

भारतीय मानक

IS 524 : 2024

Indian Standard

(Superseding IS 198 : 1978,  
IS 337 : 1975 & IS 525 : 1968)

सामान्य उपयोग के लिए वार्निश — विशिष्टि

( तीसरा पुनरीक्षण )

Varnish for General Purpose —  
Specification

( Third Revision )

ICS 87.060

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भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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## FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

This standard was first issued as a tentative standard in 1954, due to non-availability of authentic technical data on durability of this material. The first revision was done in 1968. In that revision, the requirements of JSS 3056 'Varnish, exterior, synthetic' issued by Directorate of Standardization, Ministry of Defence, Government of India, had been considered and incorporated. In addition, modifications in evaluating performance test and their assessments were also introduced in the first revision. Stripping test was elaborated by stipulating definite time intervals after which the test is to be performed.

The requirements for undercoating varnish were covered in IS 339 : 1952 but the concerned technical committee responsible for preparation of this standard was of the opinion that instead of using one coat of undercoating varnish conforming to IS 339 : 1952' and another coat of finishing varnish conforming to this specification, two coats of the latter may be used with improved performance and comparable cost. The committee, therefore, decided to withdraw IS 339 : 1952 and recommended to use two coats of the material conforming to this specification in place of one coat of undercoating and another coat of finishing. IS 339 : 1952 was, therefore, withdrawn.

The second revision was done in 1983. In that revision, a specific limit of the phthalic anhydride content was given as an optional requirement for railways.

This third revision has taken up in order to bring out the standard in the latest style and format of the Indian Standards. While reviewing this standard along with other Indian Standards on the same subject, the committee is of the opinion that IS 525 : 1968 "Specification for varnish, finishing, exterior and general purpose", IS 337 : 1975 "Specification for varnish, finishing, interior", IS 198 : 1978 "Specification for varnish gold size" and this standard have almost similar requirements and applications. Therefore, the committee recommended that it is prudent to merge the scopes of all four standards into one single standard. Accordingly, the scope, title, and requirements of this standard have been modified in order to encompass scopes of other standards on the same subject. Key changes introduced include:

- a) Recognizing the time constraints associated with the 12 month outdoor exposure test for durability requirements, and considering the availability of advanced simulation technologies like QUV and Xenon Arc accelerated test methods, the need for the extended outdoor exposure has been withdrawn. Additionally, test methods for evaluating the degradation of coatings have been prescribed;
- b) The maximum limits for lead and volatile organic compounds (VOCs) have been specified considering its adverse impact on human health and environment;
- c) The corresponding parts of IS 101 has been referred for the test methods procedure as earlier referred test method IS 197 has been withdrawn;
- d) A suitable precautionary note has been added in the marking clause in order to prevent unforeseen events; and
- e) References of Indian Standards have been updated wherever required.

The composition of the Committee, responsible for the formulation of this standard is given in [Annex H](#).

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***VARNISH FOR GENERAL PURPOSE — SPECIFICATION***( Third Revision )***1 SCOPE**

This standard specifies the requirements and methods of sampling and testing for varnish used for general purposes. The material is typically used in protective coatings for wooden surfaces, paintings, and various decorative objects.

**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 agreements 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, the definitions given in IS 1303 and the one given below shall apply.

**3.1 Volatile Organic Compounds (VOC)** — is any organic compound having an initial boiling point less than or equal to 250 °C measured at a Standard atmospheric pressure of 101.3 kPa.

**4 REQUIREMENTS****4.1 Composition**

The material shall be based on oil modified alkyd resin and shall be free from natural resins or their derivatives or their modifications, in any form, when tested in accordance with IS 101 (Part 9/Sec 2). It shall be of such a composition as to satisfy the requirements of this standard.

**4.1.1 Optional Requirement for Railways**

The phthalic anhydride content of the non-volatile vehicle in the material shall not deviate by more than  $\pm 10$  percent by mass of the declared value of manufacturer or agreed between parties when estimated by the method prescribed in IS 101 (Part 8/Sec 4). Further, in the material the phthalic anhydride content shall, in no case, be less than 20 percent by mass of the nonvolatile vehicle when tested as prescribed in IS 101 (Part 8/Sec 4).

NOTE — Due allowance may be given to the repeatability of the method for the determination of phthalic anhydride content as prescribed in IS 101 (Part 8/Sec 4).

