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**Petroleum products — Biodiesel  
— Determination of free and  
total glycerin and mono-, di- and  
tracylglycerols by gas chromatography**

*Produits pétroliers — Biogazole — Détermination de glycérine  
libre et totale et des mono-, di- et tracylglycerols avec  
chromatographie gazeuse*

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ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
[copyright@iso.org](mailto:copyright@iso.org)  
[www.iso.org](http://www.iso.org)

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 28, *Petroleum products and related products of synthetic or biological origin*, Subcommittee SC 7, *Liquid biofuels*.

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## Introduction

This Technical Specification establishes a method for quantitative determination of free glycerol, mono-, di-, triacylglycerols and total glycerol in fatty acid methyl esters (biodiesel) by gas chromatography. High concentrations of these components can contribute to formation of deposits on the pistons and valves of diesel cycle engines. Additionally, they can cause problems during storage and in the engine's fuel injection system.

Alternative methods for similar determinations exist in ASTM D6584<sup>[2]</sup> and EN 14105<sup>[3]</sup> which are tailor made to regional quality specification needs. This Technical Specification describes an alternative technique using more easily available internal standards, instrumentation that can also measure esters and a procedure applicable to short chain fatty acid esters, such as those from palm kernel and coconut oil. This Technical Specification thus provides a wider usage with similar or worse precision as other techniques.

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# Petroleum products — Biodiesel — Determination of free and total glycerin and mono-, di- and triacylglycerols by gas chromatography

**WARNING** — The use of this Technical Specification may involve the usage of dangerous materials and equipment. It is the responsibility of the user to establish the appropriate security, health and environmental practices, and to determine the applicability of regulatory limitations before their use.

## 1 Scope

This Technical Specification establishes a methodology for quantitative determination of free glycerol, mono-, di-, triacylglycerols and total glycerol by gas chromatography in biodiesel produced from any raw material including coconut or palm oil and animal fat. It is not applicable for biodiesel from castor oil.

In most actual cases, biodiesel is based on fatty acid methyl esters (FAME). These have also been used during the precision study for this test method. There is no indication that the methodology does not apply to other ester types, but the precision has not been determined nor compared.

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

## 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.

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

## 3 Terms and definitions

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

### 3.1

#### **biodiesel**

fuel comprised of mono-alkyl esters of fatty acids, derived from vegetable oils or animal fats

### 3.2

#### **bonded glycerol**

glycerol portion of the mono-, di-, and triacylglycerols molecules

### 3.3

#### **total glycerol**

sum of free glycerol and bonded glycerol

### 3.4

#### **monoacylglycerols**

sum of monostearin, monopalmitin, monoolein, monolinolein, concentrations and/or other monoacylglycerols present in the biodiesel