

भारतीय मानक
Indian Standard

IS 528 : 2025

मेंथा अरवेन्सिस का तेल — विशिष्टि

(चौथा पुनरीक्षण)

Oil of *Mentha Arvensis* — Specification

(Fourth Revision)

ICS 71.100.60

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Price Group 6

Fragrance and Flavour Sectional Committee, PCD 18

FOREWORD

This Indian Standard (Fourth revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Fragrance and Flavour Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard covers two types of oil of *Mentha arvensis* L. namely Type 1 whole oil, and Type 2 partially dementholized oil. Type 1 whole oil of *Mentha arvensis* L., is primarily used all over the world as a natural raw material for the production of menthol. Type 2, partially dementholised oil, is a by-product obtained during the process of producing menthol crystals, which after rectification is used in pharmacy and also as a flavouring material in the preparation of dental pastes, powders and mouth washes.

This standard was first published in 1954 and subsequently revised in 1970, 1989 and 1999.

The first revision was taken up to incorporate the whole oil *ex Mentha arvensis* as well as its dementholized oil after due consideration of the published data and authentic analysis of imported as well as ingeniously produced oil.

The second revision was taken up to incorporate gas chromatographic method to determine free alcohol in place of wet method of analysis, whereas wet method of analysis was retained for determination of esters, total alcohol and ketones. Both maximum and minimum requirement were incorporated for free alcohol (as 1-menthol) for Type 2 dementholized oil, to remove ambiguity in identification and import of the two type of oil. The limit for characteristics including relative density optical density, refractive index, esters, total alcohol and ketones were modified, keeping in mind the quality of oil available at that time.

The third revision was done with a view to bring it in line with trade practices prevalent in perfumery technology and also to align with the quality level of the material being produced, sold in the country and exported. Considerable assistance was derived from the draft of ISO 9776 : 1999 on partially dementholized oil and its values on Indian oil, during the third revision.

This revision has been brought out to keep pace with the latest technological developments and international practices. In this revision, the following major changes have been made:

- a) The gas chromatographic method has been upgraded from packed column GC to capillary column GC for more accurate results, which are being progressively used in the country;
- b) The requirements of free alcohols, esters, total alcohols and ketones for dementholized oil have been modified as per the quality of the oil produced and currently available in the market;
- c) The following requirements for Type 2 in [Table 1](#) have been modified:
 - 1) Relative density at 27 °C/27 °C and 20 °C/20 °C;
 - 2) Optical rotation;
 - 3) Refractive index at 27 °C and 20 °C; and
 - 4) Gas chromatographic analysis.
- d) Reference and marking clause have been updated.

The composition of the Committee responsible for the revision of this standard is given in [Annex C](#).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
OIL OF *Mentha Arvensis* — SPECIFICATION
(*Fourth Revision*)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for the oil of *Mentha arvensis* L., family Labiatae, whole and partially dementholized.

2 REFERENCES

The standards listed in [Annex A](#) contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 6597 shall apply.

4 TYPES

There shall be two types of the oil of *Mentha arvensis* L. as given below:

- a) Type 1 whole oil; and
- b) Type 2 partially dementholized oil.

5 REQUIREMENTS

5.1 Description

5.1.1 The whole oil (Type 1) shall be obtained by steam distillation of the fresh over ground portion of the flowering plant of *Mentha arvensis* L., family Labiatae.

5.1.2 The partially dementholized oil (Type 2) shall be the product obtained by subjecting the whole oil (Type 1) to cooling, centrifuging, fractional distillation, rectification and other ancillary processes for the removal of substantial quantities of menthol.

5.1.3 The oil shall be a clear liquid, free from sediment, suspended matter, separated water and adulterants, when examined as prescribed in IS 326 (Part 2).

5.1.4 The oil shall be tested olfactorily, especially for notes and for the presence of adulterants and impurities, if any, as prescribed in IS 2284.

5.2 The material shall also comply with the requirements given in [Table 1](#) when tested according to the methods referred in col (5) of [Table 1](#).

