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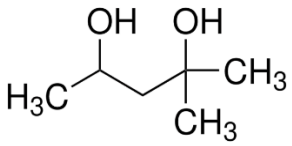
भारतीय मानक मसौदा
हेक्सिलीन ग्लाइकोल — विशिष्टि

Draft *Indian Standard*
HEXYLENE GLYCOL — SPECIFICATION
(ICS 71.080.60)

Organic Chemicals, Alcohols and Allied Products Sectional Committee, PCD 09	Last date for receipt of comment is **23 September 2025**

FOREWORD
(*Formal clauses to be added later*)

Hexylene Glycol is also known as 2-methylpentane-2,4-diol, with the chemical formula as $(CH_3)_2C(OH)CH_2CH(OH)CH_3$ and structural formula as:



It is colourless liquid, soluble in water and common organic solvents. It is used as a solvent in paint, coatings, varnish, lacquer, inks, paint strippers and related products. It is a potential substitute for glycol ethers. It exhibits both surfactant and emulsion-stabilizing properties. Its relatively high viscosity and low volatility are advantageous in coatings, cleansers, cosmetics, solvents, lubricants, and hydraulic fluids.

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.

1 SCOPE

This standard prescribes the requirements, methods of sampling and test for hexylene glycol for industrial use.

2 REFERENCES

The standards given below 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 agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards.

IS No.	*Title*
IS 229 : 2021	Ethyl acetate — Specification (*fourth revision*)
IS 1070 : 2023	Reagent grade water — Specification (*fourth revision*)
IS 1448 (Part 16) : 2014/ISO 3675 : 1998	Methods of test for petroleum and its products: Part 16 Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (*fourth revision*)
IS 2362 : 1993	Determination of water by Karl Fischer method — Test method (*second revision*)
IS 5298 : 2013	Method for determination of distillation range and distillation yield (*second revision*)
IS 8768 : 2000	Method of measurement of colour in liquid chemical products platinum-cobalt scale (*second revision*)

3 REQUIREMENTS

3.1 Description

The material shall be a clear, colourless liquid and free from suspended matter, when tested according to Annex A.

3.2 It shall be miscible with water in all proportions at 25 °C.

3.3 The material shall also comply with the requirements prescribed in Table 1, when tested according to the methods given in col (4) and col (5) of Table 1.

Table 1 Requirements for Hexylene Glycol
(*Clause* 3.3)

Sl No.	**Characteristics**	**Requirements**	**Method of Test, Ref to**	
			Indian Standards	Annex
(1)	(2)	(3)	(4)	(5)
i)	Purity, area percent, *Min*	99.5	—	B
ii)	Colour, Pt-Co, *Max*	10	IS 8768	—
iii)	Moisture content, percent by	0.1	IS 2362	—

	mass, *Max*			
iv)	Specific gravity at 20 ºC/20 ºC	0.921 to 0.924	IS 1448 (Part 16) [1)]	C
v)	Acidity (as acetic acid), percent by mass, *Max*	0.005	—	D
vi)	Distillation range (ºC)	195.5 to 198.5	IS 5298	—
vii)	Water miscibility	Miscible	—	E

[1)] In case of disputes, Method A of Annex C shall be the referee method.

3.4 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.

4 PRECAUTIONS IN HANDLING

The material shall be kept well protected from atmospheric humidity as it is hygroscopic. Splashes in eye can cause eye irritation. It can cause skin irritation. Splashes in eye or on skin should be removed by washing with copious quantity of water. Use personal protective equipment like safety goggles, gloves during handling operations.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in suitable mild steel drums or plastic IBCs or ISO containers or stainless-steel tankers, well closed with preferably replaceable closure or as agreed between the purchaser and the supplier.

5.2 Marking

5.2.1 Each container shall be marked legibly and indelibly with the following information:

a) Name of the material;
b) Name of manufacturer and his recognized trade-mark, if any;
c) Batch or lot number;
d) Net mass of the material in the container;
e) Month and year of manufacture; and

f) Any other statutory requirements.

