

Directive 2013/53/EU of the European Parliament and of the Council
of 20 November 2013 on recreational craft and personal watercraft
and repealing Directive 94/25/EC (Text with EEA relevance)

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ANNEX I

ESSENTIAL REQUIREMENTS

B. Essential requirements for exhaust emissions from propulsion engines

Propulsion engines shall comply with the essential requirements for exhaust emissions set out in this Part.

1. PROPULSION ENGINE IDENTIFICATION

1.1. Each engine shall be clearly marked with the following information:

- (a) engine manufacturer's name, registered trade name or registered trade mark and contact address; and, if applicable, the name and contact address of the person adapting the engine;
- (b) [^{XI}engine type and, if applicable, engine family;]
- (c) a unique engine serial number;
- (d) CE marking, as provided for in Article 18.

Editorial Information

XI Substituted by [Corrigendum to Directive 2013/53/EU of the European Parliament and of the Council of 20 November 2013 on recreational craft and personal watercraft and repealing Directive 94/25/EC \(Official Journal of the European Union L 354 of 28 December 2013\)](#).

1.2. The marks referred to in point 1.1 must be durable for the normal life of the engine and must be clearly legible and indelible. If labels or plates are used, they must be attached in such a manner that the fixing is durable for the normal life of the engine, and the labels/plates cannot be removed without destroying or defacing them.

1.3. The marks must be secured to an engine part necessary for normal engine operation and not normally requiring replacement during the engine life.

1.4. The marks must be located so as to be readily visible after the engine has been assembled with all the components necessary for engine operation.

2. EXHAUST EMISSION REQUIREMENTS

Propulsion engines shall be designed, constructed and assembled so that when correctly installed and in normal use, emissions shall not exceed the limit values obtained from point 2.1, Table 1 and point 2.2, Tables 2 and 3:

2.1. Values applying for the purposes of Article 55(2) and Table 2 of point 2.2:

TABLE 1

| Type | Carbon monoxide | | | Hydrocarbons | | | Nitrogen oxides NO _x | Particulates PT |
|------------|--|-------|-----|--|-------|------|------------------------------------|--------------------|
| | CO = A + B / P _n ^N | | | HC = A + B / P _n ^N | | | | |
| | A | B | n | A | B | n | | |
| Two-stroke | 150,0 | 600,0 | 1,0 | 30,0 | 100,0 | 0,75 | 10,0 | Not applicable |

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| | | | | | | | | |
|----------------------------|-------|-------|-----|-----|------|------|------|----------------|
| spark ignition | | | | | | | | |
| Four-stroke spark ignition | 150,0 | 600,0 | 1,0 | 6,0 | 50,0 | 0,75 | 15,0 | Not applicable |
| Compression ignition | 15,0 | 0 | 0 | 1,5 | 2,0 | 0,5 | 9,8 | 1,0 |

Where A, B and n are constants in accordance with the table, P_N is the rated engine power in kW.

2.2. Values applying from 18 January 2016:

TABLE 2

Exhaust emission limits for compression ignition (CI) engines⁰

| Swept Volume SV (L/cyl) | Rated Engine Power P_N (kW) | Particulates PT (g/kWh) | Hydrocarbons + Nitrogen Oxides HC + NO _x (g/kWh) |
|-------------------------|-------------------------------|-----------------------------------|---|
| SV < 0,9 | $P_N < 37$ | The values referred to in table 1 | |
| | $37 \leq P_N < 75$ a | 0,3 | 4,7 |
| | $75 \leq P_N < 3700$ | 0,15 | 5,8 |
| 0,9 ≤ SV < 1,2 | $P_N < 3700$ | 0,14 | 5,8 |
| 1,2 ≤ SV < 2,5 | | 0,12 | 5,8 |
| 2,5 ≤ SV < 3,5 | | 0,12 | 5,8 |
| 3,5 ≤ SV < 7,0 | | 0,11 | 5,8 |

a + Alternatively, compression-ignition engines with rated engine power at or above 37 kW and below 75 kW and with a swept volume below 0,9 L/cyl shall not exceed a PT emission limit of 0,20 g/kWh and a combined HC + NO_x emission limit of 5,8 g/kWh.

b ++ Any compression-ignition engine shall not exceed a Carbon monoxide (CO) emission limit of 5,0 g/kWh.

TABLE 3

Exhaust emission limits for spark ignition (SI) engines

| Type of engine | Rated Engine Power P_N (kW) | Carbon monoxide CO (g/kWh) | Hydrocarbons + Nitrogen Oxides HC + NO _x (g/kWh) |
|---------------------------------|-------------------------------|----------------------------|---|
| Stern-drive and inboard engines | $P_N \leq 373$ | 75 | 5 |
| | $373 < P_N \leq 485$ | 350 | 16 |
| | $P_N > 485$ | 350 | 22 |

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| Outboard engines and PWC engines | $P_N \leq 4,3$ | $500 - (5,0 \times P_N)$ | 30 |
| | $4,3 < P_N \leq 40$ | $500 - (5,0 \times P_N)$ | $15,7 + \left(\frac{50}{P_N^{0,9}}\right)$ |
| | $P_N > 40$ | 300 | $15,7 + \left(\frac{50}{P_N^{0,9}}\right)$ |

2.3. Test cycles:

Test cycles and weighting factors to be applied:

The following requirements of ISO standard 8178-4:2007 shall be used, taking into account the values set out in the table below.

