
**Reciprocating internal combustion
engines — Exhaust emission
measurement —**

**Part 8:
Engine group determination**

*Moteurs alternatifs à combustion interne — Mesurage des émissions
de gaz d'échappement —*

Partie 8: Détermination des groupes de moteurs



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary Information](#)

The committee responsible for this document is ISO/TC 70, *Reciprocating internal combustion engines*, Subcommittee SC 8, *Exhaust emission measurement*.

This second edition cancels and replaces the first edition (ISO 8178-8:1996), which has been technically revised.

ISO 8178 consists of the following parts, under the general title *Reciprocating internal combustion engines — Exhaust emission measurement*:

- *Part 1: Test-bed measurement of gaseous and particulate exhaust emissions*
- *Part 2: Measurement of gaseous and particulate exhaust emissions under field conditions*
- *Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions*
- *Part 4: Steady-state test cycles for different engine applications*
- *Part 5: Test fuels*
- *Part 6: Report of measuring results and test*
- *Part 7: Engine family determination*
- *Part 8: Engine group determination*
- *Part 9: Test cycles and test procedures for test bed measurement of exhaust gas smoke emissions from compression ignition engines operating under transient conditions*
- *Part 10: Test cycles and test procedures for field measurement of exhaust gas smoke emissions from compression ignition engines operating under transient conditions*

Introduction

Unlike engines for on-road applications, engines for non-road use are made in a much wider range of power output and configuration and are used in a great number of different applications.

The objective of this International Standard is to rationalize the test methods for non-road engines in order to simplify and make more cost effective the drafting of legislation, the development of engine specifications, and the certification of engines to control gaseous and particulate emissions.

In order to achieve its objectives, this International Standard embraces four concepts that are the following:

- a) grouping of engine applications in order to reduce the number of test cycles as defined in ISO 8178-4;
- b) use of observed brake power as defined in ISO 8178-4 as the basis for the expression of specific emission levels;
- c) incorporation of an “engine family” concept in which engines with similar emission characteristics and design can be represented by an engine within the family;
- d) incorporation of an “engine group” concept which assumes that
 - 1) engines can be adjusted or modified after measurement on the test bed,
 - 2) engines of basically the same type or model can be classified within a group even if the engine is adjusted or modified after measurement on the test bed, and
 - 3) adjusted or modified engines must comply with the applicable emission limits.

The parameters that define the engine group are more restrictive than those for an engine family.

The group concept is typically applied to large sizes and engines produced in small number. This concept also provides the possibility for a reduction in approval testing for modifications to engines, either in production or in service.

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Reciprocating internal combustion engines — Exhaust emission measurement —

Part 8: Engine group determination

1 Scope

This part of ISO 8178 specifies the parameters to be applied for the determination of which engine specifications can be included in an engine group and for the selection of the parent engine of the group.

It can be applied for applications that might require modification or adjustment to suit at-site operating conditions. Such applications include stationary engines and engines for shipping.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1

engine group

grouping of engines applicable to those engines which require adjustment or modification after test bed measurement to ensure that they comply after adjustment or modification with the emissions and performance requirements at-site (primarily for stationary applications), respectively, under reference conditions (primarily for marine applications)

Note 1 to entry: The engine group is a more restrictive grouping of engines than the engine family specified in ISO 8178-7. The definition of the group and choice of the *parent engine* (2.2) are to be agreed by the parties involved.

2.2

parent engine

engine which represents an *engine group* (2.1) in terms of emission performance by agreement of the parties involved

Note 1 to entry: See [Clause 6](#).

3 General

There are engines, primarily for shipping and stationary applications, that require modification or adjustment to suit the at-site operating conditions. In these situations, the option exists for the parties involved to agree to a group of engines with restrictive basic characteristics and specifications to permit limited modification and adjustment.

The selection procedure for the parent engine is preferably such that the selected engine will incorporate those features which will adversely affect the emission level of the relevant exhaust components.

On the other hand, the procedure shall suit the production volume of the engine manufacturer. Therefore, the parent engine can be the first unit of a production series or, in some cases, a relevant test engine.

The definition of the group and choice of the parent engine shall be agreed by the parties involved.

4 Parameters defining the engine group

The engine group can be defined by basic characteristics and specifications which should be common to engines within the group.

The engine manufacturer is responsible for indicating those engines from his production range which are to be included in a group and agreed by the parties involved. In order that engines can be considered to belong to the same engine group, the following list of characteristics and specifications should be common.

- a) Combustion cycle
 - 1) Two-stroke
 - 2) Four-stroke
 - 3) Rotary engine
 - 4) Others
- b) Main cooling medium
 - 1) Air
 - 2) Water
 - 3) Oil
- c) Cylinders
 - 1) Bore
 - 2) Stroke
- d) Maximum rated power per cylinder at maximum rated speed: The permitted range of derating within the engine group shall be declared by the manufacturer and should be agreed by the parties involved.
- e) Method of air aspiration
 - 1) Naturally aspirated
 - 2) Pressure charged
 - i) Constant pressure
 - ii) Pulsating system
- f) Method of charge air cooling
 - 1) With/without intercooler
 - 2) Number of intercooler stages
- g) Fuel type
 - 1) Diesel
 - 2) Petrol
 - 3) Natural gas
 - 4) Liquefied petroleum gas
 - 5) Other gases
 - 6) Alcohol

- 7) Other fuels
- h) Combustion chamber type
 - 1) Open chamber
 - 2) Divided chamber
- i) Valve and porting
 - 1) Configuration
 - 2) Size and number of valves per cylinder
- j) Cylinder head
- k) Cylinder liner
- l) Fuel system type
 - 1) Fuel only
 - i) Pump-line injector
 - ii) In-line pump
 - iii) Distributor pump
 - iv) Single element pump
 - v) Unit injector
 - vi) Common rail
 - vii) Gas valve
 - viii) Throttle body injection
 - 2) Fuel and air
 - 3) Carburettor
- m) Miscellaneous features
 - 1) Exhaust gas recirculation (EGR)
 - 2) Water emulsion or direct water injection or stratified injection
 - 3) Charge air humidification
 - 4) Air injection
 - 5) Charge cooling system
 - 6) Exhaust after-treatment

The function and combination of the following devices are regarded as membership criteria for an engine family.

- Oxidation catalyst
- Three-way catalyst
- DeNO_x Reduction catalyst, e.g. Selective Catalytic Reduction
- Thermal reactor