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**Essential oil of clementine (*Citrus clementina* hort. ex Tanaka syn. *Citrus reticulata* Blanco × *Citrus sinensis* (L.) Osbeck), Spanish type**

*Huile essentielle de clémentine (Citrus clementina hort. ex Tanaka syn. Citrus reticulata Blanco × Citrus sinensis (L.) Osbeck), type Espagne*

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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 54, *Essential oils*.

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).

# Essential oil of clementine (*Citrus clementina* hort. ex Tanaka syn. *Citrus reticulata* Blanco × *Citrus sinensis* (L.) Osbeck), Spanish type

## 1 Scope

This document specifies certain characteristics of the essential oil of clementine (*Citrus clementina* hort. ex Tanaka syn. *Citrus reticulata* Blanco × *Citrus sinensis* (L.) Osbeck), Spanish type, in order to facilitate 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 degrees C — Reference method*

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

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

ISO 1242, *Essential oils — Determination of acid value*

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 clementine, Spanish type**

essential oil obtained by cold press expression of the peel of sound and mature fruits of clementine (*Citrus clementina* hort. ex Tanaka syn. *Citrus reticulata* Blanco × *Citrus sinensis* (L.) Osbeck), principally produced in Spain

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

## 4 Requirements

### 4.1 General requirements

The essential oil of clementine, Spanish type, shall meet the requirements given in [Table 1](#).

**Table 1 — Requirements for the essential oil of clementine, Spanish type**

Characteristic	Requirements	ISO test method
Appearance	Clear mobile liquid	—
Colour	Pale orange to dark orange	—
Odour	Citrus type, mandarin	—
Relative density at 20 °C $d_{20}^{20}$	0,840 to 0,860	ISO 279
Refractive index at 20 °C	1,470 to 1,478	ISO 280
Optical rotation at 20 °C	Between +90° and +98°	ISO 592
Acid value	Max. 0,2	ISO 1242

### 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 %
$\alpha$ -Pinene	0,3	0,9
Sabinene	0,3	1,5
$\beta$ -Pinene	traces <sup>a</sup>	0,3
Myrcene	1,0	2,5
Limonene	90,0	97,0
Octanal	0,05	0,30
(E)- $\beta$ -Ocimene	traces <sup>a</sup>	0,3
$\gamma$ -Terpinene	traces <sup>a</sup>	1,0
<i>p</i> -Cymene	traces <sup>a</sup>	0,2
Decanal	0,1	0,4
(E)- $\alpha$ -Farnesene	traces <sup>a</sup>	0,5
Linalool	0,1	0,6
Neral	traces <sup>a</sup>	0,5
$\alpha$ -Terpineol	traces <sup>a</sup>	0,15
Geranial	traces <sup>a</sup>	0,5
N-Methyl methylantranilate	traces <sup>a</sup>	0,06
$\beta$ -Sinensal	traces <sup>a</sup>	0,2
$\alpha$ -Sinensal	traces <sup>a</sup>	0,4

<sup>a</sup> < 0,01 %.

NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in [Annex A](#), see [Figures A.1](#) and [A.2](#).

## 5 Flash point

Information on the flash point is given in [Annex B](#).

## 6 Sampling

Sampling shall be performed in accordance with ISO 212. The minimum test sample volume is 50 ml.

