INTERNATIONAL STANDARD

ISO 16928

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Essential oil of ginger [*Zingiber officinale* Roscoe]

*Huile essentielle de gingembre [*Zingiber officinale *Roscoe]*

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Foreword

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.

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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 54, *Essential oils*.

Essential oil of ginger [*Zingiber officinale* Roscoe]

1 Scope

This International Standard specifies certain characteristics of the essential oil of ginger (*Zingiber officinale* Roscoe) cultivated in China, India and West Africa, in order to facilitate assessment of its quality.

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

ISO/TR 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 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.

3.1
essential oil of ginger
essential oil obtained by steam distillation of the rhizome of *Zingiber officinale* Roscoe of the *Zingiberaceae* family, cultivated principally in China, India and West Africa

Note 1 to entry: For information on the CAS number, see ISO/TR 21092[2].

4 Requirements

4.1 Appearance

Clear mobile liquid.

4.2 Colour

China	India	West Africa
Pale yellow to amber	Yellow	Pale yellow to yellow

4.3 Odour

Characteristic of ginger rhizome, with spicy, peppered, lemony odour.

4.4 Relative density at 20 °C, d_{20}^{20}

Value	China	India	West Africa
Minimum	0,873	0,872	0,872
Maximum	0,885	0,890	0,892

4.5 Refractive index at 20 °C

Value	China	India	West Africa
Minimum	1,486	1,484	1,486
Maximum	1,495	1,498	1,496

4.6 Optical rotation at 20 °C

China	India	West Africa
Between −47° and −26°	Between −50° and −27°	Between −47° and −18°

4.7 Chromatographic profile

Carry out the analysis of the essential oil by gas chromatography. Identify in the chromatogram obtained, the representative and characteristic components shown in Table 1. The proportions of these components, indicated by the integrator, shall be as shown in Table 1. This constitutes the chromatographic profile of the essential oil.

Table 1 — Chromatographic profile

Component	China		India		West Africa	
	Minimum %	Maximum %	Minimum %	Maximum %	Minimum %	Maximum %
α-Pinene	1,5	2,5	2,0	6,0	0,1	3,0
Camphene	4,5	10,0	5,0	8,0	0,2	12,0
Neral	n.d.[a]	0,5	0,1	0,4	0,2	2,0
Geraniol	0,1	1,0	0,1	0,6	0,1	3,5
Geranial	n.d.[a]	0,6	0,1	0,6	0,5	3,5
β-Elemene	0,5	1,5	0,6	1,1	n.d.[a]	1,0
ar-Curcumene	5,0	11,0	6,5	9,0	3,0	11,0
α-Zingiberene	29,0	40,0	35,0	40,0	23,0	45,0
β-Bisabolene	2,5	9,0	2,5	5,5	3,0	7,0
β-Sesquiphellandrene	10,0	14,0	11,5	13,5	8,0	17,0
NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.						
[a] Not detected.						

4.8 Flashpoint

Information on the flashpoint is given in Annex B.

5 Sampling

Sampling shall be performed in accordance with ISO 212.

Minimum volume of test sample: 30 ml.

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

6 Test methods

6.1 Relative density at 20 °C, d_{20}^{20}

Determine the relative density in accordance with ISO 279.

6.2 Refractive index at 20 °C

Determine the refractive index in accordance with ISO 280.

6.3 Optical rotation at 20 °C

Determine the optical rotation in accordance with ISO 592.