5.3 Chromatographic Profile

Carry out the gas chromatography analysis of the essential oil as per [Annex B](#). The proportions of the components in the chromatogram are given in [Table 2](#). The marker chemicals identified in oil of *Mentha arvensis* L. are listed as per their order of elution in a polar phase capillary column coated with polyethylene glycol as stationary phase.

5.4 Menthofuran Test

The oil shall not develop blue colour when tested as follows:

Mix 3 drops of the oil with 5 ml of a solution of 1 volume of nitric acid in 300 volumes of glacial acetic acid in a dry test tube. Place the tube in beaker of boiling water for 5 min.

NOTE — If oil *ex Mentha piperita* is present, blue colour develops within 1 min to 5 min of placing the tube in boiling water, which, on continued heating deepens and shows a copper-coloured fluorescence and then fades leaving a golden yellow solution.

5.5 Solubility

Type 1 material shall be soluble in 2.5 volumes to 3 volumes and Type 2 in 3 volumes of ethyl alcohol (70 percent by volume) respectively when tested as prescribed in IS 326 (Part 6).

6 PACKING AND MARKING

6.1 Packing

6.1.1 The material shall be supplied in well-closed containers permitting a minimum of air space, as agreed to between the purchaser and the supplier.

6.1.2 The material shall be well-protected from light and stored in a cool place.

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Table 1 Requirements for Oil of *Mentha Arvensis*

([Foreword](#), [Clauses 5.2](#), [7.3.1](#) and [8.1](#))

SI No.	Characteristic	Requirement		Method of Test, Ref to
		Type 1	Type 2	
(1)	(2)	(3)	(4)	(5)
i)	Colour and appearance	Colourless pale yellow or greenish yellow	Colourless pale yellow	Visual observation
ii)	Odour	Characteristic strong minty, herbal followed by cooling sensation	Characteristic, minty intense herbal followed by cooling sensation	IS 2284
iii)	Relative density:			
	a) at 27 °C/ 27 °C ¹⁾	0.877 to 0.912	0.873 5 to 0.912	IS 326 (Part 3)
	b) at 20 °C/ 20 °C ¹⁾	0.898 3 to 0.901 3	0.878 0 to 0.927 0	
iv)	Optical rotation	– 31° to – 40°	– 10 ° to – 40 °	IS 326 (Part 4)
v)	Refractive index:			
	a) at 27 °C ¹⁾	1.456 to 1.464 2	1.447 3 to 1.467 3	IS 326 (Part 5)
	b) at 20 °C ¹⁾	1.459 0 to 1.460 6	1.450 0 to 1.470 0	
vi)	Flash point, °C, Min ²⁾	79	81	IS 326 (Part 26)
vii)	Gas chromatographic analysis:			Annex B
	a) Terpene, percent by mass	4.4 to 7.0	2.0 to 5.0	IS 326 (Part 8)
	b) Ketones, as menthone (molecular mass 154.25), percent by mass (using free hydroxylamine method)	4.6 to 11.5	10.0 to 27.0	IS 326 (Part 11/ Sec 1)
viii)	Isomenthone (molecular mass 154.25), percent by mass (using free hydroxylamine method)	1.5 to 4.5	4.0 to 13.0	IS 326 (Part 11/ Sec 1)
ix)	Esters, as menthyl acetate (molecular mass 198.28), percent by mass	1.0 to 6.3	0 to 8	IS 326 (Part 24)
x)	Neomenthol (molecular mass 156.26), percent by mass	1.8 to 2.5	3.0 to 12.0	IS 326 (Part 9/ Sec 2)
xi)	Free alcohols, as 1-menthol (molecular mass 156.26), percent by mass	67 to 80	28 to 62	IS 326 (Part 9/ Sec 2)
xii)	Total alcohols, as menthol (molecular mass 156.26), percent by mass ³⁾	71 to 80	48 to 58	IS 326 (Part 9/ Sec 2)
xiii)	Pulegone (molecular mass 152.23), percent by mass	0.2 to 0.5	0.3 to 0.7	IS 326 (Part 11/ Sec 1)

¹⁾ The correction factors for relative density and refractive index for each degree celsius change in temperature are 0.000 64 and 0.000 38 respectively.