**4.1.2** The material shall be capable of being thinned with petroleum hydrocarbon solvent, 145/205 low aromatic grade (*see* IS 1745).

**4.2 Durability**

A film of the sample shall be prepared and tested in any of the accelerated weathering apparatus xenon arc or QUV-A as prescribed under [Annex B](#). It shall be examined every 72 h for a period of 500 h for both apparatus and a complete record of its performance maintained and qualified as per requirement given in [Table 1](#).

**4.3 Resistance to Acid**

The material, when tested as prescribed in [Annex C](#), shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.

**4.4 Resistance to Alkali**

The material, when tested as prescribed in [Annex D](#), shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.

**4.5 Resistance to Water**

The material, when tested as prescribed in [Annex E](#), shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.

**4.6 Lead Restriction**

The material shall not contain lead or compounds of lead or mixtures of both, as metallic lead more than 90 ppm, when tested for restriction from lead in accordance with ICP-OES or AAS method of IS 101(Part 8/Sec 5).

**4.7** The material shall also comply with the requirements given in [Table 1](#).

**Table 1 Requirements for Varnish for General Purpose**(Clauses [4.2](#) and [4.7](#))

SI No.	Characteristic	Requirement	Method of Test, Ref To
(1)	(2)	(3)	(4)
i)	Drying time, h, <i>Max</i> a) Surface dry b) Hard dry	4 18	IS 101 (Part 3/Sec 1)
ii)	Finish	Smooth and glossy	IS 101 (Part 3/Sec 4)
iii)	Colour, gardner value, <i>Max</i>	10	IS 354 (Part 1)
iv)	Durability using accelerated weathering equipment's, ratings after exposing stipulated time given in <a href="#">4.2</a> :		<a href="#">Annex B</a>
	a) Degree of chalking, cracking	0 (unchanged that is no perceptible chalking)	
	b) Degree of spotting	No spotting	
	c) Gloss 60° retention, percentage of original, <i>Min</i>	50	
v)	Flexibility and adhesion, after 96 h air-drying: a) Scratch hardness (at load 1 000 g) b) Bent test with 6.25 mm dia. Mandrel	No such scratch as to show the bare metal No visible damage or detachment of film	IS 101(Part 5/Sec 2)
vi)	Stripping test after 96 hours air-drying	Scratches free from jagged edges	<a href="#">Annex F</a>
vii)	Flash point, °C	Not below 30	IS 101 (Part 1/Sec 6)
viii)	Volatile matter content, percent by weight, <i>Max</i>	60.0	IS 101 (Part 2/Sec 2)
ix)	Viscosity by ford cup No. 4 at (27 ± 2) °C, s	40 to 80	IS 101 (Part 1/Sec 5)
x)	Volatile organic compound, gm/litre, <i>Max</i> ( <i>see Notes</i> )	550	IS 101 (Part 2/Sec 3)
xi)	Keeping properties	Not less than one year from date of manufacture	<a href="#">Annex G</a>

## NOTES

**1** It is in-can VOC as supplied by manufacturer, without including any thinner. Since the amount of thinner used on-site can vary depending on the application method (brushing, spraying, etc), it can be challenging to precisely track the extent of thinning during application.

**2** VOCs of colorant added at point of sale. The VOC content of product including the colorant added at the point-of-sale shall not exceed 50 grams per litre over and above the allowed VOC limit of product without colorant.

**3** For the calculation of the VOC content, for solvent and water-based paints, Method 2 and Method 3 may be employed respectively as given in the IS 101 (Part 2/Sec 3) and IS 101 (Part 2/Sec 4).

## 5 PACKING AND MARKING

### 5.1 Packing

The material shall be packed as agreed to between the purchaser and the supplier.

### 5.2 Marking

**5.2.1** Each container shall be marked with the following particulars:

- a) Name and type of the material;
- b) Name of the manufacturer or his recognized trade-mark, if any;
- c) Volume of the material;
- d) Lead content, *Maximum* and VOC *Maximum*;
- e) Batch No. or lot No. in code or otherwise; and
- f) Month and year of manufacture.
- g) A cautionary note as below:
  - 1) Keep out of reach of children;
  - 2) Dried film of this paint may be harmful if eaten or chewed; and
  - 3) This product may be harmful if swallowed or inhaled.

### 5.2.2 BIS Certification Mark

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 Preparation of Test Samples

**6.1.1** The sample shall be submitted in three different containers, each containing not less than 500 ml of the material. Representative samples of the material shall be drawn and treated as prescribed in IS 101 (Part 1/Sec 1).