6.4 Chromatographic profile

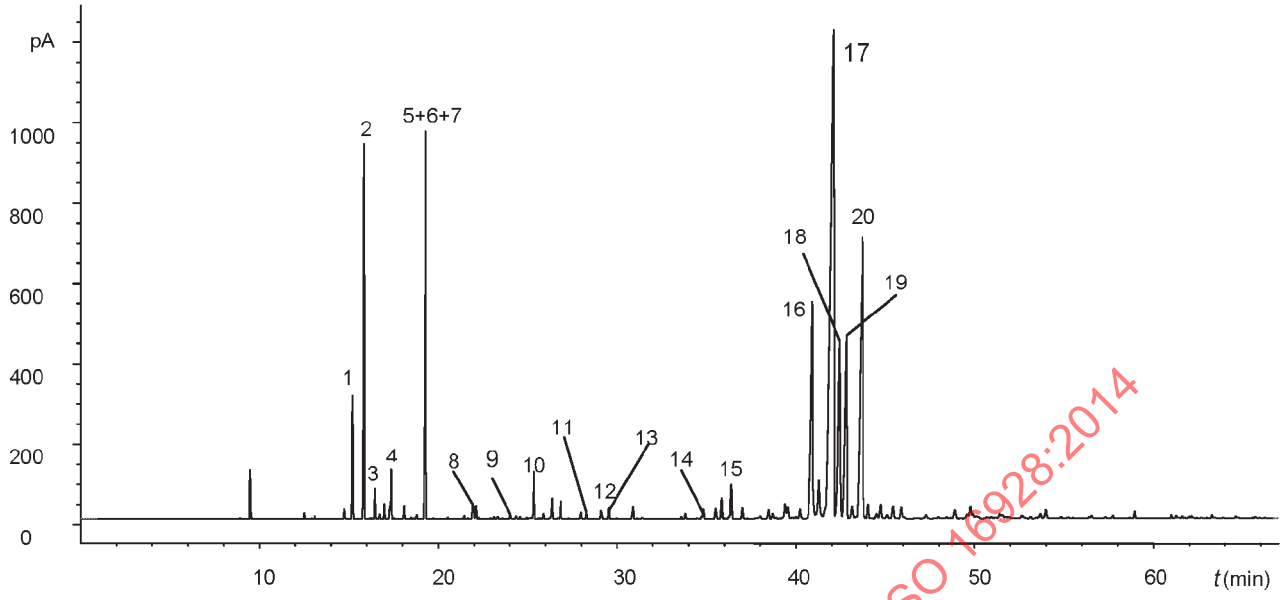
Determine the chromatographic profile in accordance with ISO 11024.

7 Packaging, labelling, marking and storage

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

Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of ginger (*Zingiber officinale* Roscoe)



Key

Peak identification

1	α-Pinene
2	Camphene
3	Methyl heptenone
4	β-Myrcene
5+6+7	Limonene + 1,8-Cineole + β-phellandrene
8	Linalool
9	Camphor
10	Borneol
11	Neral
12	Geraniol
13	Geranial
14	Geranyl acetate
15	β-Elemene
16	ar-Curcumene
17	α-Zingiberene
18	α-Farnesene
19	β-Bisabolene
20	β-Sesquiphellandrene

Operating conditions

Column: capillary, fused silica; length 60 m; internal diameter 0,25 mm

Stationary phase: polydimethy siloxane (DB-1)[a]

Film thickness: 0,25 µm

Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 150 °C at a rate of 3 °C/min, temperature programming from 150 °C to 180 °C at a rate of 1 °C/min, temperature programming from 180 °C to 220 °C at a rate of 5 °C/min, isothermal at 220 °C for 5 min