5.2.2 For supplies of material in bulk, a test certificate certified by authorized person of the manufacturer's organization containing the details mentioned at **5.2.1**, along with date of analysis shall be provided for each consignment.

5.2.3 *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.

6 SAMPLING

6.1 The procedure for sampling of the material shall be as prescribed in Annex F of IS 229.

6.2 Criteria for Conformity

The lot shall be declared as conforming to the requirements of the specification, if all the test results on each of the individual samples and the composite sample meet the relevant specification requirements.

ANNEX A
(*Clause* 3.1)
DETERMINATION OF APPEARANCE (VISUAL INSPECTION PROCEDURE)

A-1 GENERAL

This test method describes the visual assessment of samples at room temperature for the appearance of clear, transparent liquids for clarity and the presence of undesirable components (contamination) such as suspended matter, free from oil or water and particulates when examined by transmitted light.

A-2 PROCEDURE

Take a clean and dry 1 000 ml glass container, with a screw cap. Fill the glass container with the sample to approximately 75 percent of its full capacity to allow sufficient space for swirling without spillage. Once filled, securely close the container.

Swirl the sample gently to form vortex and avoid formation of bubbles. Examine the sample particularly the bottom of vortex at arm's length for particulates and free oil or contamination.

A-3 REPORT

Report the appearance of the sample as clear liquid free from suspended matter, if no contamination or colour is found.

ANNEX B

[*Table* 1, *Sl No.* (i)]

DETERMINATION OF PURITY (HEXYLENE GLYCOL CONTENT) BY GAS CHROMATOGRAPHIC METHOD

B-1 GENERAL

A representative sample is introduced into a gas chromatograph equipped fused silica capillary column. Suitable carrier gas transports the vaporized sample through the column where the components are separated by the chromatographic process. Components are sensed by a flame ionization detector as they elute from the column. The detector signal is processed by an electronic data acquisition system. The product and other components are identified by comparing their retention times to the ones identified by analysing standards under identical conditions. The concentration of all components are determined in mass percent area by area normalization of the peak areas.

B-2 APPARATUS

B-2.1 Gas Chromatograph

B-2.1.1 Any gas chromatograph equipped with a flame ionization detector (FID), a split injector and a suitable electronic integrator/software can be used with following accessories and operating condition:

Column	:	fused silica capillary column with stationary phase of polyethylene glycol, length 30 m, internal diameter 0.25 mm and film thickness 0.5 µm or equivalent.
Split ratio	:	1 : 100
Carrier gas	:	Nitrogen/helium
Column gas flow, ml/min	:	1.1
Purge flow, ml/min	:	3
Total run time, min	:	24.42
Hydrogen flow rate, ml/min	:	30
Air flow rate, ml/min	:	300

Sample size, µl : 0.2 µl

B-2.1.2 *Temperature Programme of Oven, Detector and Injector:*

Injector Temperature, °C	*Detector Temperature, °C*	*Oven*		
		Temperature, °C	*Hold Time, min*	*Ramp Rate, °C/min*
		70	1.5	12
200	250	250	10	—

NOTE — The above gas chromatographic (GC) conditions are suggestive. However, any GC method having difference in detector, column packing material and type (like packed/capillary, diameter, length, film thickness etc.), calibration technique (internal standard, external standard, area normalization, percent area, etc.), carrier gas (He, H_2, N_2) may be used with applicable GC operating parameters, provided standardization and calibration of the components is established after setting GC parameters for the resolution and accuracy level as specified in this standard.

B-2.2 Data Acquisition System

Any suitable data integrator or PC based gas chromatograph software.

B-3 REAGENT

B-3.1 Hexylene Glycol, certified reference material

NOTE — In case certified reference material of reagents as mentioned at **B-3.1** is unavailable, high purity chemical (known purity) may also be used as an alternative to certified reference material.