²⁾ Flash point was measured in a continuous closed cup (CCC) automatic flash point tester.

³⁾ 3-Octanol proportions (> 1.0) shall be high in Type 2 oil as compared to Type 1.

6.2 Marking

6.2.1 The material shall be marked with the following information:

- Name of the material;
- Each container shall be clearly marked with the origin of the material and the menthol content (total alcohols);
- Name of the manufacturer and the recognized trade-mark, if any;
- Net mass of material;
- Net volume, of material;
- Batch number; and
- Manufacturing date.

6.2.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

7 SAMPLING

7.1 Representative samples of the material shall be drawn as prescribed in IS 326 (Part 1).

7.1.1 The oil, particularly Type 1, shall be warmed to 40 °C and agitated to homogenize prior to drawing a representative sample.

NOTE — At low temperatures, menthol is liable to crystallize producing stratification.

7.2 Number of Tests

7.2.1 Test for determination of menthol content

(total alcohols) shall be conducted on each of the individual samples.

7.2.2 Tests for all the remaining characteristics shall be conducted on the composite sample.

7.3 Criteria for Conformity

7.3.1 For Individual Samples

For menthol content (total alcohols), determined on the individual samples, the mean ($\bar{x}$) and range (R) of the test results shall be calculated. If the value of the expression $\bar{x} - 0.4 R$ is greater than or equal to the value specified in [Table 1](#), the lot shall be declared as conforming to the requirement of menthol content.

7.3.2 For Composite Sample

For declaring conformity of the lot to all other requirements of this specification, the results of tests on the composite sample shall meet the corresponding requirements.

8 TEST METHODS

8.1 Tests shall be conducted as prescribed under [5.1.3](#), [5.1.4](#), [5.3](#) and [5.4](#) and the appropriate references to relevant parts and Annexes of the standards as given in col (4) of [Table 1](#).

8.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (see IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

Table 2 Proportions of Marker Components

(Clause [5.3](#))

Peak No.	Components	FID, percent	
		Min, percent	Max, percent
(1)	(2)	(3)	(4)
1.	Limonene	1.2	3.2
2.	Menthone	4.6	11.5
3.	Isomenthone	1.5	4.5
4.	Menthyl acetate*	1.0	6.3
5.	Neomenthol	1.8	2.5
6.	Pulegone	0.2	0.5
7.	Menthol	67.0	80.0
8.	Terpene	4.4	7.0

*Menthyl acetate co-elute with linalool, but the major proportion to this peak is contributed by menthyl acetate.

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ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 326	Methods of sampling and test for natural and synthetic perfumery materials:	(Part 26) : 2017	difficult-to-saponify esters General guidance on determination of flashpoint
(Part 1) : 2022	Sampling (<i>fourth revision</i>)	IS 326	Natural and synthetic perfumery materials — Methods of sampling and test
(Part 3) : 2006/ ISO 279 : 1998	Determination of relative density (<i>third revision</i>)	(Part 2) : 2023	Preliminary examination of perfumery materials and samples (<i>third revision</i>)
(Part 4) : 2005/ ISO 592 : 1998	Determination of optical rotation (<i>third revision</i>)	(Part 19) : 2023	Gas chromatographic analysis of perfumery materials on fused silica capillary columns — General method (ISO 7609 : 1985, MOD) (<i>second revision</i>)
(Part 5) : 2006/ ISO 280 : 1998	Determination of refractive index (<i>third revision</i>)		
(Part 6) : 2005/ ISO 875 : 1999	Evaluation of miscibility in ethanol (<i>third revision</i>)	IS 1070 : 2023	Reagent grade water — Specification (<i>fourth revision</i>)
(Part 8) : 2005/ ISO 709 : 2001	Determination of ester value (<i>third revision</i>)	IS 2284 : 1988	Methods for olfactory assessment of natural and synthetic perfumery materials (<i>first revision</i>)
(Part 9/Sec 2) : 2017/ISO 3794 : 1976	Determination of ester value and free alcohols, Section 2 Estimation of free alcohols content by determination of ester value after acetylation (<i>third revision</i>)	IS 6597 : 2001	Glossary of terms relating to fragrance and flavour industry (<i>second revision</i>)
(Part 11/Sec 1) : 2017/ISO 1271 : 1983	Determination of carbonyl value, Section 1 Free hydroxylamine method (<i>third revision</i>)		
(Part 24) : 2017/ ISO 7660 : 1983	Determination of ester value of oils containing		

