INTERNATIONAL STANDARD

ISO 3140

Fifth edition
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Essential oil of sweet orange expressed [*Citrus sinensis* (L.)]

*Huile essentielle d'orange douce obtenue par expression [*Citrus sinensis *(L.)]*

Reference number
ISO 3140:2019(E)

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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).

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).

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.

This document was prepared by Technical Committee ISO/TC 54, *Essential oils.*

This fifth edition cancels and replaces the fourth edition (ISO 3140:2011), which has been technically revised. The main changes to the previous edition are as follows:

— title and botanical name of the essential oil changed;

— structure revised;

— ranges revised for the following components in Table 2: Sabinene, *n*-Octanal and *n*-Nonanal.

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.

Essential oil of sweet orange expressed [*Citrus sinensis* (L.)]

1 Scope

This document specifies certain characteristics of the essential oil of sweet orange expressed [*Citrus sinensis* (L.)] with a view to facilitating the assessment of its quality.

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/TS 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TS 211, *Essential oils — General rules for labelling and marking of containers*

ISO 212, *Essential oils — Sampling*

ISO 279, *Essential oils — Determination of relative density at 20 °C — Reference method*

ISO 280, *Essential oils — Determination of refractive index*

ISO 592, *Essential oils — Determination of optical rotation*

ISO 4715, *Essential oils — Quantitative evaluation of residue on evaporation*

ISO 11024 (all parts), *Essential oils — General guidance on chromatographic profiles*

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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
essential oil of sweet orange expressed
essential oil obtained without heating, by physical extraction of the peel, from the pericarp of the fruit of *Citrus sinensis* (L.), of the Rutaceae family

Note 1 to entry: For information on CAS number, see ISO/TR 21092.

4 Requirements

4.1 General requirements

Essential oil of sweet orange expressed [*Citrus sinensis* (L.)] shall meet the requirements as given in Table 1.

Table 1 — Requirements for the essential oil of sweet orange expressed [*Citrus sinensis* (L.)]

Characteristic	Requirement	ISO test method
Appearance	Clear, mobile liquid	—
Colour	Yellow to reddish yellow	—
Odour	Characteristic, orange peel odour	—
Relative density at 20 °C, d_{20}^{20}	0,842 to 0,850	ISO 279
Refractive index at 20 °C	1,470 to 1,476	ISO 280
Optical rotation	Between +94° and +99°	ISO 592
Residue on evaporation	1,0 % to 4,0 %	ISO 4715

4.2 Chromatographic profile

Carry out the analysis of the essential oil by gas chromatography. Determine the chromatographic profile in accordance with the ISO 11024 series. Identify in the chromatogram obtained the representative and characteristic components shown in Table 2. The proportions of these components, indicated by the integrator, shall be as shown in Table 2. This constitutes the chromatographic profile of the essential oil.

Table 2 — Chromatographic profile

Component	Min. %	Max. %
α-Pinene	0,4	0,8
β-Pinene	0,02	0,15
Sabinene	0,2	1,0
Myrcene	1,5	3,5
Limonene	93,0	96,0
n-Octanal	0,1	0,6
n-Nonanal	0,01	0,1
n-Decanal	0,1	0,7
Linalool	0,15	0,7
Neral	0,03	0,1
Valencene	0,01	0,4
Geranial	0,05	0,2
β-Sinensal	0,01	0,06
NOTE The chromatographic profile is normative, contrary to the typical chromatograms given for information in Annex A, Figures A.1 and A.2.		

5 Flashpoint

Information on the flashpoint is given in Annex B.

6 Sampling

Sampling shall be performed in accordance with ISO 212. Minimum volume of test sample is 25 ml.