B-4 IDENTIFICATION

Determine the retention time of each component by injecting small amounts of highly pure material of hexylene glycol (*see* **B-3.1**) individually. Typical data of retention time is given in Table 2.

Table 2 Typical Retention Time and Area Percentage of Peaks
(*Clause* B-4)

Peak	**Retention Time, min**	**Area**	**Area Percent**
(1)	(2)	(3)	(4)
Hexylene Glycol	8.349	11 756	0.028 76
	10.069	1 354	0.003 31
	11.203	4 08 31 171	99.900 12
	12.805	2 341	0.005 73
	13.579	4 712	0.011 53

	13.949	3 189	0.007 80
	18.365	17 471	0.042 75
Total		4 08 71 994	100.000 00

B-5 PROCEDURE

Inject 0.2 µl of sample by using manual or automatic liquid syringe, without any air bubble trapped in the syringe. Determine the mass concentration of all components by area normalization method.

B-6 CALCULATION

Calculate concentration of hexylene glycol:

$$\text{Hexylene glycol, percent by area} = \frac{Area\ of\ hexylene\ glycol\ peak\ in\ sample}{Sum\ of\ area\ of\ all\ peaks\ in\ sample} \times 100$$

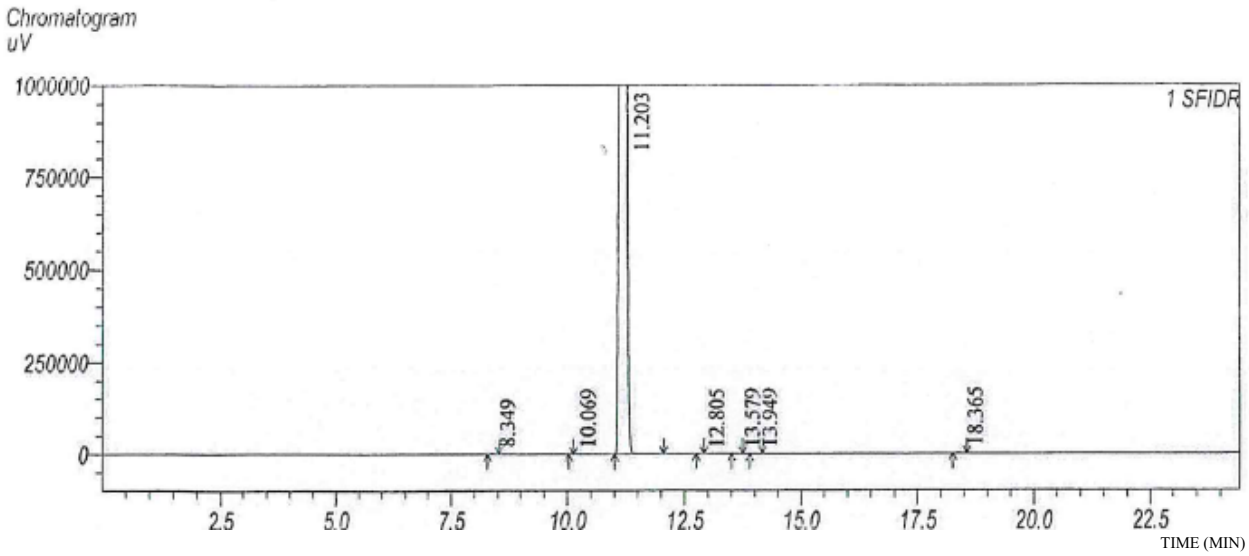


FIG. 1 TYPICAL CHROMATOGRAM

ANNEX C
[*Table* 1, *Sl No.* (iv)]
DETERMINATION OF SPECIFIC GRAVITY

C-1 GENERAL

Two methods, namely, IS 1448 (Part 16) determination of specific gravity by hydrometer and Method A determination of specific gravity by relative density bottle have been prescribed. In case of disputes, Method A shall be the referee method.