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ANNEX B

[[Table 1, Sl No. \(vii\)](#) and [5.3](#)]

GAS CHROMATOGRAPHIC ANALYSIS OF OIL OF *Mentha arvensis* L.

B-1 GENERAL

The chromatographic analysis is given on both packed column and capillary column. The conditions given here are for guidance only.

B-2 PROCEDURE

B-2.1 The analysis shall be done as per IS 326 (Part 19). The typical chromatograms for oil of *Mentha arvensis* for the following conditions are given in [Fig. 1](#) and [Fig. 2](#), respectively.

B-2.2 Gas Chromatographic Conditions for Polar Column

Sample size	:	0.1 µl (diluted in hexane/dichloromethane)
Capillary column	:	Polar phase fused silica capillary column
Material	:	Polyethylene glycol
Length	:	30 m
Internal diameter	:	0.32 mm
Film thickness	:	0.25 µm
Carrier gas	:	Hydrogen/nitrogen (1.7 ml/min)
Flow split ratio	:	1 : 40
Injector type	:	Split/splitless
Injection temperature	:	240 °C
Flow control	:	Electronic/automatic
Detector:		
a) Type	:	Flame ionization detector
b) Temperature	:	250 °C
c) Flow control	:	Electronic/automatic

Oven temperature programming:

a) Initial temperature	:	40 °C
b) Ramp	:	3 °C/min
c) Temperature (Step 1)	:	120 °C hold for 9 min
d) Ramp	:	2 °C/min
e) Temperature (Step 2)	:	140 °C
f) Ramp	:	5 °C/min
g) Final temperature	:	220 °C hold for 9 min

B-3 CALCULATION

Area percent of each baseline separated peaks is automatically calculated and presented in result section of acquired gas chromatogram of Type 1 and Type 2, respectively.

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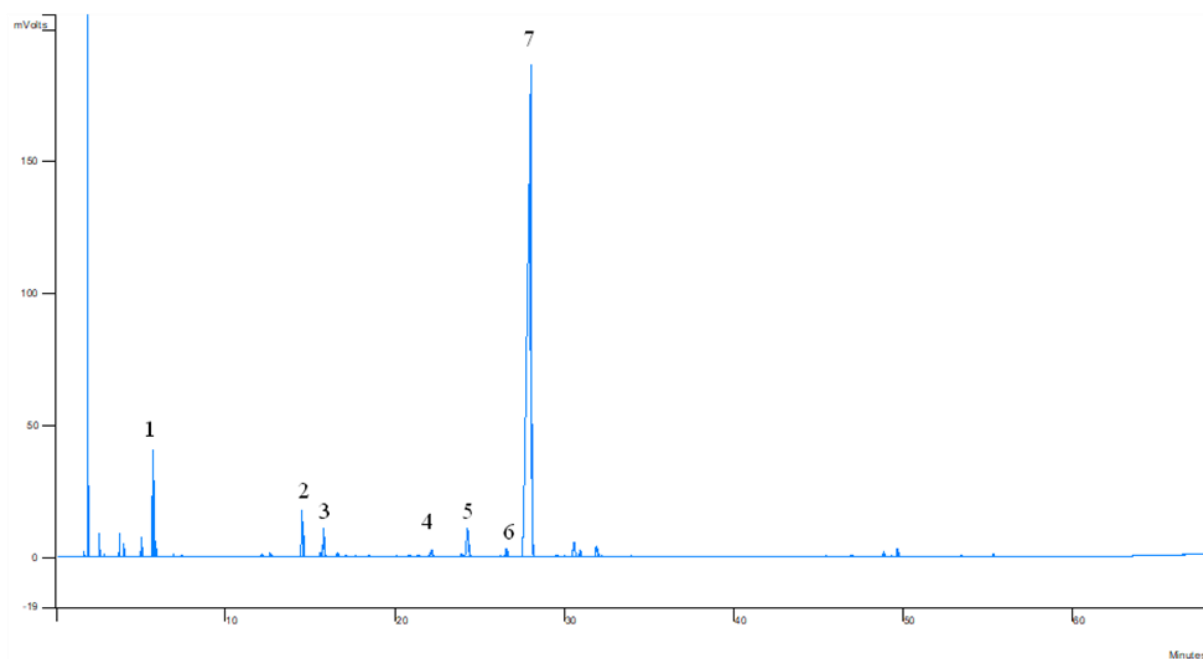