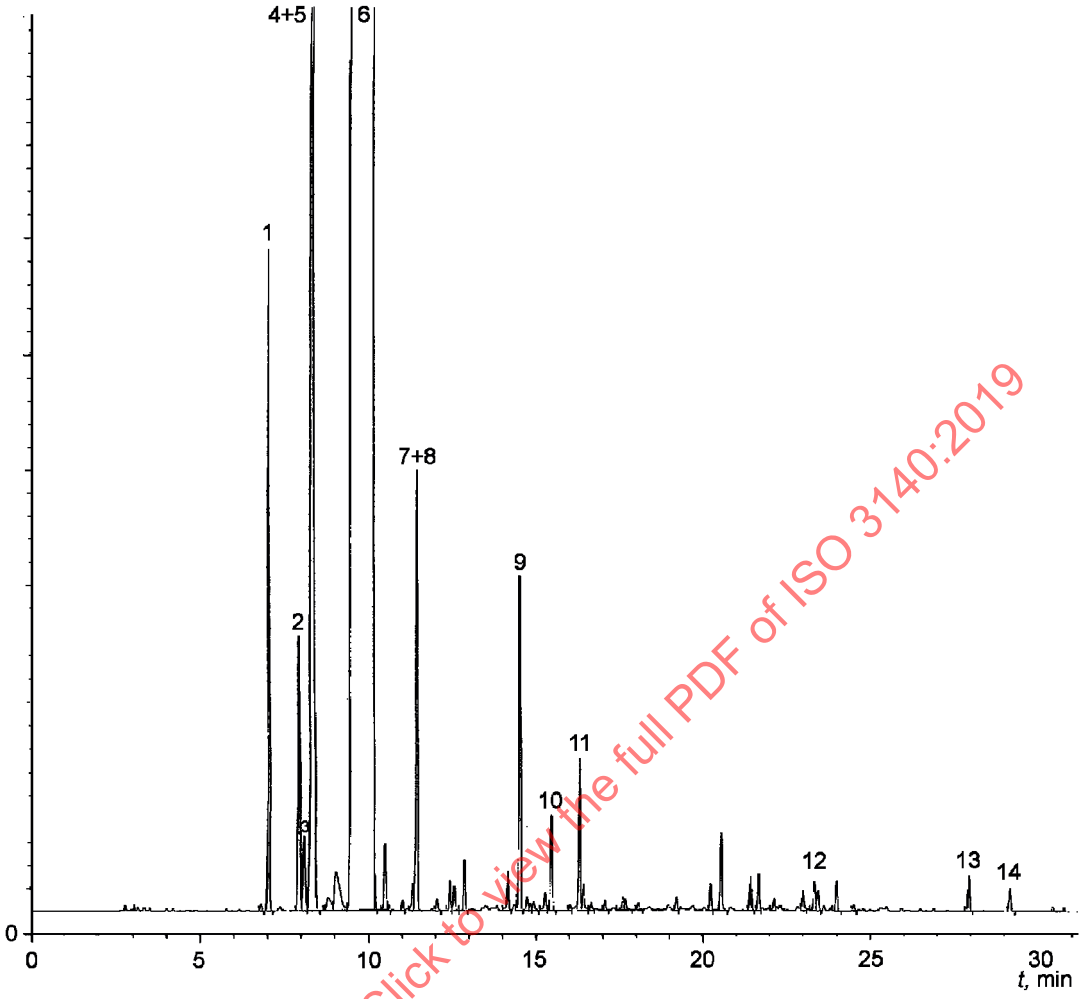
NOTE The volume allows each of the tests specified in this document to be carried out at least once.

7 Packaging, labelling, marking and storage

These items shall be in accordance with ISO/TS 210 and ISO/TS 211.

Annex A
(informative)

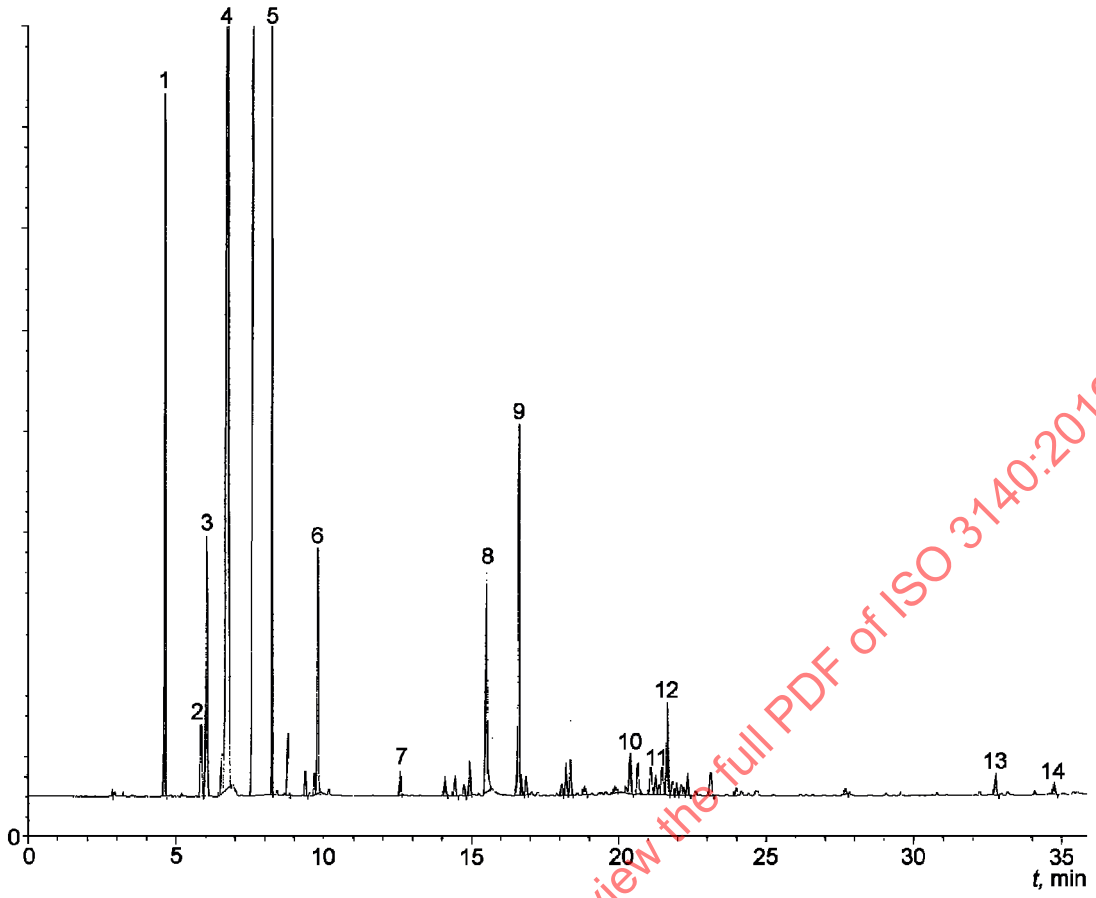
Typical chromatograms of the analysis by gas chromatography of the essential oil of sweet orange expressed [*Citrus sinensis* (L.)]



