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## Paints and Varnishes - Specification for lacquer thinner

### 1. Scope

This ECOWAS Standard specifies the requirements, sampling procedure, test methods and acceptance criteria for lacquer thinners used in diluting nitrocellulose lacquers and retarders which are mixed with lacquer thinners to prevent painting from blushing.

### 2. Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. 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 editions of these reference standards.

- 2.1 ISO 15528:2005 – Paints, varnishes and raw materials for paints and varnishes – Sampling.
- 2.2 ISO 2114:2005 – Plastics (polyester resins) and paints and varnishes – Determination of partial acid value and total acid value.
- 2.3 GS 798: 2005 – Paints, varnishes and allied products – Determination of transparency.
- 2.4 GS 799: 2005 – Paints, varnishes and allied products – Determination of the resistance of paint films to staining.
- 2.5 ISO 3270:2005 – Paints and varnishes and their raw materials – Temperatures and humidities for conditioning and testing.
- 2.6 ISO 1513: 2005 – Paints and varnishes- Examination and preparation of samples for testing.
- 2.7 ASTM S86: 2005 – Standard method for the distillation of petroleum products

### 3. Definitions

For the purposes of this standard the following definitions apply:

#### 3.1

##### **lacquer thinner**

a transparent and evaporative liquid whose main component is low boiling point solvent suitable for dilution of nitrocellulose lacquer

#### 3.2

##### **retarder**

a transparent and evaporative liquid whose main component is high boiling point solvent which dissolves nitrocellulose

### 3.3

#### **standard test condition**

a temperature of  $27 \pm 2^{\circ}\text{C}$  and relative humidity of  $60 \pm 5\%$

### 3.4

#### **blushing**

a milky opalescence that sometimes develops as a film of lacquer dries, and is due to the deposition of moisture from the air and/or precipitation of one or more of the solid constituents of the lacquer

### 3.5

#### **defective**

a test sample or container of the lacquer thinner or retarder that fails in one or more respects to comply with the relevant requirements of this standard

### 3.6

#### **lot**

the quantity of lacquer thinner or retarder in containers bearing the same batch identification, produced by one manufacturer and submitted at any one time for inspection and testing

## 4. Requirements

### 4.1 Transparency

When tested in accordance with GS 798 the sample shall be colourless or very faint yellow. There shall be no floats, precipitates and separation of liquid phase.

### 4.2 Stain resistance

When tested in accordance with GS 799 there shall be no stains on the paint film

### 4.3 Reducibility (Applicable to lacquer thinners only):

When tested in accordance with 8.3 the dry paint film shall be free from rivelling, unevenness, graining, pin holes, whitening or other film defects.

### 4.4 Nitrocellulose solubility

There shall be no gelatinous precipitate, turbidity or clouding and the solution shall also be transparent when tested in accordance with 8.4. The solution shall also be transparent.

### 4.5 Blushing prevention (Applicable to retarders only)

When tested in accordance with 8.5 the dry paint film shall show no sign of blushing.

### 4.6 Residue on evaporation

When of the lacquer thinner or the retarder is tested in accordance with 8.6, the residue on evaporation shall be not more than 0,02g per 100 ml of the sample.

### 4.7 Distillation test

The volume of distillate at various temperatures shall be as given in Table 1 when tested in accordance with ASTM D86.

**Table 1 – Volume of distillate at various temperatures**

No.	Test Conditions	Volume of distillate	
		Lacquer thinner	Retarder
1	up to 75 <sup>0</sup> C, %, max	1	-
2	From 100 <sup>0</sup> C to and excld. 145 <sup>0</sup> C, %, max	40	-
3	from 160 <sup>0</sup> C or higher, %, max.	5	-
4	up to 100 <sup>0</sup> C, max.	-	1
5	from 120 <sup>0</sup> C to and excl. 170 <sup>0</sup> C, %, min	-	50
6	from 170 <sup>0</sup> C or higher, %, max.	-	10

#### 4.8 Acid Value

When tested in accordance with ISO 2114 the acid value of the lacquer thinner shall be not more than 0,3% and 0,5% in the case of retarders.

## 5. Packing and marking

### 5.1 Packing

The thinner shall be packed in non-corrosive, clean, dry containers. The containers shall be strong enough to withstand normal usage and shall be adequately sealed to prevent leakage and contamination of the contents during normal transportation and handling.