## 7 TEST METHODS

**7.1** Tests shall be conducted as prescribed in [4.1](#) to [4.7](#).

### 7.2 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.

## ANNEX A

(Clause 2)

## LIST OF REFERRED STANDARDS

IS No.	Title	IS No.	Title
IS 101	Methods of sampling and test for paints, varnishes and related products:	(Part 6/Sec 2) : 1989	Durability test on paint films, Section 2 Keeping properties ( <i>third revision</i> )
(Part 1)	Tests on liquid paints (general and physical),	(Part 8)	Tests for pigments and other solids,
(Sec 1) : 2023	Sampling ( <i>fourth revision</i> )	(Sec 4) : 2015	Phthalic anhydride ( <i>fourth revision</i> )
(Sec 3) : 1986	Preparation of panels ( <i>third revision</i> )	(Sec 5) : 2022	Lead restriction test ( <i>fourth revision</i> )
(Sec 5) : 2024	Consistency ( <i>fourth revision</i> )	(Part 9/Sec 2) : 1993	Tests for lacquers and varnish, Section 2 Rosin test ( <i>third revision</i> )
(Sec 6) : 1987	Flash point ( <i>third revision</i> )	IS 266 : 2024	Sulphuric acid — Specification ( <i>fourth revision</i> )
(Part 2)	Test on liquid paints (chemical examination),	IS 285 : 2021	Laundry soaps — Specification ( <i>fourth revision</i> )
(Sec 2) : 1986	Volatile matter ( <i>third revision</i> )	IS 296 : 2023	Sodium carbonate anhydrous — specification ( <i>fourth revision</i> )
(Sec 3) : 2015/ ISO 11890-1 : 2007	Determination of volatile organic compound (VOC) content — Difference method	IS 354 (Part 2) : 2024	Resins for paints methods of sampling and test: Part 2 Special test methods for alkyd resins ( <i>third revision</i> )
(Part 3)	Tests on paint film formation,	IS 1017 : 1983	Specification for chamois leather ( <i>second revision</i> )
(Sec 1) : 1986	Drying time ( <i>third revision</i> )	IS 1070 : 2023	Reagent grade water — Specification ( <i>fourth revision</i> )
(Sec 4) : 1987	Finish ( <i>third revision</i> )	IS 1303 : 1983	Glossary of terms relating to paints ( <i>second revision</i> )
(Part 4/Sec 2) : 2021/ISO 3668 : 2017	Optical tests, Section 2 Colour-visual comparison of colour of paints ( <i>fourth revision</i> )	IS 1745 : 2018	Petroleum hydrocarbon solvents — Specification ( <i>third revision</i> )
(Part 5)	Mechanical test on paint films,		
(Sec 1) : 1988	Hardness tests ( <i>third revision</i> )		
(Part 5/Sec 2) : 1988	Mechanical test, Section 2 Flexibility and adhesion ( <i>third revision</i> )		

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## ANNEX B

[Table 1 (iv) and Clause 4.2]

## DETERMINATION OF DURABILITY

**B-1 GENERAL****B-1.1 Outline of the Method**

The durability of the varnish is determined by ascertaining actual behavior of suitably prepared test panels by an accelerated weathering test wherein a prepared panel is subjected to controlled exposure of heat, light and water in an artificial weathering apparatus.

**B-2 TEST PANELS**

The panels shall be of seasoned teakwood conforming to the requirements given in IS 101 (Part 1/Sec 1). Panels for the accelerated weathering test 150 mm × 75 mm × 12 mm. The panels shall be levelled at the edges and shall be smoothened by rubbing down with fine emery paper, the back being protected with a suitable paint.

**B-3 PREPARATION OF TEST PANELS**

**B-3.1** In the painting procedure outlined under **B-3.2**, the air-drying shall be done at the room temperature and at a relative humidity of not more than 70 percent.

**B-3.2** The surface of the test panels to be exposed shall be prepared as follows:

- a) Apply one coat of liquid, transparent wood filler and remove the excess after it has dried to touch, by rubbing across the grains with jute fibres or hessian cloth, and allow it to air-dry for 24 hours;
- b) Rub down with emery paper No. 220/240 and wipe off the dust, apply one coat of sealer and allow to air-dry for 24 hours;
- c) Rub down with waterproof emery paper No. 220/240, wash and wipe off water, and when dry, apply one coat of the material, and allow to air-dry for 24 hours;
- d) Rub down with waterproof emery paper No. 320, wash and wipe off water, and when dry, apply second coat of the material, and allow to air-dry for 48 hours; and
- e) Rub down with waterproof emery paper No. 320, wash and wipe off water, and when dry, apply a third coat of the material and allow to air-dry for 7 days.