Injector temperature: 250 °C

Detector temperature: 250 °C

Detector: flame ionization type

Carrier gas: nitrogen

Volume injected: 0,2 µl

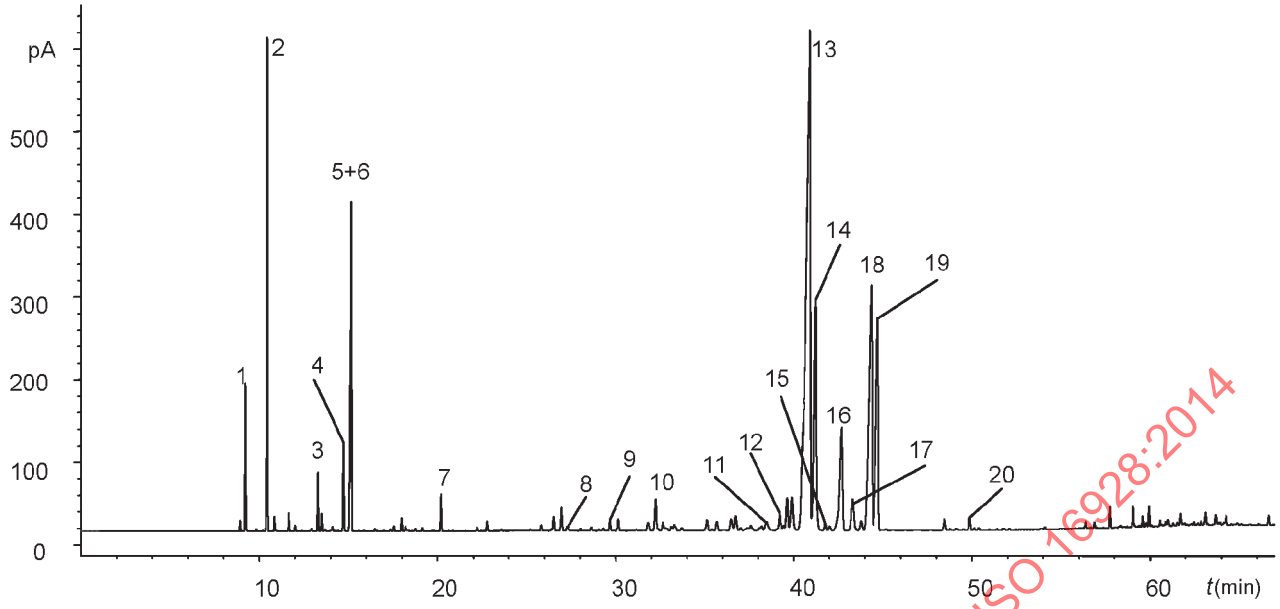
Carrier gas flow rate: 1 ml/min

Split ratio: 1/100

t time

[a] 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 for essential oil of ginger, produced in China



Key

Peak identification	
1	α-Pinene
2	Camphene
3	β-Myrcene
4	Limonene
5+6	1,8-Cineole + β-phellandrene
7	Methyl heptenone
8	Camphor
9	Linalool
10	β-Elemene
11	Neral
12	Borneol
13	α-Zingiberene
14	β-Bisabolene
15	Geranial
16	α-Farnesene
17	Geranyl acetate
18	β-Sesquiphellandrene
19	ar-Curcumene
20	Geraniol

Operating conditions

Column: capillary, fused silica; length 60 m; internal diameter 0,25 mm

Stationary phase: polyethylene glycol (Innowax 20 M)[a]

Film thickness: 0,25 µm

Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 120 °C at a rate of 3 °C/min, temperature programming from 120 °C to 145 °C at a rate of 1 °C/min, temperature programming from 145 °C to 220 °C at a rate of 5 °C/min, isothermal at 220 °C for 5 min

