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Reciprocating internal combustion engines — Exhaust emission measurement —

Part 3: Test procedures for measurement of exhaust gas smoke emissions from compression ignition engines using a filter type smoke meter

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.

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).

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.

This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*, Subcommittee SC 8, *Exhaust gas emission measurement*.

This second edition cancels and replaces the first edition (ISO 8178-3:1994), which has been technically revised.

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

— smoke measurement by an opacimeter has been removed; this will be handled in ISO 8178-9;

— definitions of exhaust gas components related to exhaust gas smoke has been added.

This document is intended to be used in conjunction with ISO 10054.

A list of all 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.

Introduction

There exist several measurement methods to determine the components of smoke emissions. Each method is measuring special properties of smoke. Therefore, the results obtained with different methods are typically not comparable among each other.

The objective of this document is to give a guidance for measurement of soot with a filter type smoke meter, knowing about the different components of the smoke of compression ignition engines and their particular properties.

An overview of the measurement methods specified by ISO 8178-1, ISO 8178-3, ISO 8178-9 and ISO 9096 is given in Annex B.

Correlation formulae to calculate the mass concentration of black carbon out of the filter smoke number (FSN) are given in Annex C.

The characteristics required for filter-type-smoke meters are defined in ISO 10054.

Reciprocating internal combustion engines — Exhaust emission measurement —

Part 3: Test procedures for measurement of exhaust gas smoke emissions from compression ignition engines using a filter type smoke meter

1 Scope

This document specifies a method for the measurement of smoke from exhaust gas of reciprocating internal combustion (RIC) engines at a steady state condition. The method evaluates the soot content by measurement of the blackening of a filter and derivation of black carbon mass concentration (mg/m^3) from FSN. Where necessary, individual requirements may be specified for particular engine 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 10054, *Internal combustion compression-ignition engines — Measurement apparatus for smoke from engines operating under steady-state conditions — Filter-type smokemeter*

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
filter-type smoke meter
instrument in which a given exhaust gas volume is passed through a clean filter of a certain area and the blackness condition of this filter is subsequently used to define the *filter smoke number* (3.3)