

VEDELKÜTUSED. SÜSIVESINIKRÜHMADE JA HAPNIKKU  
SISALDAVATE ÜHENDITE MÄÄRAMINE  
MOOTORIBENSIINIS JA ETANOLKÜTUSES (E85).  
MITMEMÕÕTMELINE GAASKROMATOGRAAFILINE  
MEETOD

Liquid petroleum products - Determination of  
hydrocarbon types and oxygenates in  
automotive-motor gasoline and in ethanol (E85)  
automotive fuel - Multidimensional gas  
chromatography method (ISO 22854:2021)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 22854:2021 sisaldab Euroopa standardi EN ISO 22854:2021 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 22854:2021 consists of the English text of the European standard EN ISO 22854:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 04.08.2021.	Date of Availability of the European standard is 04.08.2021.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

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English Version

Liquid petroleum products - Determination of  
hydrocarbon types and oxygenates in automotive-motor  
gasoline and in ethanol (E85) automotive fuel -  
Multidimensional gas chromatography method (ISO  
22854:2021)

Produits pétroliers liquides - Détermination des  
groupes d'hydrocarbures et de la teneur en composés  
oxygénés de l'essence pour moteurs automobiles et du  
carburant éthanol pour automobiles E85 - Méthode par  
chromatographie multidimensionnelle en phase  
gazeuse (ISO 22854:2021)

Flüssige Mineralölerzeugnisse - Bestimmung der  
Kohlenwasserstoffgruppen und der sauerstoffhaltigen  
Verbindungen in Ottokraftstoffen und in  
Ethanolkraftstoff (E85) - Multidimensionales  
gaschromatographisches Verfahren (ISO 22854:2021)

This European Standard was approved by CEN on 18 July 2021.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## European foreword

This document (EN ISO 22854:2021) has been prepared by Technical Committee ISO/TC 28 "Petroleum and related products, fuels and lubricants from natural or synthetic sources" in collaboration with 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 February 2022, and conflicting national standards shall be withdrawn at the latest by February 2022.

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 ISO 22854:2016.

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

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

## Endorsement notice

The text of ISO 22854:2021 has been approved by CEN as EN ISO 22854:2021 without any modification.

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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)).

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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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 19, *Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 22854:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the Scope and precision have been extended in concentration range;
- the precision statement has been updated;
- new examples of typical chromatograms have been added to [Annex B](#);
- the text has been further harmonized with ASTM D6839<sup>[Z]</sup>.

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

Previous editions of this document were used for determination of saturated, olefinic, aromatic and oxygenated hydrocarbons in automotive motor gasoline according to European fuel specifications.

An interlaboratory study has shown that the method can be used for gasolines with a higher concentration of oxygenated compounds, including methanol. The interlaboratory study also provided data to calculate precision for toluene in gasoline.

[Annex B](#) now includes example chromatograms of gasolines with a variety of oxygenates which can be used for the correct identification of these oxygenates.

The test method described in this document is harmonized with ASTM D6839<sup>[2]</sup>.

# Liquid petroleum products — Determination of hydrocarbon types and oxygenates in automotive-motor gasoline and in ethanol (E85) automotive fuel — Multidimensional gas chromatography method

## 1 Scope

This document specifies the gas chromatographic (GC) method for the determination of saturated, olefinic and aromatic hydrocarbons in automotive motor gasoline and ethanol (E85) automotive fuel. Additionally, the benzene and toluene content, oxygenated compounds and the total oxygen content can be determined.

NOTE 1 For the purposes of this document, the terms % ( $m/m$ ) and % ( $V/V$ ) are used to represent respectively the mass fraction,  $w$ , and the volume fraction,  $\varphi$ .

This document defines two procedures, A and B.

Procedure A is applicable to automotive motor gasoline with total aromatics of 19,32 % ( $V/V$ ) up to 46,29 % ( $V/V$ ); total olefins from 0,40 % ( $V/V$ ) up to 26,85 % ( $V/V$ ); oxygenates from 0,61 % ( $V/V$ ) up to 9,85 % ( $V/V$ ); oxygen content from 1,50 % ( $m/m$ ) to 12,32 % ( $m/m$ ); benzene content from 0,38 % ( $V/V$ ) up to 1,98 % ( $V/V$ ) and toluene content from 5,85 % ( $V/V$ ) up to 31,65 % ( $V/V$ ).