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

## 7 Packaging labelling, marking and storage

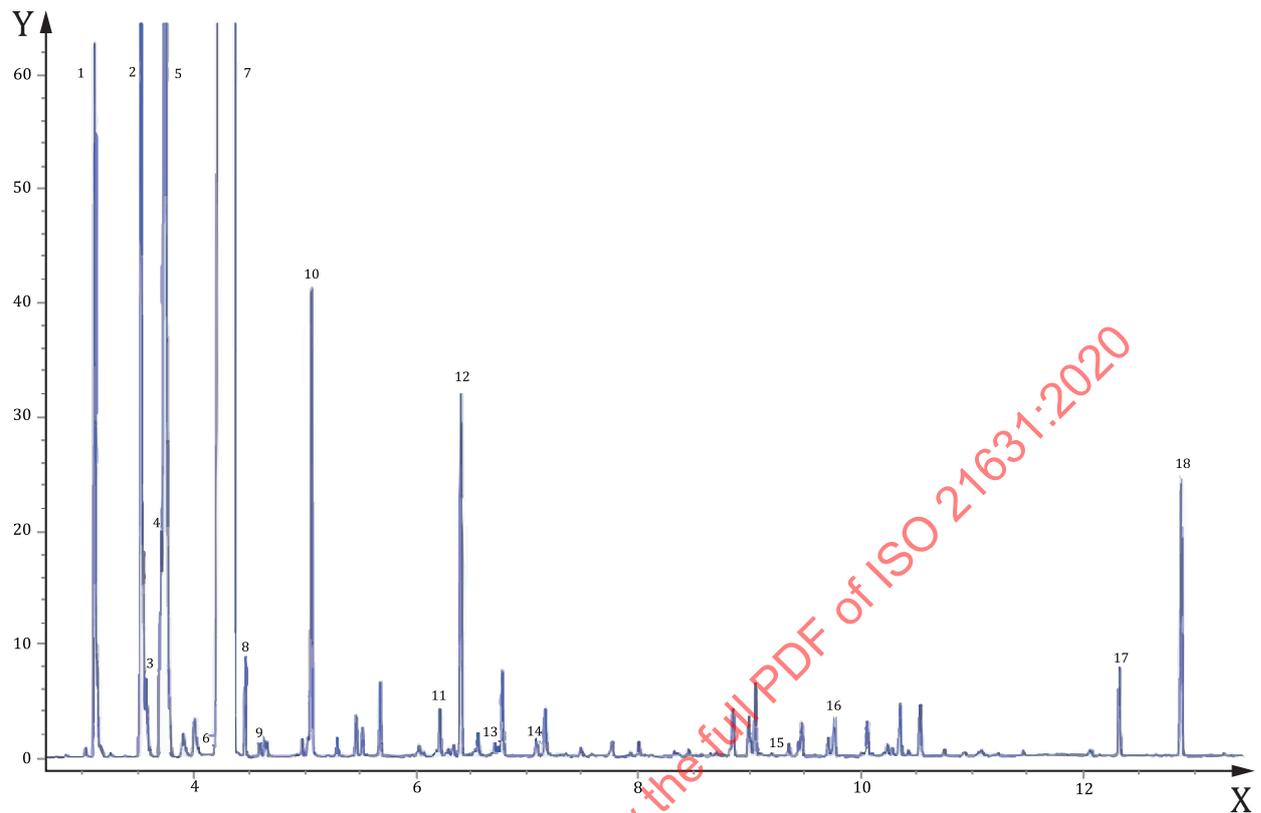
Packaging of the labelling, marking and storage shall be in accordance with ISO/TS 210 and ISO/TS 211.

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**Annex A**  
(informative)

**Typical chromatograms of the analysis by gas chromatography  
of the essential oil of clementine (*Citrus clementina* hort. ex  
Tanaka syn. *Citrus reticulata* Blanco × *Citrus sinensis* (L.) Osbeck),  
Spanish type**

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**Peak identification**

- 1  $\alpha$ -Pinene
- 2 Sabinene
- 3  $\beta$ -Pinene
- 4 Octanal
- 5 Myrcene
- 6 *p*-Cymene
- 7 Limonene
- 8 (E)- $\beta$ -Ocimene
- 9  $\gamma$ -Terpinene
- 10 Linalool
- 11  $\alpha$ -Terpineol
- 12 Decanal
- 13 Neral
- 14 Geranial
- 15 N- Methyl methylantranilate
- 16 (E)- $\alpha$ -Farnesene
- 17  $\beta$ -Sinensal
- 18  $\alpha$ -Sinensal

