

<b>STN</b>	<b>Ropné výrobky a príbuzné výrobky z prírodných alebo syntetických zdrojov</b> <b>Stanovenie destilačných charakteristík pri atmosférickom tlaku (ISO 3405: 2019)</b>	<b>STN</b> <b>EN ISO 3405</b>  65 6124
------------	---	---

Petroleum and related products from natural or synthetic sources - Determination of distillation characteristics at atmospheric pressure (ISO 3405:2019)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/19

Rozpracované prekladom.

Obsahuje: EN ISO 3405:2019, ISO 3405:2019

Oznámením tejto normy sa ruší  
STN EN ISO 3405 (65 6124) z augusta 2011

**129613**

EUROPEAN STANDARD

**EN ISO 3405**

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2019

ICS 75.080

Supersedes EN ISO 3405:2011

English Version

## Petroleum and related products from natural or synthetic sources - Determination of distillation characteristics at atmospheric pressure (ISO 3405:2019)

Produits pétroliers et connexes d'origine naturelle ou synthétique - Détermination des caractéristiques de distillation à pression atmosphérique (ISO 3405:2019)

Mineralölerzeugnisse und verwandte Produkte mit natürlichem oder synthetischem Ursprung - Bestimmung des Destillationsverlaufes bei Atmosphärendruck (ISO 3405:2019)

This European Standard was approved by CEN on 7 March 2019.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

**EN ISO 3405:2019 (E)**

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>

## **European foreword**

This document (EN ISO 3405:2019) 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 November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

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 3405:2011.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 3405:2019 has been approved by CEN as EN ISO 3405:2019 without any modification.

# INTERNATIONAL STANDARD

# ISO 3405

Fifth edition  
2019-03

---

---

## **Petroleum and related products from natural or synthetic sources — Determination of distillation characteristics at atmospheric pressure**

*Produits pétroliers et connexes d'origine naturelle ou synthétique —  
Détermination des caractéristiques de distillation à pression  
atmosphérique*



Reference number  
ISO 3405:2019(E)

© ISO 2019

**ISO 3405:2019(E)****COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>3</b>
<b>5 Apparatus</b> .....	<b>3</b>
5.1 General.....	3
5.2 Distillation flasks.....	4
5.3 Condenser tube and cooling bath.....	4
5.4 Metal shield or enclosure for flask (manual apparatus only).....	4
5.5 Heat source(s).....	8
5.6 Flask-support.....	8
5.7 Graduated cylinders.....	9
5.8 Temperature measurement system.....	10
5.9 Centring device.....	10
5.10 Barometer.....	10
<b>6 Samples and sampling</b> .....	<b>12</b>
6.1 Sample grouping.....	12
6.2 Sample maintenance prior to testing.....	12
6.2.1 General.....	12
6.2.2 Groups 1 and 2.....	13
6.2.3 Groups 3 and 4.....	13
6.3 Removing water from sample.....	13
6.3.1 General.....	13
6.3.2 Groups 1 and 2.....	14
6.3.3 Groups 3 and 4.....	14
<b>7 Preparation of apparatus</b> .....	<b>14</b>
<b>8 Apparatus verification</b> .....	<b>16</b>
8.1 Level follower.....	16
8.2 Electronic temperature-measurement devices.....	16
8.3 Electronic pressure measuring device.....	17
<b>9 Procedure — Manual apparatus</b> .....	<b>17</b>
<b>10 Procedure — Automated apparatus</b> .....	<b>20</b>
<b>11 Calculations</b> .....	<b>21</b>
<b>12 Expression of results</b> .....	<b>24</b>
<b>13 Precision (Manual Apparatus)</b> .....	<b>25</b>
13.1 General.....	25
13.2 Repeatability.....	26
13.3 Reproducibility.....	26
<b>14 Precision (automated apparatus)</b> .....	<b>27</b>
14.1 General.....	27
14.2 Repeatability.....	27
14.3 Reproducibility.....	27
14.4 Bias.....	28
14.4.1 Bias.....	28
14.4.2 Relative bias.....	29
<b>15 Test report</b> .....	<b>29</b>
<b>Annex A (normative) Thermometer specifications</b> .....	<b>30</b>

**ISO 3405:2019(E)**

<b>Annex B (normative) Determination of temperature-sensor lag times</b> .....	<b>31</b>
<b>Annex C (normative) Determination of specified distillation data</b> .....	<b>32</b>
<b>Annex D (informative) Examples of data calculations</b> .....	<b>34</b>
<b>Annex E (informative) Emulation of emergent-stem errors</b> .....	<b>37</b>
<b>Annex F (informative) Examples of a test report</b> .....	<b>38</b>
<b>Bibliography</b> .....	<b>40</b>



## 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*.

This fifth edition cancels and replaces the fourth edition (ISO 3405:2011), which has been technically revised. The main changes compared to the previous edition are as follows:

- extension of the scope to include synthetic and biological products in general and automotive petrol-ethanol blends and to diesel with up to 30 % (V/V) FAME specifically;
- the procedure has been aligned with ASTM D86<sup>[1]</sup> and ASTM International has granted usage of its precision data on 5 July 2017;
- update of the precision (for automated apparatus) for groups 1, 2, and 3, with the slope-based precision obtained from a 2010 Interlaboratory Study<sup>[2]</sup>;
- for T95, group 4 now has a valid range of 260 °C to 360 °C and an updated precision, as a review of a 2006 Interlaboratory Study revealed the absence of some group 4 samples having a final boiling point near 360 °C, as well final boiling points above;
- the test report example in Annex F has been updated as group 0 is not addressed since the fourth edition of this document;
- introduction of a solution for the replacement of mercury-in-glass thermometers.

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).

# Petroleum and related products from natural or synthetic sources — Determination of distillation characteristics at atmospheric pressure

**WARNING** — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all the safety problems 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 the standard, and to determine the applicability of any other restrictions for this purpose.

## 1 Scope

This document specifies a laboratory method for the determination of the distillation characteristics of light and middle distillates derived from petroleum and related products of synthetic or biological origin with initial boiling points above 0 °C and end-points below approximately 400 °C, utilizing either manual or automated equipment. Light distillates are typically automotive engine petrol, automotive engine ethanol fuel blends with up to 85 % (V/V) ethanol, and aviation petrol. Middle distillates are typically aviation turbine fuel, kerosene, diesel, diesel with up to 30 % (V/V) FAME, burner fuel, and marine fuels that have no appreciable quantities of residua.

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

The distillation (volatility) characteristics of hydrocarbons and related products of synthetic or biological origin have an important effect on their safety and performance, especially in the case of fuels and solvents. The boiling range gives important information on composition and behaviour during storage and use, and the rate of evaporation is an important factor in the application of many solvents. Limiting values to specified distillation characteristics are applied to most distillate petroleum product and liquid fuel specifications in order to control end-use performance and to regulate the formation of vapours which may form explosive mixtures with air, or otherwise escape into the atmosphere as emissions (VOC).

## 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 918, *Volatile organic liquids for industrial use — Determination of distillation characteristics*

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

ISO 4788, *Laboratory glassware — Graduated measuring cylinders*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**