

**Automotive fuels - Fatty acid methyl ester (FAME) fuel
and blends with diesel fuel - Determination of oxidation
stability by accelerated oxidation method**

EESTI STANDARDI EESSÕNA

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English Version

**Automotive fuels - Fatty acid methyl ester (FAME) fuel and
blends with diesel fuel - Determination of oxidation stability by
accelerated oxidation method**

Carburants pour automobiles - Esters méthyliques d'acides
gras (EMAG) et mélanges avec du gazole - Détermination
de la stabilité à l'oxydation par méthode d'oxydation
accélérée

Kraftstoffe für Kraftfahrzeuge - Kraftstoff
Fettsäuremethylester (FAME) und Mischungen mit
Dieselkraftstoff - Bestimmung der Oxidationsstabilität
(beschleunigtes Oxidationsverfahren)

This European Standard was approved by CEN on 20 December 2013.

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Foreword

This document (EN 15751:2014) has been prepared by Technical Committee CEN/TC 19 “Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15751:2009.

Significant changes between this document and EN 15751:2009 are:

- a) the limitation of the scope of the method to a maximum induction period of 48 h, reflecting the precision range of the method,
- b) indication of a potential alteration of the induction period in the presence of cetane enhancers,
- c) inclusion of the results of a short applicability check on non-petroleum based (such as Fischer-Tropsch synthesis or hydrotreatment process originated) diesel type of fuels (see Introduction),
- d) editorial changes in order to clarify the test procedure.

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Introduction

This document is based on EN 14112 [1], which was specifically adapted for the determination of oxidation stability of fatty acid methyl esters (FAME). This method had been developed under CEN/TC 307 (Fats and oils). At the time of development the method was applicable for FAME fuel according to EN 14214 [2], but questions remained on the accuracy towards blends of FAME and diesel fuel.

The modifications to EN 14112 as given in this document, allow application of this test method for oxidation stability for pure FAME and diesel/FAME blends at various levels.

The goal was to have one single test method for FAME fuel, diesel/FAME blends and pure diesel fuels. Although the modifications cover FAME fuel and diesel/FAME blends, CEN/TC 307 decided that it was better to retain EN 14112 for methyl esters and publish a separate standard for all automotive fuel and heating oil applications, as the use of 'diesel and diesel blends' falls out the scope of CEN/TC 307.

While developing the fuels specification for paraffinic diesel fuel, three labs executed a small test on neat fuel and on 7 % (V/V) FAME blend based on product originating from both Fischer-Tropsch synthesis and hydrotreatment process. No indications towards a different interaction with the methodology of this document were found, so it was concluded that the stability of these paraffinic diesel fuels can be determined with the test method described in this document. The stability of these products usually is that high that the results do not match the scope of this European Standard.

The modifications required a new validation covering pure FAME, diesel/FAME blends and pure diesel fuels which resulted in the fact that the method is not suitable for pure petroleum-based diesel fuels.

1 Scope

This European Standard specifies a test method for the determination of the oxidation stability of fuels for diesel engines, by means of measuring the induction period of the fuel up to 48 h. The method is applicable to fatty acid methyl esters (FAME) intended for the use as pure biofuel or as a blending component for diesel fuels, and to blends of FAME with diesel fuel containing 2 % (V/V) of FAME at minimum.

NOTE 1 EN 14112 [1] describes a similar test method for oxidation stability determination of pure fatty acid methyl esters (see the Introduction to this European Standard).

NOTE 2 For induction periods higher than 48 h the precision is not covered by the precision statement of this method. The limit values of the relevant fuel standards are well within the scope of this test method.

NOTE 3 The presence of cetane improver can reduce the oxidation stability determined by this test method. Limited studies with EHN (2-ethyl hexyl nitrate) indicated, however, that the stability is reduced to an extent which is within the reproducibility of the test method.

NOTE 4 For the purposes of this European Standard, the term “% (V/V)” is used to represent the volume fraction (φ) of a material.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 3170, *Petroleum liquids - Manual sampling (ISO 3170)*

EN ISO 3171, *Petroleum liquids - Automatic pipeline sampling (ISO 3171)*

3 Terms and definitions

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

3.1

induction period

time which passes between the moment when the measurement is started and the moment when the formation of oxidation products begins to increase rapidly

3.2

oxidation stability

induction period determined according to the procedure specified in this European Standard, expressed in hours

4 Principle

A stream of purified air is passed through the sample which has been heated to the target temperature which is 110 °C in the usual application of the method. Volatile compounds are formed during the oxidation process. They are, passed together with the air into a flask containing demineralised or distilled water, equipped with a conductivity electrode. The electrode is connected to a measuring and recording device. It indicates the end of the induction period by rapid increase of the conductivity due to the dissociation of volatile carboxylic acids produced during the oxidation process and absorbed in the water. For more details on the background of the method, see Annex A.