**Key**

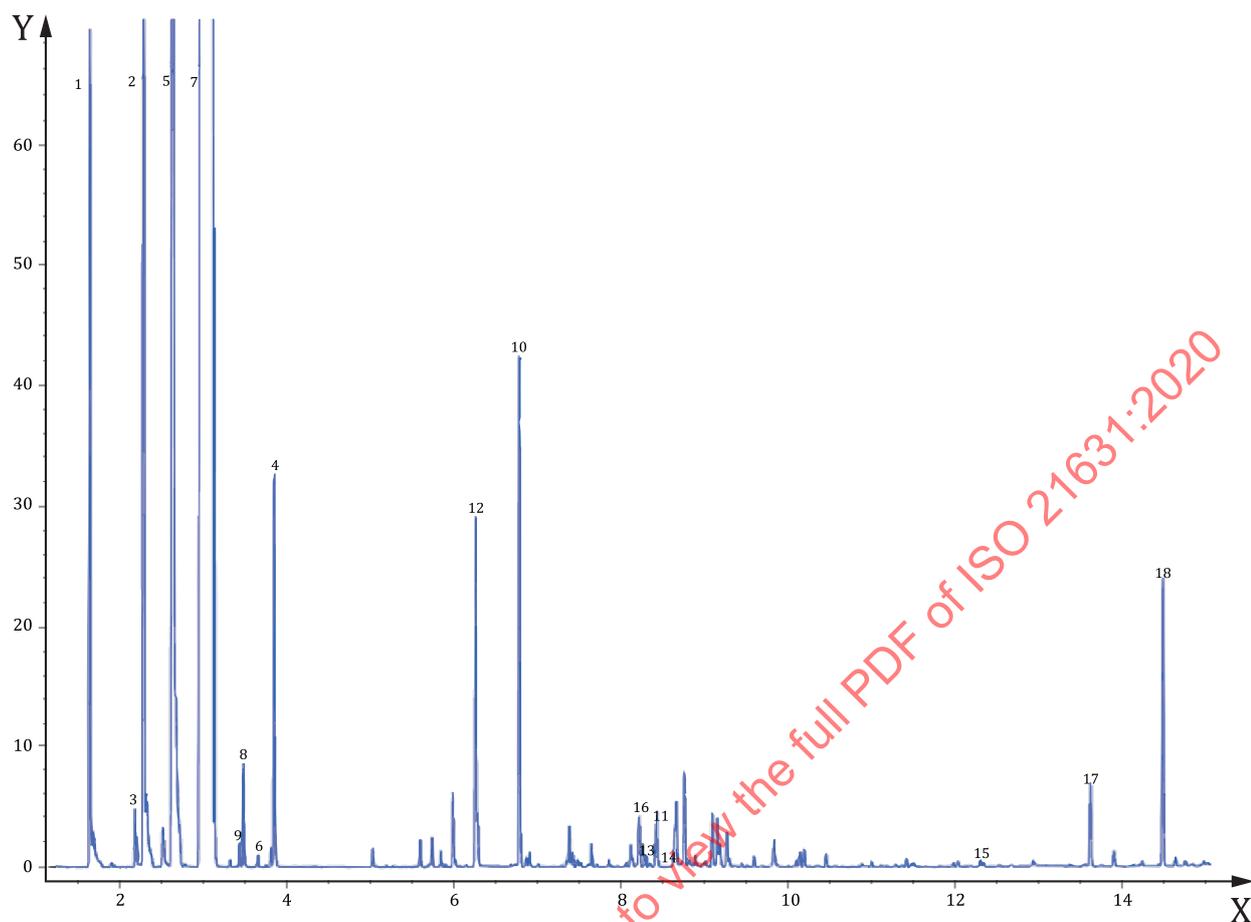
- X time (min)  
Y signal intensity (pA)

**Operating conditions**

- Column: capillary, fused silica; length 20 m; internal diameter 0,18 mm  
 Stationary phase: poly(dimethyl siloxane), DB-1<sup>1)</sup>  
 Film thickness: 0,18  $\mu$ m  
 Oven temperature: temperature programming from 50 °C to 250 °C at a rate of 10 °C/min, then isothermal at 250 °C for 10 min  
 Injector temperature: 250 °C  
 Detector temperature: 280 °C  
 Detector: flame ionization type  
 Carrier gas: hydrogen  
 Volume injected: 0,20  $\mu$ l  
 Carrier flow rate: 1,1 ml/min  
 Split ratio: 1/200

<sup>1)</sup> DB-1 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**

1	$\alpha$ -Pinene
2	Sabinene
3	$\beta$ -Pinene
4	Octanal
5	Myrcene
6	<i>p</i> -Cymene
7	Limonene
8	(E)- $\beta$ -Ocimene
9	gamma-Terpinene
10	Linalool
11	$\alpha$ -Terpineol
12	Decanal
13	Neral
14	Geranial
15	N-Methyl methylantranilate
16	(E)- $\alpha$ -Farnesene
17	$\beta$ -Sinensal
18	$\alpha$ -Sinensal

**Key**

X	time (min)
Y	signal intensity (pA)

**Operating conditions**

Column: capillary, fused silica; length 20 m; internal diameter 0,18 mm

Stationary phase: (polyethylene glycol), DB-WAX<sup>2)</sup>

Film thickness: 0,18  $\mu$ m

Oven temperature: temperature programming from 50 °C to 250 °C at a rate of 10 °C/min, then isothermal at 250 °C for 10 min

Injector temperature: 250 °C

Detector temperature: 280 °C

Detector: flame ionization type

Carrier gas: hydrogen

Volume injected: 0,20  $\mu$ l

Carrier flow rate: 1,1 ml/min

Split ratio: 1/200

<sup>2)</sup> 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 the following:

- There is a wide variation in the chemical composition of essential oils.
- The volume of the sample needed in certain requirements would be too costly for high-priced 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 document, 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 clementine

The mean value is +50 °C.

NOTE Obtained with Pensky-Martens equipment.