FIG. 1 GAS CHROMATOGRAM OF TYPE 1 WHOLE OIL OF *MENTHA ARVENSIS* L.

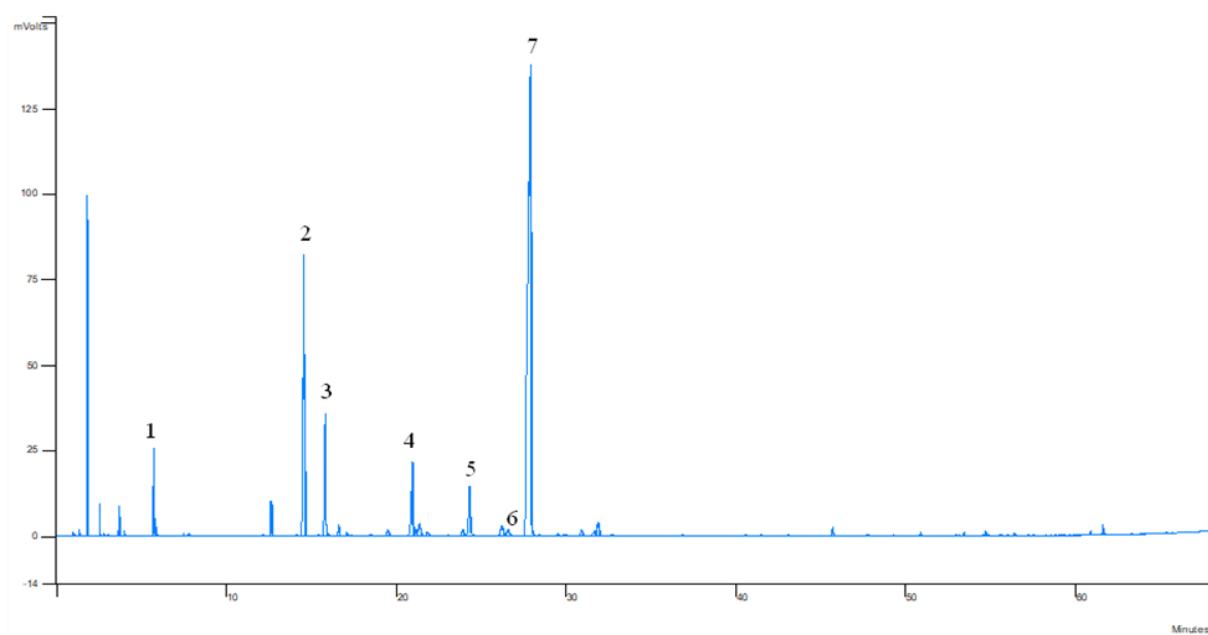


FIG. 2 GAS CHROMATOGRAM OF TYPE 2 PARTIALLY DEMENTHOLIZED OIL

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Fragrance and Flavour Sectional Committee, PCD 18

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