Injector temperature: 250 °C

Detector temperature: 250 °C

Detector: flame ionization type

Carrier gas: helium

Volume injected: 0,2 µl

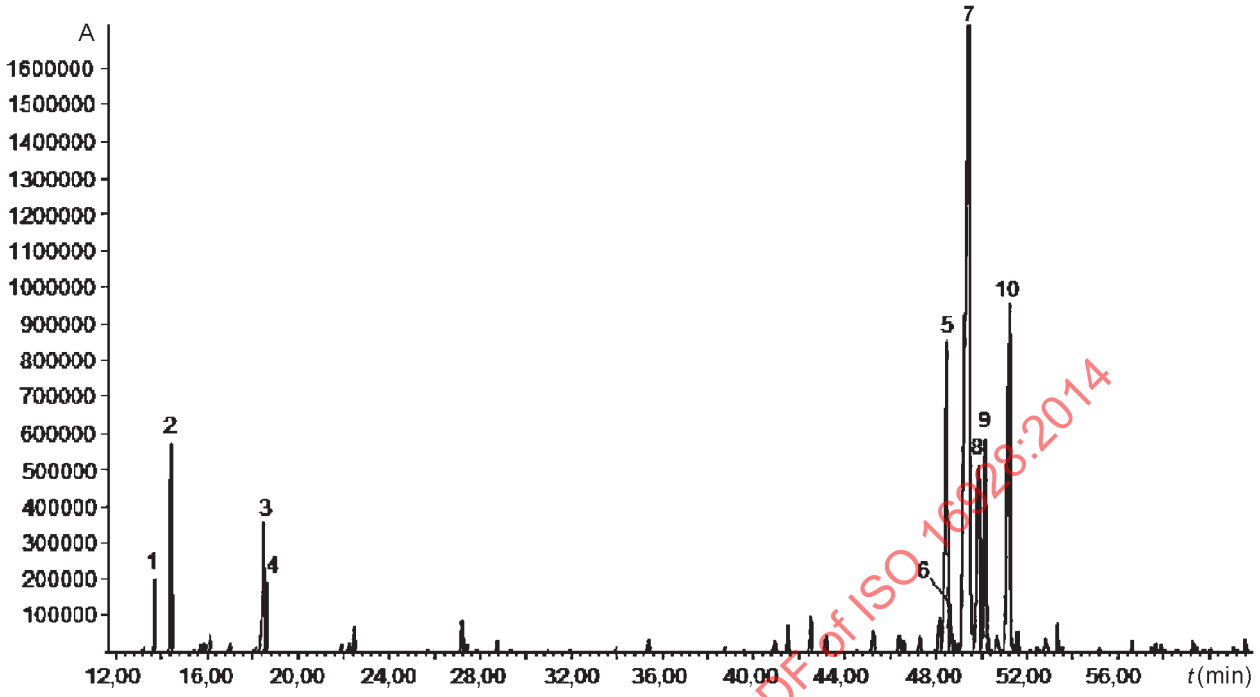
Carrier gas flow rate: 1 ml/min

Split ratio: 1/100

t time

[a] 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 for essential oil of ginger, produced in China