For variable speed CI engines test cycle E1 or E5 shall be applied or alternatively, above 130 kW, test cycle E3 may be applied. For variable speed SI engines test cycle E4 shall be applied.

| Cycle E1, Mode number | 1 | 2 | 3 | 4 | 5 |
|--------------------------------------|--------------------|----------|---------------------------|----------|-----------------------|
| Speed | Rated speed | | Intermediate speed | | Low-idle speed |
| Torque, % | 100 | 75 | 75 | 50 | 0 |
| Weighting factor | 0,08 | 0,11 | 0,19 | 0,32 | 0,3 |
| Speed | Rated speed | | Intermediate speed | | Low-idle speed |
| Cycle E3, Mode number | 1 | 2 | 3 | 4 | |
| Speed, % | 100 | 91 | 80 | 63 | |
| Power, % | 100 | 75 | 50 | 25 | |
| Weighting factor | 0,2 | 0,5 | 0,15 | 0,15 | |
| Cycle E4, Mode number | 1 | 2 | 3 | 4 | 5 |
| Speed, % | 100 | 80 | 60 | 40 | Idle |
| Torque, % | 100 | 71,6 | 46,5 | 25,3 | 0 |
| Weighting factor | 0,06 | 0,14 | 0,15 | 0,25 | 0,4 |
| Cycle E5, Mode number | 1 | 2 | 3 | 4 | 5 |
| Speed, % | 100 | 91 | 80 | 63 | Idle |
| Power, % | 100 | 75 | 50 | 25 | 0 |

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| Weighting factor | 0,08 | 0,13 | 0,17 | 0,32 | 0,3 |
|------------------|------|------|------|------|-----|

Notified bodies may accept tests carried out on the basis of other tests cycles as specified in a harmonised standard and as applicable for the engine duty cycle.

2.4. Application of the propulsion engine family and choice of parent propulsion engine

The engine manufacturer shall be responsible for defining those engines from his range which are to be included in an engine family.

A parent engine shall be selected from an engine family in such a way that its emissions characteristics are representative for all engines in that engine family. The engine incorporating those features that are expected to result in the highest specific emissions (expressed in g/kWh), when measured on the applicable test cycle, should normally be selected as the parent engine of the family.

2.5. Test fuels

The test fuel used for exhaust emission testing shall meet the following characteristics:

| Petrol Fuels | | | | |
|---------------------------------------|-------------------------|------------|-------------------------|------------|
| Property | RF-02-99Unleaded | | RF-02-03Unleaded | |
| | min | max | min | max |
| Research Octane Number (RON) | 95 | — | 95 | — |
| Motor Octane Number (MON) | 85 | — | 85 | — |
| Density at 15 °C (kg/m ³) | 748 | 762 | 740 | 754 |
| Initial boiling point (°C) | 24 | 40 | 24 | 40 |
| Mass fraction of sulphur (mg/kg) | — | 100 | — | 10 |
| Lead content (mg/l) | — | 5 | — | 5 |
| Reid vapour pressure (kPa) | 56 | 60 | — | — |
| Vapour pressure (DVPE) (kPa) | — | — | 56 | 60 |
| Diesel Fuels | | | | |
| Property | RF-06-99 | | RF-06-03 | |
| | min | max | min | max |
| Cetane number | 52 | 54 | 52 | 54 |
| Density at 15 °C (kg/m ³) | 833 | 837 | 833 | 837 |

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| | | | | |
|----------------------------------|----------------|----------|----|------|
| Final boiling point (°C) | — | 370 | — | 370 |
| Flash point (°C) | 55 | — | 55 | — |
| Mass fraction of sulphur (mg/kg) | To be reported | 300 (50) | — | 10 |
| Mass fraction of ash (%) | To be reported | 0,01 | — | 0,01 |

Notified bodies may accept tests carried out on the basis of other tests fuel as specified in a harmonised standard.

3. DURABILITY

The manufacturer of the engine shall supply engine installation and maintenance instructions, which if applied should mean that the engine in normal use will continue to comply with the limits set out in points 2.1 and 2.2 throughout the normal life of the engine and under normal conditions of use.

This information shall be obtained by the engine manufacturer by use of prior endurance testing, based on normal operating cycles, and by calculation of component fatigue so that the necessary maintenance instructions may be prepared by the manufacturer and issued with all new engines when first placed on the market.

The normal life of the engine is as follows:

- (a) For CI engines: 480 hours of operation or 10 years, whichever occurs first;
- (b) For SI inboard or stern drive engines with or without integral exhaust:
 - (i) for the engine category
 $P_N \leq 373 \text{ kW}$
: 480 hours of operation or 10 years, whichever occurs first,
 - (ii) for engines in the category
 $373 < P_N \leq 485 \text{ kW}$
: 150 hours of operation or three years, whichever occurs first,
 - (iii) for the engine category
 $P_N > 485 \text{ kW}$
: 50 hours of operation or one year, whichever occurs first;
- (c) personal watercraft engines: 350 hours of operation or five years, whichever occurs first;
- (d) outboard engines: 350 hours of operation or 10 years, whichever occurs first

4. OWNER'S MANUAL

Each engine shall be provided with an owner's manual in a language or languages which can be easily understood by consumers and other end-users, as determined by the Member State in which the engine is to be marketed.

The owner's manual shall:

- (a) provide instructions for the installation, use and maintenance needed to assure the proper functioning of the engine to meet the requirements of Section 3 (Durability);

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- (b) specify the power of the engine when measured in accordance with the harmonised standard.