### 5.2 Marking

The following shall be legibly and indelibly marked on each container or on a label securely fixed to the container:

- (i) Name of product and type
- (ii) Name and address of the manufacturer or trade mark
- (iii) Net volume (litres)
- (iv) Year of manufacture
- (v) Batch or lot number
- (vi) Country of manufacture
- (vii)

## 6. Sampling and testing

### 6.1 Sampling

Unless otherwise agreed upon, select the samples in accordance with ISO 15528.

Examine and prepare samples as described in ISO 1513.

### 6.2 Testing

The samples selected in accordance with 6.1 shall be inspected for compliance with the requirements of 5.1 and 5.2, and tested in accordance with the test methods given in this standard for compliance with the requirements given in cl. 4. At least one litre of sample is needed for the tests.

## 7. Compliance criteria

The lot shall be deemed to comply with the relevant requirements of this standard if, on inspection of the containers in the lot and on testing of the samples taken in accordance with 6.1, no defective is found.

## 8. Test methods

NOTE: A summary of the quality parameters to be assessed, the test panels and the duration of each test is given in Annex A.

8.1 The evaluation sample for the assessment of transparency shall be as given in Table 2.

**Table 2 – Evaluation sample**

Parameter	Item to be observed	Classification of evaluation sample		
		Form	Approval system	Qualities level
Transparency	Transparency	Paint sample	Agreement sample or manufacturers sample	Boundary sample
The boundary sample shall be the evaluation sample giving the permissible limit of the quality of test samples.				

8.2 Unless otherwise specified, temperatures and humidities for conditioning and testing shall be in accordance with ISO 3270.

8.3 **Reducibility** (Applicable to lacquer thinners only)

### 8.3.1 Apparatus

8.3.1.1 Conical beaker of 100 ml capacity

8.3.1.2 Glass panel of dimensions 200 mm x 100 mm x 2 mm which has been solvent cleaned in accordance with ISO 1514.

8.3.2 Kind of coating

8.3.2.1 Use the clear lacquer compounded in accordance with Table 3.

**Table 3 –Compounding of clear lacquer**

<b>Component</b>	<b>Compounding ratio (by mass)</b>
Nitrocellulose for industrial use <sup>+</sup>	15
Solution of alkyd resin	35*
Dibutyl phythalate <sup>+</sup>	3
Ethyl acetate <sup>+</sup>	13
Butyl acetate <sup>+</sup>	4
Butanol (Butane-1-ol) <sup>+</sup>	3
Toluene <sup>+</sup>	27
* Alkyd resin modified with palm oil shall be dissolved in toluene and it shall have the properties given in Table.	
+ These components shall conform to the requirements given in the relevant standard in Annex D.	

**8.3.2.2 Properties of alkyd resin solution.**

The alkyd resin solution used as one of the components in the compounding of the clear lacquer (8.3.2.1) shall have the properties given in Table 4.

**Table 4 – Properties of alkyd resin**

<b>Property</b>	<b>Values</b>
Kinematic viscosity (25°C),m <sup>2</sup> /s [5t]	0,0022 to 0,0040 (22 to 40)
Acid value, max	8
Phthalic acid anhydride in evaporation residue, %	43 to 47
Fatty acid in evaporation residue, %	29 to 32
Evaporation residue, %	60 ± 2

**8.5.2.1 Preparation of clear lacquer :**

- a) Weigh 15 g of nitrocellulose for industrial use in an Erlenmeyer flask with a ground-stopper.
- b) Add butanol and toluene in that order and shake after stoppering.
- c) Add ethyl acetate and butyl acetate to the resultant solution obtained in 8.5.2.3(b) and shake to dissolve them.
- d) Finally add the solution of alkyd resin (table 4) and dibutyl phthalate to the resultant solution obtained in 8.5.2.3(c). Shake to obtain a uniform solution.

**8.3.3 Procedure**

**8.3.3.1** Take 20 ml each of the thinner and clear lacquer into the conical beaker (8.5.1.1).

After mixing sufficiently by shaking until no bubbles are present, place the glass plate (8.5.1.2) horizontally and flow on the whole surface.

**8.3.3.2** Immediately, stand the glass panel with its short side horizontally and the long side inclined at 85 degrees to the horizontal surface. Dry it for a period of 1h under standard conditions.

#### **8.3.4 Observation**

Examine the paint film visually for conformance with 4.3.

### **8.4 Nitrocellulose solubility**

#### **8.4.1 Procedure**

Weigh 6.0 g of nitrocellulose for industrial use in a 200 ml Erlenmeyer flask. Add 33,0 ml of sample and 17.0 ml of toluene to it. Dissolve them at  $20 \pm 1^\circ\text{C}$  by shaking after stoppering the flask.