	Peak identification	Operating conditions
1	α-Pinene	Column: fused silica, length 30 m, internal diameter 0,2 mm
2	Sabinene	Stationary phase: poly(dimethylsiloxane) [SPS[a]]
3	β-Pinene	Film thickness: 0,20 µm
4	Myrcene	Oven temperature: isothermal at 80 °C for 4 min, then programming temperature
5	*n*-Octanal	From 80 °C to 250 °C at a rate of 5 °C/min, then isothermal at 250 °C for 10 min
6	Limonene	Injector temperature: 275 °C
7	*n*-Nonanal	Detector temperature: 300 °C
8	Linalool	Detector: flame ionization type
9	*n*-Decanal	Carrier gas: helium
10	Neral	Volume injected: 0,1 µl
11	Geranial	Carrier gas flow rate: 1 ml/min
12	Valencene	Split ratio: 1:100
13	β-Sinensal	*t* time
14	α-Sinensal	

[a] SPS is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Figure A.1 — Typical chromatogram taken on an apolar column



Peak identification		Operating conditions
1	α-Pinene	Column: fused silica, length 30 m, internal diameter 0,2 mm
2	β-Pinene	Stationary phase: polyethylene glycol [DB-WAX[a]]
3	Sabinene	Film thickness: 0,20 µm
4	Myrcene	Oven temperature: isothermal at 80 °C for 4 min, then programming temperature
5	Limonene	From 80 °C to 250 °C at a rate of 5 °C/min, then isothermal at 250 °C for 10 min
6	*n*-Octanal	Injector temperature: 275 °C
7	*n*-Nonanal	Detector temperature: 300 °C
8	*n*-Decanal	Detector: flame ionization type
9	Linalool	Carrier gas: helium
10	Neral	Volume injected: 0,1 µl
11	Valencene	Carrier gas flow rate: 1 ml/min
12	Geranial	Split ratio: 1:100
13	β-Sinensal	*t* time
14	α-Sinensal	

[a] DB-WAX is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Figure A.2 — Typical chromatogram taken on a polar column

Annex B
(informative)

Flashpoint

B.1 General information

For safety reasons, transport companies, insurance companies and people in charge of safety services require information on the flash points of essential oils, which in most cases are flammable products.

A comparative study on the relevant methods of analysis (see ISO/TR 11018) concluded that it was difficult to recommend a single apparatus for standardization purposes, given that:

— there is a wide variation in the chemical composition of essential oils;

— the volume of the sample needed for certain test equipment is incompatible with the high price of essential oils;

— as there are several different types of equipment which can be used for the determination, users cannot be expected to use one specified type only.

Consequently, it was decided to give a mean value for the flashpoint annexed to each International Standard, for information, in order to meet the requirements of the interested parties.

The equipment with which this value was obtained has to be specified.

For further information see ISO/TR 11018.

B.2 Flashpoint of the essential oil of sweet orange expressed [*Citrus sinensis* (L.)]

The mean value is +43 °C.

NOTE Obtained with Luchaire[1)] equipment.

1) Equipment available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.