**B-4 ACCELERATED WEATHERING TEST**

Accelerated weatherometer test on paints being done to simulate and predict the effects of long-term exposure to various environmental conditions such as sunlight, moisture, temperature fluctuations, and other atmospheric elements.

Testing can be conducted using any of the two accelerated weathering apparatus, namely QUV-A or Xenon with exposure times set at 500 hours for both apparatuses. Both side of the panels for these tests shall be prepared as described under **B-3**. Duplicate samples are to be tested in an appropriate accelerated weathering apparatus, as detailed in **B-4.1** and **B-4.2**. For details of method of tests for both xenon arc and QUV-A apparatus, refer to IS 101 (Part 6/Sec 5).

**B-4.1 Xenon arc**

An artificial weathering apparatus of the xenon arc type for uniform and controlled exposure to the effects of heat, light and water.

**B-4.1.1** Commonly used cycles and test conditions for Xenon arc apparatus are given below:

- a) Black panel temperature:  $(63 \pm 3) ^\circ\text{C}$
- b) Continuous exposure in light for 17 minutes and intermittent exposure to water spray for 3 minutes light and spray.
- c) Irradiance:  $0.55 \text{ W/m}^2/\text{nm}$
- d) Total exposure time: 500 h

**B-4.2 QUV-A**

An artificial weathering apparatus of the QUV type for uniform and controlled exposure to the effects of UV and condensation.

**B-4.2.1** Commonly used cycles and test conditions for UV type apparatus are given below:

- a) Lamp type UVA 340
- b) Test cycle UV – (4 h at  $60 \pm 3 ^\circ\text{C}$ )  
Condensation – (4 h at  $50 ^\circ\text{C} \pm 3 ^\circ\text{C}$ )
- c) Irradiance  $0.67 \text{ W/m}^2/\text{nm}$
- d) UV-A wavelength 340 nm  
(approx.)
- e) Total exposure time 500 h

## **B-5 EVALUATION AND RATING OF FILM CHARACTERISTICS OF TEST PANEL**

The test panels before and after the specified periods of exposure tests shall be assessed for the various film characteristics as prescribed in [B-5.1](#) to [B-5.3](#).

### **B-5.1 Freedom from Chalking**

The exposed panel shall be examined for the degree of flaking at the interval of 72 h up to the stipulated exposed time. The rating for the degree of chalking shall be provided by matching with the figures given in IS 101 (Part 11/Sec 7).

### **B-5.2 Freedom from Spotting**

The exposed panel shall be examined for the degree of spotting at the interval of 72 up to the

stipulated exposed time. For passing the sample there shall be no spotting observed both during the exposure period and after completing the stipulated time in the respective accelerated weatherometers.

### **B-5.3 Gloss loss at 60°**

The exposed panel shall be examined for the loss of gloss at the interval of 72 h up to the stipulated exposed time. The percentage of gloss loss shall be calculated with the initial taken gloss value, for measurement of gloss IS 101 (Part 4/Sec 4) may be referred. For passing the sample loss of gloss shall not be more 50 percent both during the exposure period and after completing the stipulated time in the respective accelerated weatherometers.

## **ANNEX C**

(Clause [4.3](#))

### **DETERMINATION OF RESISTANCE TO ACID**

#### **C-1 GENERAL**

##### **C-1.1 Outline of the Method**

A test panel coated with the varnish, after specified drying period, is immersed in a definite concentration of sulphuric acid for 24 hours after which it is washed and dried.

#### **C-2 PROCEDURE**

**C-2.1** Apply a coat of the varnish by brushing or spraying on a 150 mm × 50 mm clean glass panel to give a dry film weight commensurate with the weight in kg/10 litres of the material. Allow the

panel to air-dry in a horizontal position for 48 hours at  $(27 \pm 2)$  °C and relative humidity of  $(65 \pm 2)$  percent. Protect the edges of the panel by applying a coat of wax. Immerse the panel in a 2 percent (w/v) solution of concentrated sulphuric acid (sp gr 1.84 conforming to IS 266) for 24 hours at room temperature. Remove the panel, wash in running fresh water and allow to dry for an hour.