The method has also been tested for individual oxygenates. A precision has been determined for a total volume of methanol from 1,05 % ( $V/V$ ) up to 16,96 % ( $V/V$ ); a total volume of ethanol from 0,50 % ( $V/V$ ) up to 17,86 % ( $V/V$ ); a total volume of MTBE from 0,99 % ( $V/V$ ) up to 15,70 % ( $V/V$ ), a total volume of ETBE from 0,99 % ( $V/V$ ) up to 15,49 % ( $V/V$ ), a total volume of TAME from 0,99 % ( $V/V$ ) up to 5,92 % ( $V/V$ ), and a total volume of TAEE from 0,98 % ( $V/V$ ) up to 15,59 % ( $V/V$ ).

Although this test method can be used to determine higher-olefin contents of up to 50 % ( $V/V$ ), the precision for olefins was tested only in the range from 0,40 % ( $V/V$ ) to 26,85 % ( $V/V$ ).

Although specifically developed for the analysis of automotive motor gasoline that contains oxygenates, this test method can also be applied to other hydrocarbon streams having similar boiling ranges, such as naphthas and reformates.

NOTE 2 For Procedure A, applicability of this document has also been verified for the determination of  $n$ -propanol, acetone, and di-isopropyl ether (DIPE). However, no precision data have been determined for these compounds.

Procedure B describes the analysis of oxygenated groups (ethanol, methanol, ethers, C3 – C5 alcohols) in ethanol (E85) automotive fuel containing ethanol between 50 % ( $V/V$ ) and 85 % ( $V/V$ ). The gasoline is diluted with an oxygenate-free component to lower the ethanol content to a value below 20 % ( $V/V$ ) before the analysis by GC.

The sample can be fully analysed including hydrocarbons. Precision data for the diluted sample are only available for the oxygenated groups.

NOTE 3 For Procedure B, the precision can be used for an ethanol fraction from about 50 % up to 85 % ( $V/V$ ). For the ether fraction, the precision as specified in [Table 6](#) can be used for samples containing at least 11 % ( $V/V$ ) of ethers. For the higher alcohol fraction, too few data were obtained to derive a full precision statement and the data presented in [Table 6](#) are therefore only indicative.

NOTE 4 An overlap between C9 and C10 aromatics can occur. However, the total is accurate. Isopropyl benzene is resolved from the C8 aromatics and is included with the other C9 aromatics.



## 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*

## 3 Terms and definitions

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

ISO and IEC maintain terminology 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

#### hydrocarbon

#### hydrocarbon group

#### HG

family of hydrocarbons such as saturated hydrocarbons, olefinic hydrocarbons

#### 3.1.1

##### saturate

##### saturated hydrocarbon

type of *hydrocarbon* (3.1) that contains no double bonds with a carbon number of 3 to 12

EXAMPLE *n*-Paraffins, *iso*-paraffins, naphthenes and poly-naphthenes.

#### 3.1.2

##### olefin

##### olefinic hydrocarbon

type of *hydrocarbon* (3.1) that contains double or triple bonds with a carbon number of 3 to 10

EXAMPLE *n*-Olefins, *iso*-olefins and cyclic olefins.

#### 3.1.3

##### aromatic

##### aromatic hydrocarbon

type of cyclic *hydrocarbon* (3.1) with alternating double and single bonds between carbon atoms forming the rings

EXAMPLE Benzene, toluene and higher homologous series with a carbon number of 6 to 10 and naphthalenes, with a carbon number of up to 12.

### 3.2

#### oxygenate

#### oxygenated compound

type of *hydrocarbon* (3.1) that contains an oxygen group, the addition of which is allowed according to current petrol specifications

EXAMPLE Alcohols and ethers.

Note 1 to entry: See Note 2 to [Clause 1](#).