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

*Huiles essentielles — Détermination de la densité relative à 20 °C —  
Méthode de référence*



## **Foreword**

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 279 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 279:1981), which has been technically revised.

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International Organization for Standardization  
Case postale 56 • CH-1211 Genève 20 • Switzerland  
Internet iso@iso.ch

Printed in Switzerland

# Essential oils — Determination of relative density at 20 °C — Reference method

## 1 Scope

This International Standard specifies the reference method for the determination of the relative density of essential oils at 20 °C.

NOTE If it is necessary to perform the test at a different temperature on account of the nature of the essential oil, the temperature should be mentioned in the International Standard appropriate to the essential oil concerned. The average correction in the region of 20 °C is from 0,000 7 to 0,000 8 per degree Celsius.

## 2 Normative reference

This following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, this publication do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO editions maintain registers of currently valid International Standards.

ISO 356, *Essential oils — Preparation of test samples*.

## 3 Terms and definitions

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

### 3.1

#### **relative density at 20 °C**

ratio of the mass of a given volume of the oil at 20 °C to the mass of an equal volume of distilled water at 20 °C

NOTE This quantity is dimensionless and its symbol is  $d_{20}^{20}$ .

### 3.2

#### **absolute density at 20 °C of an essential oil**

ratio of the mass of a given volume of the oil at 20 °C to the same volume

NOTE This quantity is expressed in grams per millilitre.

## 4 Principle

Equal volumes of the essential oil and water, at 20 °C, are weighed successively in a pycnometer.

## 5 Reagents

**5.1 Distilled water**, freshly boiled and subsequently cooled to approximately 20 °C.

## 6 Apparatus

Ordinary laboratory apparatus and the following.

**6.1 Glass pycnometer**, of minimum nominal capacity of 5 ml.

NOTE 1 There are available on the market automatic electronic instruments for the accurate measurement of the relative density. Such instruments may be used for routine controls, but in cases of dispute the reference method is the pycnometric method.

NOTE 2 Appropriate pycnometers are described in ISO 3507 [2].

**6.2 Water bath**, capable of being maintained at 20 °C ± 0,2 °C.

**6.3 Standardized thermometer**, graduated from 10 °C to 30 °C, with 0,2 °C or 0,1 °C divisions.

**6.4 Analytical balance**, accurate to 0,001 g.

## 7 Sampling

It is important that the laboratory receive a representative sample which has not been damaged or modified during transportation or storage.

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 212 [1].

## 8 Special

Prepare the test sample in accordance with ISO 356.

## 9 Procedure

### 9.1 Preparation of pycnometer

Carefully clean the pycnometer (6.1) and then rinse it successively with, for example, ethanol and acetone, then dry the interior by means of a current of dry air.

If necessary, wipe the outside with a dry cloth or a filter paper.

When temperature equilibrium is reached between the balance case and the pycnometer, weigh the latter with its stopper, if any, to the nearest 1 mg.

### 9.2 Weighing of distilled water

Fill the pycnometer with distilled water (5.1).

Immerse the pycnometer in the water bath (6.2). After 30 min, adjust the water to the mark, if necessary. Insert the stopper, if any, and dry the outside as before with a dry cloth or a filter paper.

When temperature equilibrium is reached between the balance room and the pycnometer, weigh the latter and its stopper, if any, to the nearest 1 mg.

### 9.3 Weighing of essential oil

Empty the pycnometer, then wash it and dry it as specified in 9.1.

Proceed as specified in 9.2, replacing the water by the test sample prepared according to clause 8.

## 10 Expression of results

The relative density,  $d_{20}^{20}$ , is given by the following equation:

$$\frac{m_2 - m_0}{m_1 - m_0}$$

where

$m_0$  is the mass, in grams, of the empty pycnometer determined in 9.1;

$m_1$  is the mass, in grams, of the pycnometer filled with water, determined according to 9.2;

$m_2$  is the mass, in grams, of the pycnometer filled with the essential oil, determined according to 9.3.

Express the result to three decimal places.

NOTE 1 In practice, no correction is made for the upthrust due to air.

NOTE 2 Electronic instruments often register higher accuracy levels.

If the absolute density of the essential oil is required, multiply the value obtained for the relative density by the absolute density of water at 20 °C (i.e. 0,998 23 g/ml).

## 11 Test report

The test report shall state:

- the method used;
- the result obtained; and
- if repeatability has been verified, the final result obtained.

It shall also mention any operating conditions not specified in this International Standard, or regarded as optional, as well as any circumstances that might have influenced the results.

The test report shall include all details required for the complete identification of the sample.

## Bibliography

[1] ISO 212, *Essential oils — Sampling*.

[2] ISO 3507, *Laboratory glassware — Pyknometers*.