#### **8.4.2 Observation**

Examine the flask visually after 24 h for compliance with 4.4.

### **8.5 Blushing prevention (Retarder only)**

#### **8.5.1 Apparatus**

**8.5.1.1** Erlenmyer flask of 250 ml capacity with a ground stopper

**8.5.1.2** Analytical balance

**8.5.1.3** Thermo-hygrostat kept at  $20 \pm 3^\circ\text{C}$  and  $90\% \pm 3\%$  relative humidity.

**8.5.1.4** Glass plate of dimensions, 200 mm x 100mm x 2mm that has been solvent cleaned in accordance with ISO 1514.

#### **8.5.2 Lacquer thinner**

The lacquer thinner shall be compounded as given in Table 5.

**Table 5 – Compounding of lacquer thinner**

<b>Component</b>	<b>Compounding ration (by volume)</b>
Ethyl acetate	15
Bentzyl acetate	10
Butanol (Butane-1-01)	5
Tolene	70

#### **8.5.3 Procedure**

Weigh 10g of sample in the 250 ml flask. Add 30g of clear lacquer specified in 8.3.2.1 and 20 g of lacquer thinner specified in 8.5.2. Shake the contents of the flask for a reasonable period. Keep the flask and its content for 1 h or more in a thermo-hygrostat kept at  $20 \pm 3^\circ\text{C}$  and  $90 \pm 3\%$  relative humidity. Pour the mixture on one side of the glass plate (see 8.5.1.4)

in the thermo-hygrostat (8.7.1.3) with the length (long side) side of the plate in a nearly vertical position and the short side of the plate in a horizontal position. Remove the glass panel and let it stand for 1h to dry. Examine the paint film visually after 1 h standing.

#### 8.5.4 Observation

When the dry paint film is examined visually it shall comply with 4.5.

### 8.6 Residue on evaporating

#### 8.6.1 Procedure

- a) Weigh 100 ml of sample in a measuring cylinder. Transfer it into a distillation flask. Carry out the distillation until 75 ml is distilled in accordance with GS. Stop heating and remove the flask.
- b) Transfer the contents of the flask into an evaporation dish of which the mass is known. Transfer the residual contents sticking to the inner wall of the flask to the evaporating dish.

**Note:** Before the evaporating dish is used, dry it in an oven at a temperature of  $105 \pm 2^\circ\text{C}$  to constant mass ( $m_1$ ).

- c) Heat the evaporating dish on a water bath, and evaporate most of the residue.
- d) Continue the heating in a drying oven at a temperature of  $105 \pm 2^\circ\text{C}$  for 2 h. Cool in a desiccator. Weigh the evaporating dish together with its contents(residue)to constant mass ( $m_2$ )

#### 8.6.2 Expression of results

Calculate the residue on heating, A, using the following quotation.

$$A = \frac{m_2 - m_1}{m_3} \times 100$$

Where

- A is the residue on heating expressed as a percentage.
- $m_2$  is the mass in grams of evaporating dish with the residue.
- $m_1$  is the mass in grams of evaporating dish
- $m_3$  is the mass, in grams, of 100 ml of sample

If the two results (duplicates) differ by more than 2% (relative to the mean) repeat the procedure described in cl. 8.6.1.

## ANNEX A (Informative)

### Lacquer thinner

**Table A1 – Summary of requirements, test panels and duration of tests**

Parameter	Test panel			Days for test (day)	
	Material	Dimension (mm)	Number of panels (sheet)	1	2
Transparency	-	-	-		
Stain	-	-	-		
Reducibility	Glass	200 x 100 x 2	1		
Nitrocellulose solubility	-	-	-		
Blushing preventiveness	-	-	-		
Heating residue	Glass	200 x 100 x 2	1		
Distillation test	-	-	-		
Acid value	-	-	-		
	-	-	-		
NOTE: 1. Explanation of symbols    x: sampling,                  O: coating,                  O: judgment, - : standing,         : heating,         : other procedures. 2. The numerals in the column of days for test indicate the duration (h)					



## **ANNEX B (Informative)**

### **Quality verification of lacquer thinners**

When the purchaser requires on-going quality verification of lacquer thinner produced to this standard, it is suggested that, instead of concentrating solely on evaluation of the final product he also direct his attention to the manufacturer's quality system. In this connection, it should be noted that ISO 9001 covers the provisions of an integrated quality system.