



BSI Standards Publication

# Reciprocating internal combustion engines — Exhaust emission measurement

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Part 4: Steady-state and transient test cycles for different engine applications

## National foreword

This British Standard is the UK implementation of ISO 8178-4:2020. It supersedes BS ISO 8178-4:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/14/-/3, RIC Engines - Performance and emissions.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2020  
Published by BSI Standards Limited 2020

ISBN 978 0 539 06172 7

ICS 13.040.50; 27.020

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2020.

### Amendments/corrigenda issued since publication

Date	Text affected
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INTERNATIONAL  
STANDARD

**ISO**  
**8178-4**

Fourth edition  
2020-06

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

Part 4:  
**Steady-state and transient test cycles  
for different engine applications**

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

*Partie 4: Cycles d'essai à l'état stable et transitoires pour différentes  
applications des moteurs*



Reference number  
ISO 8178-4:2020(E)



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Published in Switzerland

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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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

This fourth edition cancels and replaces the third edition (ISO 8178-4:2017), which has been technically revised.

The main changes compared to the previous edition are as follows:

- amendment of the information regarding the determination of the background concentration;
- revision of particle number emission evaluation;
- addition of electrical equipment in the auxiliary table;

A list of all the parts in the ISO 8178 series, can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).



## Introduction

In comparison with 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 document is to rationalize the test procedures 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.

This document embraces three concepts in order to achieve the objectives.

The first principle is to group applications with similar engine operating characteristics in order to reduce the number of test cycles to a minimum, but ensure that the test cycles are representative of actual engine operation.

The second principle is to express the emissions results on the basis of brake power as defined in ISO 8178-1. This ensures that alternative engine applications do not result in a multiplicity of tests.

The third principle is the incorporation of an engine family concept in which engines with similar emission characteristics and of similar design may be represented by the highest emitting engine within the group.

# Reciprocating internal combustion engines — Exhaust emission measurement —

## Part 4: Steady-state and transient test cycles for different engine applications

### 1 Scope

This document specifies the test cycles, the test procedures and the evaluation of gaseous and particulate exhaust emissions from reciprocating internal combustion (RIC) engines coupled to a dynamometer. With certain restrictions, this document can also be used for measurements at site. The tests are carried out under steady-state and transient operation using test cycles which are representative of given applications.

This document is applicable to RIC engines for mobile, transportable and stationary use, excluding engines for on-road transport of passengers and goods. It can be applied to engines for non-road use, e.g. for earth-moving machines, generating sets and for other applications. For engines used in machinery covered by additional requirements (e.g. occupational health and safety regulations, regulations for power plants), additional test conditions and special evaluation methods can apply.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8178-1:2020, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 1: Test-bed measurement of gaseous and particulate exhaust emissions*

ISO 8178-5, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 5: Test fuels*

ASTM E29–06b, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### adjustment factors

additive (upward adjustment factor and downward adjustment factor) or multiplicative factors to be used for engines equipped with emission controls, that are regenerated on an infrequent (periodic) basis