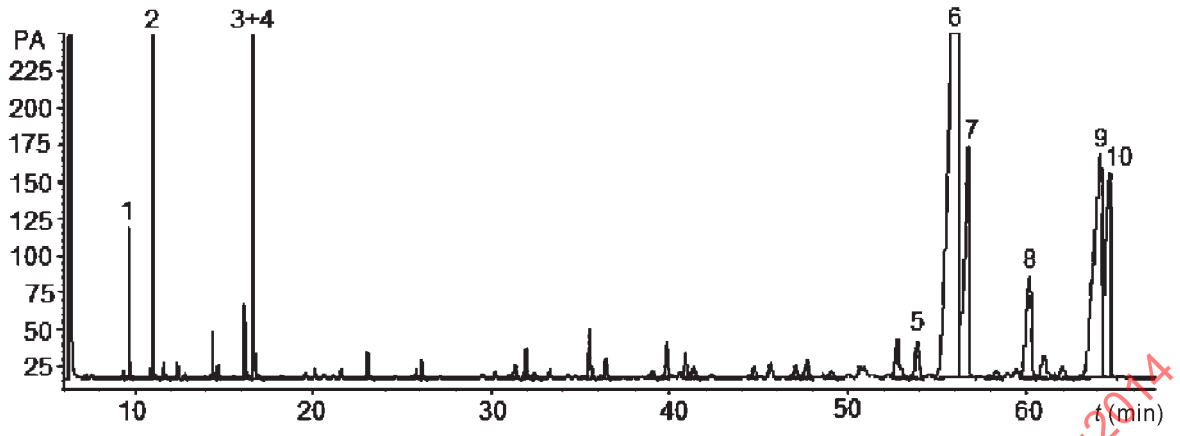


Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 60 m
2	Camphene	Stationary phase: methyl polysiloxane (DB-5)[a]
3	β-Phellandrene	Oven temperature: temperature programming from 70 °C to 270 °C at a rate of 2 °C/min
4	1,8-Cineole	Injector temperature: 280 °C
5	ar-Curcumene	Detector temperature: 280 °C
6	Germacrene D	Detector: flame ionization type
7	α-Zingiberene	Carrier gas: helium
8	α-Farnesene	
9	β-Bisabolene	*t* time
10	β-Sesquiphellandrene	

[a] 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.3 — Typical chromatogram taken on an apolar column for essential oil of ginger, produced in India



Key

Peak identification	
1	α-Pinene
2	Camphene
3+4	β-Phellandrene + 1,8-Cineole
5	Germacrene D
6	α-Zingiberene
7	β-Bisabolene
8	α-Farnesene
9	β-Sesquiphellandrene
10	ar-Curcumene

Operating conditions

Column: capillary, fused silica; length 60 m

Stationary phase: polyethylene glycol (Carbowax)[a]

Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 120 °C at a rate of 2,5 °C/min, temperature programming from 120 °C to 130 °C at a rate of 0,1 °C/min, temperature programming from 130 °C to 220 °C at a rate of 8 °C/min, isothermal at 220 °C for 20 min

