

INTERNATIONAL STANDARD

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Reciprocating internal combustion engines — Exhaust emission measurement —

Part 3:

Definitions and methods of measurement of
exhaust gas smoke under steady-state
conditions

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

*Partie 3: Définitions et méthodes de mesure de la fumée des gaz
d'échappement dans des conditions stabilisées*



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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8178-3 was prepared jointly by Technical Committees ISO/TC 70, *Internal combustion engines*, Subcommittee SC 8, *Exhaust gas emission measurement* and ISO/TC 22, *Road vehicles*, Subcommittee SC 5, *Engine tests*.

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 emissions*
- *Part 2: At-site measurement of gaseous and particulate exhaust emissions*
- *Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions*
- *Part 4: Test cycles for different engine applications*
- *Part 5: Test fuels*
- *Part 6: Test report*
- *Part 7: Determination of engine family and engine group*

Annex A of this part of ISO 8178 is for information only.

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Introduction

The International Standards listed below concerning the measurement of smoke emitted from reciprocating internal combustion (RIC) engines have been elaborated by ISO/TC 22 and ISO/TC 70 in smooth cooperation.

ISO 8178-3:—, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions.*

ISO 10054:—, *Internal combustion compression-ignition engines — Measurements apparatus for smoke from engines operating under steady-state conditions — Filter-type smoke meter.*

ISO 11614:—, *Reciprocating internal combustion compression-ignition engines — Apparatus for measurement of the opacity and for determination of the light absorption coefficient of exhaust gas.*

ISO 10054 and ISO 11614 define the measurement equipment for different smoke-measurement methods. This part of ISO 8178 defines their application to RIC engines on the basis of these International Standards.

The smoke-measurement methods are used for the measurement of visible emissions. The smoke-measurement results, evaluated in accordance with this part of ISO 8178, are different from the results obtained with the particulate-measurement methods described in ISO 8178-1 and ISO 8178-2 or in other standards and regulations.

Furthermore, the two smoke-measurement methods described in this part of ISO 8178 are different, which only allows a restricted correlation between them.

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Reciprocating internal combustion engines — Exhaust emission measurement —

Part 3:

Definitions and methods of measurement of exhaust gas smoke under steady-state conditions

1 Scope

This part of ISO 8178 specifies two methods for the measurement of exhaust gas smoke characteristics of reciprocating internal combustion (RIC) engines operating under steady-state conditions. One method evaluates smoke opacity by measurement of the obscuration of a light beam; the other evaluates the soot content by measurement of the blackening of a filter. Where necessary, individual requirements may be specified for particular engine applications.

This part of ISO 8178 does not deal with measurement under transient conditions; if smoke meters are used under transient conditions, the results from different types of instrument cannot be compared unless the sampling conditions are identical and the instrument characteristics are compatible.

This part of ISO 8178 is applicable to RIC engines for land, rail-traction and marine use, including engines used to propel agricultural tractors and road vehicles.

It may be applied to engines used to propel road-construction and earth-moving machines, industrial trucks, and for other applications where no suitable International Standards for exhaust gas smoke measurement of these engines exist.

NOTE 1 If water is injected into the exhaust system, measurement or sampling can only be made upstream of the point of water injection.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8178. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8178 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2710-1:—¹⁾ *Reciprocating internal combustion engines — Vocabulary — Part 1: Terms for engine design and operation.*

ISO 10054:—²⁾ *Internal combustion compression-ignition engines — Measurement apparatus for smoke from engines operating under steady-state conditions — Filter-type smoke meter.*

ISO 11614:—²⁾ *Reciprocating internal combustion compression-ignition engines — Apparatus for measurement of the opacity and for determination of the light absorption coefficient of exhaust gas.*

1) To be published. (Revision of ISO 2710:1978 and Add.1:1982)

2) To be published.