C-2 METHOD A

C-2.1 Outline of the Method

In this method, weights of equal volumes of the material and water at the 20 °C are compared using relative density bottle.

C-2.2 Apparatus

C-2.2.1 *Relative Density Bottle* — 25 ml capacity

C-2.2.2 *Water Bath* — maintained at (20.0 ± 0.2) °C

C-2.2.3 *Thermometer* — any convenient thermometer of a suitable range with 0.1 °C or 0.2 °C subdivisions.

C-2.2.3.1 The thermometer shall bear a certificate from any institution authorized to issue certificate traceable to international or national measurement standards.

C-2.3 Procedure

Clean and dry the relative density bottle. Weigh and then fill with recently boiled and cooled water at 20 °C. Fill to overflowing by holding the relative density bottle on its side in such a manner as to prevent entrapment of air bubbles. Insert the stopper and immerse in the water-bath. Keep the entire bulb covered with water and hold at that temperature for 30 min. Carefully, remove any water, which has exuded from the capillary opening. Remove from the bath, wipe completely, dry and weigh. Again clean and dry the relative density bottle. Using the material under test, proceed exactly as in the case of water and weigh the bottle with the material.

C-2.4 Calculation

$$\text{Relative density/Specific gravity at 20 °C/20 °C} = \frac{M_1 - M_2}{M_3 - M_2}$$

where

M_1 = mass, in g, of the relative density bottle with the material;
M_2 = mass, in g, of the relative density bottle; and
M_3 = mass, in g, of the relative density bottle with water.

ANNEX D
[*Table* 1, *Sl No.* (v)]
DETERMINATION OF ACIDITY (*as* ACETIC ACID)

D-1 OUTLINE OF THE METHOD

The material is titrated with standard sodium hydroxide solution to the phenolphthalein end point and from the volume of standard sodium hydroxide solution used acidity is calculated as acetic acid.

D-2 REAGENTS

D-2.1 Phenolphthalein Indicator, 1 percent (*w/v*)

Dissolve 1 g of phenolphthalein in 100 ml ethyl alcohol or isopropyl alcohol.

D-2.2 Standard Sodium Hydroxide Solution, 0.05 N

NOTE — Standard potassium hydroxide (KOH) solution may also be used as an alternate to standard sodium hydroxide solution.

D-2.3 Distilled Water

D-3 PROCEDURE

D-3.1 Take 50 ml of water in a 250 ml Erlenmeyer flask. To it add 5 to 6 drops of phenolphthalein indicator solution (*see* **D-2.1**) and neutralize with 0.05 N sodium hydroxide solution (*see* **D-2.2**) to the first perceptible pink colour.

D-3.2 Pipet 50 ml of the sample into the flask. Titrate the mixture with standard sodium hydroxide solution until the first pink colour persists for at least 10 s.

D-4 CALCULATION

$$\text{Acidity (}as\text{ acetic acid), percent by mass} = \frac{V \times N \times 0.12}{D}$$

where

V = volume, in ml, of standard sodium hydroxide solution required for titration of the sample;
N = normality of the standard sodium hydroxide solution; and
D = density, in g/ml, of the material.

ANNEX E
[*Table* 1, *Sl No.* (vii)]
DETERMINATION OF WATER MISCIBILITY

E-1 PROCEDURE

E-1.1 Transfer 25 ml of the sample to one of two clean 250 ml graduated cylinders. Dilute it with water, to the 250 ml mark, and mix thoroughly. Allow any bubbles to rise to the surface.

E-1.2 Now, take 250 ml of water in the second 250 ml graduated cylinder and reserve as a blank.

E-1.3 Compare the sample-water mixture with the blank by viewing through the length of the column of liquid toward a dark background.

E-2 REPORT

If the sample-water mixture is free of cloudiness or turbidity and is a homogeneous liquid as the blank, report the sample as "miscible". If any cloudiness or turbidity is detected after 30 min, report it as "immiscible" that is it fails test.