Injector temperature: 240 °C

Detector temperature: 240 °C

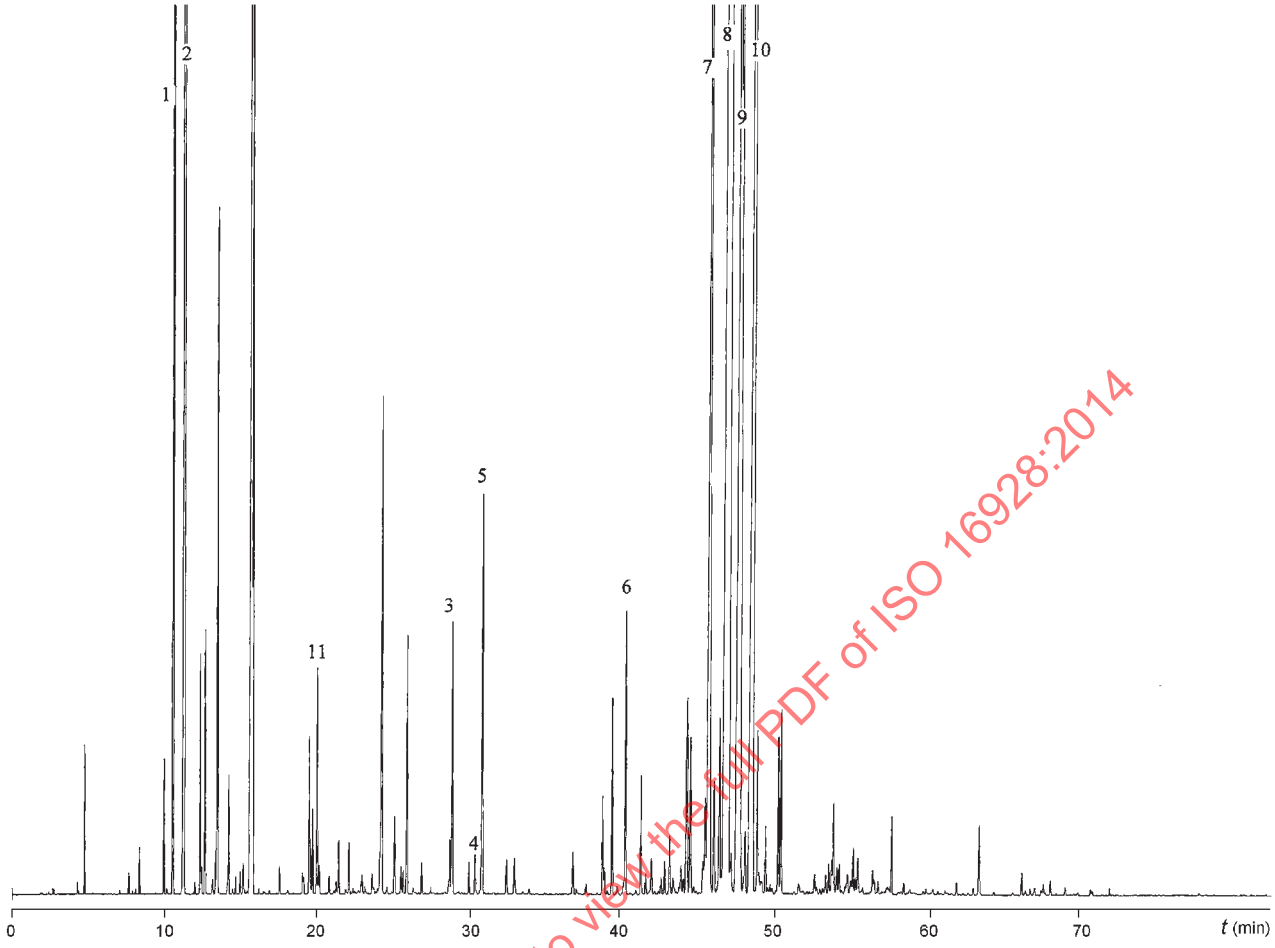
Detector: flame ionization type

Carrier gas: helium

t time

[a] 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.4 — Typical chromatogram taken on a polar column for essential oil of ginger, produced in India



