine family
.....
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- 2.4.6.1. Parameters defining an NCD engine family
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- 3. **Maintenance requirements**

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3.1. The manufacturer shall furnish or cause to be furnished to all owners of new engines or machines written instructions about the emission control system and its correct operation.

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3.2.

3.3.

3.4.

3.5.

3.6.

4. **Operator warning system**

4.1.

4.2.

4.3. The operator warning system may consist of one or more lamps, or display short messages, which may include, for example, messages indicating clearly:

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4.4.

4.5.

4.6.

4.7.

4.8.

4.9.

5. **Operator inducement system**

5.1.

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5.2.

5.3. *Low-level inducement system*

5.3.1.

5.3.2.

5.3.3.

5.4. *Severe inducement system*

5.4.1.

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5.4.2. The severe inducement system shall reduce the machine's utility to a level that is sufficiently onerous as to cause the operator to remedy any problems related to Sections 6 to 9. The following strategies are acceptable:

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5.5.

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5.6.

5.7.

5.8.

6. Reagent availability

6.1. *Reagent level indicator*

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6.2. *Activation of the operator warning system*

6.2.1.

6.2.2.

6.2.3.

6.2.4.

6.2.5.

6.3. *Activation of the operator inducement system*

6.3.1.

6.3.2.

6.3.3.

7. Reagent quality monitoring

7.1.

7.1.1.

7.1.1.1.

7.1.2.

7.1.3.

7.1.3.1.

7.1.4.

7.2. *Activation of the operator warning system*

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7.3. *Activation of the operator inducement system*

7.3.1.

7.3.2.

7.3.3.

8. **Reagent dosing activity**

8.1.

8.2. *Reagent dosing activity counter*

8.2.1.

8.2.1.1.

8.2.2.

8.3. *Activation of the operator warning system*

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8.4. *Activation of the operator inducement system*

8.4.1.

8.4.2.

8.4.3.

9. **Monitoring failures that may be attributed to tampering**

9.1.

.....

9.2. *Monitoring requirements*

9.2.1.

.....

9.2.2. EGR valve counter

9.2.2.1.

9.2.2.1.1.

9.2.2.2.

9.2.3. NCD system counter(s)

9.2.3.1.

9.2.3.1.1.

9.2.3.2.

9.3. *Activation of the operator warning system*

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9.4. *Activation of the operator inducement system*

9.4.1.

9.4.2.

9.4.3.

9.5.

.....

10. **Demonstration requirements**

10.1. *General*

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10.2. *Engine families And NCD engine families*

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10.2.1.

10.2.2.

10.2.3.

10.3. *Demonstration of the warning system activation*

10.3.1.

10.3.2. Selection of the failures to be tested

10.3.2.1.

10.3.2.2.

.....

10.3.3. Demonstration

10.3.3.1.

10.3.3.2.

10.3.3.3.

10.3.3.4.

10.3.3.5. Detection of failures other than lack of reagent

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10.3.3.6. Detection in case of lack of reagent

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10.3.3.6.1.....

10.3.3.6.2The warning system is deemed to have performed in the correct manner if the following conditions are met simultaneously:

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10.3.3.7. NCD test cycle

10.3.3.7.1.....

10.3.3.7.2On request of the manufacturer and with approval of the Approval Authority, an alternative NCD test-cycle can be used (e.g. the NRSC) for a specific monitor. The request shall contain elements (technical considerations, simulation, test results, etc.) demonstrating:

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10.3.4.

10.4. *Demonstration of the inducement system activation*

10.4.1.

10.4.1.1.

10.4.1.2.

10.4.2.

10.4.3.

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10.4.4.

.....
10.4.4.1.

10.4.5. Demonstration test of the low level inducement system

10.4.5.1.

10.4.5.2.

10.4.5.2.1.....

10.4.5.3.

10.4.5.4.

10.4.6. Demonstration test of the severe inducement system

10.4.6.1.

10.4.6.2.

10.4.6.2.1.....

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- 10.4.6.3.
- 10.4.6.4.
- 10.4.7.
- 10.4.7.1.
- 11. **Description of the operator warning and inducement activation and deactivation mechanisms**
- 11.1.
- 11.2. *Activation and deactivation mechanisms of the warning system*
- 11.2.1.
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- 11.2.2.
- 11.2.2.1. Requirements for erasing ‘NO_x control information’
- 11.2.2.1.1. Erasing/resetting ‘NO_x control information’ by a scan-tool
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- 11.2.2.1.2.
- 11.2.2.1.3.
- 11.2.2.1.4.
- 11.3. *Activation and deactivation mechanism of the operator inducement system*
- 11.3.1.
- 11.3.2.
- 11.3.3.
- 11.4. *Counter mechanism*
- 11.4.1. General
- 11.4.1.1.
-
- 11.4.1.1.1.
- 11.4.1.2.
- 11.4.1.3.
- 11.4.1.3.1.
- 11.4.2. Principle of counters mechanism
- 11.4.2.1.

