



BSI Standards Publication

Fat and oil derivatives — Fatty Acid Methyl Esters (FAME) — Determination of oxidation stability (accelerated oxidation test)

National foreword

This British Standard is the UK implementation of EN 14112:2020. It supersedes BS EN 14112:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AW/307, Oilseeds, animal and vegetable fats and oils and their by-products.

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

**Fat and oil derivatives - Fatty Acid Methyl Esters (FAME) -
Determination of oxidation stability (accelerated oxidation
test)**

Produits dérivés des corps gras - Esters méthyliques
d'acides gras (EMAG) - Détermination de la stabilité à
l'oxydation (Essai d'oxydation accélérée)

Erzeugnisse aus pflanzlichen und tierischen Fetten und
Ölen - Fettsäure-Methylester (FAME) - Bestimmung
der Oxidationsstabilität (beschleunigte
Oxidationsprüfung)

This European Standard was approved by CEN on 25 October 2020.

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European foreword

This document (EN 14112:2020) has been prepared by Technical Committee CEN/TC 307 “Oilseeds, vegetable and animal fats and oils and their by-products - Methods of sampling and analysis”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.

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 14112:2016.

Significant changes between this document and EN 14112:2016 are:

- change of Figure 2, removal of dimension between air inlet and heating block;
- introduction removed;
- document revised editorially.

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, Turkey and the United Kingdom.

1 Scope

This document specifies a method for the determination of the oxidation stability of fatty acid methyl esters (FAME) at 110 °C, by means of measuring the induction period up to 48 h.

For induction periods higher than 8,5 h the precision is not covered by the precision statement of this method.

NOTE 1 EN 15751 [1] describes a similar test method for oxidation stability determination of pure fatty acid methyl esters and of blends of FAME with petroleum-based diesel containing 2 % (V/V) of FAME at minimum.

NOTE 2 Limited studies on EN 15751 with EHN (2-ethyl hexyl nitrate) on FAME blends indicated that the stability is reduced to an extent which is within the reproducibility of the test method. It is likely that the oxidation stability of pure FAMES is also reduced in the presence of EHN when EN 14112 is used for testing.

NOTE 3 For the purposes of this document, the term “% (V/V)” is used to represent the volume fraction.

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:

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

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 document, expressed in hours

4 Principle

A stream of purified (dried) 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 demineralized or distilled water, and 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.

5 Chemicals

Use only chemicals of analytical grade and distilled or demineralized water.

5.1 Ternary solvent mixture, consisting of methanol/toluene/acetone 1:1:1 (by volume).

5.2 Alkaline laboratory glass cleaning solution.

5.3 2-Propanol.

6 Apparatus

Usual laboratory equipment and glassware, together with the following:

6.1 Device for the determination of oxidation stability, comprising the following parts (see Figures 1 and 2) ¹⁾.

6.1.1 Air filter, comprising a tube fitted with filter paper at the ends and filled with a molecular sieve (6.6), connected to the suction end of a pump.

6.1.2 Gas membrane pump, with an adjustable flow rate of $(10 \pm 1,0)$ l/h.

6.1.3 Reaction vessels of borosilicate glass, provided with a sealing cap. The sealing cap shall be fitted with a gas inlet and outlet tube.

6.1.4 Closed measurement cells, of approximately 150 ml capacity, with an air inlet tube extending to the bottom inside of the vessel. The cell shall have ventilation holes at the top.

6.1.5 Electrodes, for measuring conductivity within a range of 0 $\mu\text{S}/\text{cm}$ to 300 $\mu\text{S}/\text{cm}$ aligned with the dimensions of the measurement cell (6.1.4).

6.1.6 Measuring and recording apparatus, comprising:

- a) an amplifier; and
- b) a recorder registering the signal of each of the electrodes (6.1.5).

¹⁾ Rancimat is the trade name of a product supplied by Metrohm AG, Herisau, Switzerland; OSI is the trade name of a product supplied by Omnion Inc., Rockland, Massachusetts, USA. This information is given for the convenience of users of this document and does not constitute an endorsement by CEN or CENELEC of the products named. Equivalent products may be used if they can be shown to lead to the same results.