**C-2.2** The film shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.



## ANNEX D

(Clause 4.4)

## DETERMINATION OF RESISTANCE TO ALKALI

## D-1 GENERAL

## D-1.1 Outline of the Method

The film of the material is tested with a solution of laundry soap followed by a solution of sodium carbonate by the procedure specified under [D-2](#).

## D-2 PROCEDURE

**D-2.1** Immerse a panel prepared as described in [B-3](#) in a one percent (w/v) solution of laundry soap, grade 1 (conforming to IS 285) for half an hour at a temperature of  $(27 \pm 2)$  °C. Remove, wash in running water, dry for an hour and examine the film and then subject to test as prescribed under [C-2.2](#).

**D-2.2** Immerse the panel in a solution of sodium carbonate analytical reagent grade (conforming to IS 296) containing two. percent (w/v) of sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) for half an hour at a temperature of  $(27 \pm 2)$  °C. Remove, wash in running water, dry for an hour and examine the film.

**D-2.3** After each of the tests described under [D-2.1](#) and [D-2.2](#), The film shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.

## ANNEX E

(Clause 4.5)

## DETERMINATION OF RESISTANCE TO WATER

## E-1 GENERAL

## E-1.1 Outline of the Method

The varnish coated panel, after specified drying period, is immersed in distilled water for 48 hours at room temperature and examined for any signs of deterioration and change in gloss.

## E-2 PROCEDURE

**E-2.1** Apply a coat of material to a glass panel

prepared as prescribed in IS 101 (Part 1/Sec 3) to give a dry film weight commensurate with weight per 10 litres of the material as specified in [Table 2](#). Allow the varnish to air-dry in a horizontal position for 48 hours. Immerse the panel in distilled water at room temperature for 48 hours. Remove it from water and examine after 4 hours.

**E-2.2** The film shall not show any signs of disintegration, blistering, wrinkling and lifting. The loss of gloss shall not be more than 50 percent of the original gloss.

Table 2 Relation between Weight of the Wet Material and Dry Film Weight

(Clause [E-2.1](#))

Sl No.	Weight of the Wet Material		Limits of Dry Film Weight
	kg/10 l		g/m <sup>2</sup>
(1)	(2)		(3)
i)	Up to 12		27 to 34
ii)	Over 12 and up to 14		34 to 44
iii)	„	14 „ „ „ 16	44 to 54
iv)	„	16 „ „ „ 18	54 to 68
v)	„	18	68 to 80

**ANNEX F**

[\[Table 1 \(vi\)\]](#)

**STRIPPING TEST**

**F-1 OUTLINE OF THE METHOD**

The Minimum load required to produce a scratch showing the bare metal surface of the panel coated with the material is determined.

**F-2 APPARATUS**

The apparatus used for determining the scratch hardness as prescribed in IS 101 (Part 5/Sec 2) shall be used.

**F-3 PROCEDURE**

Apply a coat of the material by either brushing or spraying, whichever is specified in the material

specification, to a 150 mm × 50 mm × 0.315 mm tinned mild steel panel prepared as described in IS 101 (Part 1/Sec 3). Allow the panel to air-dry in a horizontal position for 96 hours under specified drying conditions or stove as specified in the material specification. Condition the test panels at standard atmospheric conditions for at least 26 hours before testing. Test the dried film in the apparatus under such a load that a scratch is produced showing the bare metal surface.

**F-4** The scratch so produced shall be free from jagged edges.

**ANNEX G**

[\[Table 1 \(xi\)\]](#)

**KEEPING PROPERTIES**

**G-1** When stored under cover in a dry place in the original sealed containers under normal temperature conditions, the material shall meet the requirement as specified in [4](#) for the specified period after the date of manufacture. Slight changes in viscosity may

be allowed provided the material satisfies the other requirements prescribed in the material specification.

## ANNEX H

*(Foreword)*

## COMMITTEE COMPOSITION

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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Salt Lake, Kolkata, West Bengal 700091

{ 2367 0012  
{ 2320 9474

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg,  
Chandigarh 160019

{ 265 9930

Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113

{ 2254 1442  
{ 2254 1216

Western : 5<sup>th</sup> Floor/MTNL CETTM, Technology Street, Hiranandani Gardens, Powai  
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