



BSI Standards Publication

**Liquid petroleum products — Middle distillates
and fatty acid methyl ester (FAME) fuels and
blends — Determination of oxidation stability
by rapid small scale oxidation test (RSSOT)**

National foreword

This British Standard is the UK implementation of EN 16091:2022. It supersedes BS EN 16091:2011, which is withdrawn.

BSI, as a member of CEN, is obliged to publish EN 16091:2022 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval.

The reasons for the UK committee's negative vote are in the standard's lack of bias statement offered for the two different test temperatures (see C.4).

The UK participation in its preparation was entrusted to Technical Committee PTI/13, Petroleum Testing and Terminology.

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

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Amendments/corrigenda issued since publication

Date	Text affected
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English Version

**Liquid petroleum products - Middle distillates and
fatty acid methyl ester (FAME) fuels and blends -
Determination of oxidation stability by rapid small scale
oxidation test (RSSOT)**

Produits pétroliers liquides - Distillats moyens,
esters méthyliques d'acides gras (EMAG) et
leurs mélanges - Détermination de la stabilité
à l'oxydation par méthode d'oxydation
accélérée à petite échelle (RSSOT)

Flüssige Mineralölerzeugnisse - Mitteldestillat- und
Fettsäure-Methylester (FAME)-Kraftstoffe und
-Mischungen - Bestimmung der Oxidationsstabilität
mit beschleunigtem Oxidationsverfahren
und kleiner Probenmenge (RSSOT)

This European Standard was approved by CEN on 19 September 2022.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16091:2022) 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 April 2023, and conflicting national standards shall be withdrawn at the latest by month April 2023.

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

This document supersedes EN 16091:2011.

In comparison with the previous edition EN 16091:2011, the following technical modifications have been made:

- a) addition of informative [Annex C](#) to include work that has been executed on a modified rapid small scale oxidation method at 120 °C;
- b) revision of [Clause 8](#): the performance check of the apparatus and the recommended calibration process have been merged into a single Clause 8.1;
- c) Annex on the calibration process has been removed;
- d) the document was revised editorially.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document specifies a method for the determination of the oxidation stability of middle distillate fuels, fatty acid methyl ester (FAME) fuel and blends thereof, under accelerated conditions, by measuring the induction period to the specified breakpoint in a reaction vessel charged with the sample and oxygen at 140 °C.

NOTE 1 For the purposes of this document, the term “% (V/V)” is used to represent the volume fraction (φ).

NOTE 2 The induction period is used as an indication for the resistance of middle distillates, fatty acid methyl ester (FAME) fuels and blends thereof against oxidation. This correlation can vary markedly under different conditions with different FAMEs and diesel fuel blends.

NOTE 3 The presence of ignition improvers can lead to lower oxidation stability results determined by this method. It has for instance been observed that the addition of 2-ethyl hexyl nitrate (2-EHN) can reduce the measured oxidation stability values. See [6] for details.

NOTE 4 For further information on the precision data at a test temperature of 120 °C see [Annex C](#).

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.

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.

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 <https://www.electropedia.org/>

3.1 breakpoint

point in the pressure-time curve, where the pressure in the vessel has dropped 10 % below the maximum pressure achieved in the current test run

3.2 induction period

time elapsed between starting the heating procedure of the reaction vessel, charged with sample and oxygen, and the breakpoint, measured in minutes

4 Principle

At ambient temperature, a known volume of a sample is placed in a reaction vessel charged with oxygen to a pressure of 700 kPa $\pm$ 5 kPa. The reaction vessel is heated to 140 °C. The pressure in the vessel drops as the oxygen is consumed during the oxidation of the sample. The pressure in the vessel is recorded at intervals of 1 s until the breakpoint is reached. The elapsed time from start to the breakpoint is the induction period at the test temperature of 140 °C $\pm$ 0,5 °C.

NOTE Work has been executed on the determination of oxidation stability by a modified rapid small-scale oxidation method at 120 °C. The results thereof are given in [Annex C](#).