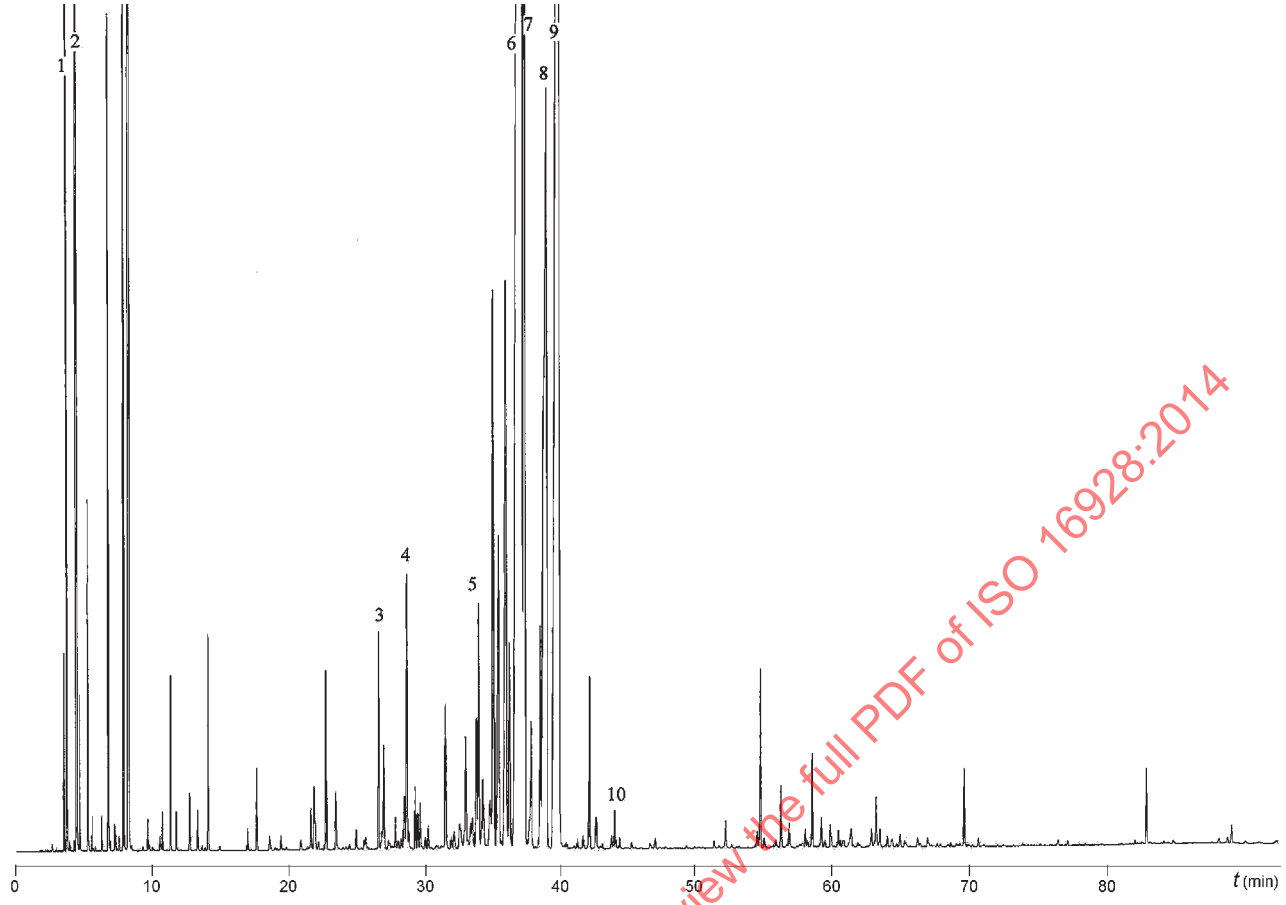
Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 50 m; internal diameter 0,22 mm
2	Camphene	Stationary phase: dimethyl polysiloxane (BP 1)[a]
3	Neral	Film thickness: 0,25 µm
4	Geraniol	Oven temperature: isothermal at 65 °C for 5 min, then temperature programming from 65 °C to 185 °C at a rate of 2°C/min, temperature programming from 185 °C to 230 °C at a rate of 3 °C/min, isothermal at 230 °C for 35 min
5	Geranial	
6	β-Elemene	
7	ar-Curcumene	Injector temperature: 230 °C
8	α-Zingiberene	Detector temperature: 250 °C
9	β-Bisabolene + α-Farnesene	Detector: flame ionization type
10	β-Sesquiphellandrene	Carrier gas: hydrogen
11	Linalool	Volume injected: 0,2 µl
		Pre-column pressure: 152 KPa
		Split ratio: 1/100

t time

[a] 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.5 — Typical chromatogram taken on an apolar column for essential oil of ginger, produced in West Africa



Key

Peak identification	
1	α-Pinene
2	Camphene
3	Linalool
4	β-Elemene
5	neral
6	α-Zingiberene
7	β-Bisabolene + Geranial
8	α-Farnesene
9	β-Sesquiphellandrene + ar-Curcumene
10	Geraniol

Operating conditions

Column: capillary, fused silica; length 50 m; internal diameter 0,22 mm

Stationary phase: polyethylene glycol (BP 20)[a]

Film thickness: 0,25 µm

Oven temperature: isothermal at 65 °C for 5 min, then temperature programming from 65 °C to 185 °C at a rate of 2°C/min, temperature programming from 185 °C to 230 °C at a rate of 3 °C/min, isothermal at 230 °C for 35 min

Injector temperature: 230 °C

Detector temperature: 250 °C

Detector: flame ionization type

Carrier gas: hydrogen

Volume injected: 0,2 µl

Pre-column pressure: 152 KPa

Split ratio: 1/100

t time

a 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.6 — Typical chromatogram taken on a polar column for essential oil of ginger, produced in West Africa