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**Fatty acid methyl esters (FAME) —  
Determination of sulfur content —  
Inductively coupled plasma optical  
emission spectrometry (ICP-OES)  
method**

*Esters méthyliques d'acides gras — Détermination de la teneur en  
soufre — Méthode par spectroscopie d'émission optique par plasma à  
couplage inductif (ICP-OES)*





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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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, Subcommittee SC 7, *Liquid Biofuels*.

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](http://www.iso.org/members.html).

## Introduction

This document seeks to evaluate the quality of fatty acid methyl esters (FAME) in terms of sulfur.

Though FAME itself does not contain sulfur, sulfur might occur as contaminant either in feedstock, due to the use of fertilizers, or in production processes using sulfuric acid. The presence of sulfur in FAME can be caused by the production process of FAME and/or possible contaminations by diesel fuel. Above certain levels of sulfur concentration, it can be harmful to use FAME as fuel. The test method provided in this document offers a simple and effective way to check and control the sulfur level of FAME, which is used as pure fuel or as blend component.



# Fatty acid methyl esters (FAME) — Determination of sulfur content — Inductively coupled plasma optical emission spectrometry (ICP-OES) method

**WARNING** — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to the application of this document, and to determine the applicability of any other restrictions.

## 1 Scope

This document specifies a test method for inductively coupled plasma optical emission spectrometry (ICP-OES) for the detection of the sulfur content from 2 mg/kg to 21 mg/kg in fatty acid methyl esters (FAME).

NOTE 1 For the purposes of this document, the term “% (m/m)” is used to represent the mass fraction ( $\mu$ ) of the material.

NOTE 2 The method can also be used for the determination of concentrations outside the given limits. The precision statement, however, is only valid for the concentration range given in the scope.

NOTE 3 The method described in the document was tested with FAME derived from soybean oil and beef tallow. FAME derived from other feedstock, in particular aged oils, may behave different due to the different nature of sulfur compounds.

## 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 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

## 3 Terms and definitions

No terms and definitions are listed in this document.

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/>

## 4 Principle

An exactly weighed test portion is diluted with kerosene to allow the proper introduction of the aerosol into the plasma. The resulting solution is directly injected into the plasma of the ICP-OES spectrometer. For reference and calibration purposes, calibration samples with a known sulfur content in the range of <1 mg/kg to 10 mg/kg are used.