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SIST HD 570 S1:1998

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Test procedure for thermal endurance of insulating varnishes - Electric strength method (IEC 60370:1971)

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Prüfverfahren zur Beurteilung des thermischen Langzeitverhaltens von Isolierlacken - Verfahren zur Prüfung der elektrischen Durchschlagfestigkeit

Méthode d'essai pour l'évaluation de la stabilité thermique des vernis isolants par l'abaissement de la rigidité diélectrique

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TEST PROCEDURE FOR THERMAL ENDURANCE OF INSULATING VARNISHES - ELECTRIC STRENGTH METHOD

Méthode d'essai pour l'évaluation de la stabilité thermique des vernis isolants par l'abaissement de la rigidité diélectrique

Prüfverfahren zur Beurteilung des thermischen Langzeitverhaltens von Isolierlacken - Verfahren zur Prüfung der elektrischen Durchschlagfestigkeit

BODY OF THE HD

The Harmonization Document consists of:

- IEC 370 (1971) ed 1, IEC/SC 15B, not appended

This Harmonization Document was approved by CENELEC on 1990-06-11.

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text. The German translation is not yet available.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level by or before 1990-12-15

to publish their new harmonized national standard by or before 1991-06-15

to withdraw all conflicting national standards by or before 1991-06-15.

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

The CENELEC National Committees are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Test procedure for thermal endurance of insulating varnishes – Electric strength method

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TEST PROCEDURE FOR THERMAL ENDURANCE OF INSULATING VARNISHES – ELECTRIC STRENGTH METHOD

FOREWORD

1) The formal decisions or agreements of the I E C on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote this international unification, the I E C expresses the wish that all National Committees having as yet no national rules, when preparing such rules, should use the I E C recommendations as the fundamental basis for these rules in so far as national conditions will permit.

4) The desirability is recognized of extending international agreement on these matters through an endeavour to harmonize national standardization rules with these recommendations in so far as national conditions will permit. The National Committees pledge their influence towards that end.

PREFACE

This Recommendation has been prepared by Sub-Committee 15B, Endurance Tests, of IEC Technical Committee No. 15, Insulating Materials.

A first draft was discussed at the meetings held in Tel Aviv in 1966 and in Warsaw in 1967. As a result of this latter meeting, a final draft was submitted to the National Committees for approval under the Six Months' Rule in June 1968. Amendments were submitted to the National Committees for approval under the Two Months' Procedure in August 1970.

The following countries voted explicitly in favour of publication:

Australia	Korea (Republic of)
Belgium	Netherlands
Canada	South Africa
Czechoslovakia	Sweden
Denmark	Switzerland
France	Turkey
Israel	United States of America
Italy	
Japan	Yugoslavia

TEST PROCEDURE FOR THERMAL ENDURANCE OF INSULATING VARNISHES – ELECTRIC STRENGTH METHOD

1. Introduction

1.1 *Scope*

This procedure covers a method for determining the relative thermal endurance of electrical insulating varnishes by means of coating on glass cloth and measuring electric strength before and after heat ageing.

1.2 *Object*

To establish temperature indices to assist in determining the suitability of electrical insulating varnishes for use in electrical systems.

1.3 *General*

This test method determines the retention of the electric strength of the varnish, coated on glass cloth, after ageing at elevated temperatures. In evaluating the suitability of application of insulating varnishes for electrical equipment, such physical and chemical properties as hardness, bonding strength, solvent resistance and thermoplastic flow are equally important. The evaluation of these properties, however, is not within the scope of this test method. These properties must be evaluated separately by other test procedures.

A major factor affecting the life of an electrical insulating varnish is thermal degradation. After a varnish has been weakened by thermal degradation, conditions such as moisture and vibration can cause failure of electrical equipment. An insulating varnish is effective in protecting electrical equipment only as long as it retains its physical and electrical integrity.

The thermal degradation of the varnish results in changes to some of its properties. These changes may involve weight loss, porosity, crazing, embrittlement and loss of other mechanical characteristics. Thermal degradation of the varnish can be detected by a decrease in electric strength. It is, therefore, used as the failure criterion for this test method.

Electrical insulating varnishes undergo flexing in service due to vibration and thermal expansion. For this reason, a functional test may include flexing or elongation of the insulation.

Two alternative methods are recommended in this procedure:

Alternative I:

A curved electrode system designed to elongate the outer surface of the varnish specimen approximately 2 %. This simulates flexing to which the varnish may be subjected in service.

Alternative II:

A flat electrode system. This method indicates the influence of thermal degradation only. The test specimen is not flexed (as in Alternative I) so that electrically weak points, which develop during thermal ageing, are determined without the effect of additional mechanical elongation.

Results of tests using both methods give an indication of whether flexing after ageing has an essential effect on electric strength.

In the test procedure, specimens are aged in ovens at elevated temperatures for specified periods. The specimens are then removed from the oven, cooled and tested for electric strength. At each temperature the thermal life is determined as the ageing time necessary for the electric strength to decrease to a pre-selected value. This value may be selected on the basis of some functional characteristic of the varnish for the intended application. The relative thermal endurance is then determined as a curve showing the relationship between ageing temperature and thermal life.

2. Test specimen

Test specimens shall consist of panels of continuous filament, woven glass cloth coated with varnish by dipping.

2.1 *Specimen preparation*

The glass cloth panels shall be cut from continuous filament, woven glass 0.1 mm to 0.18 mm thick with a weight per unit area of 90 g/m² to 140 g/m² and with 20 to 26 ends and 16 to 24 picks per centimetre. (Where glass cloth having the specified picks and ends is not available in the country making the test, the nearest standard cloth of that country shall be used.)

(The dimensions of the curved electrode were designed to give an approximate 2 % elongation to the outer surface of a 0.1 mm thick glass cloth coated to 0.175 mm to 0.185 mm total thickness. It should be noted, therefore, that greater thicknesses will increase the elongation which, in turn, may significantly affect the ageing results.)

The glass cloth shall be heat cleaned to remove binders. (A suggested heat cleaning procedure consists of heating the cloth 24 h at 250 °C and 24 h at 400 °C. Caution: heating above 450 °C may damage the cloth.)

Each panel of glass cloth shall be 15 cm × 30 cm with the 30 cm dimension parallel to the warp threads of the cloth.

Each panel shall be mounted and fastened in a suitable specimen-holding frame.

(Such a frame is made by using a 1 m length of corrosion-resistant wire approximately 1.7 mm in diameter bent to form a rectangle having inside dimensions of 15 cm × 30 cm. The ends of the wire may overlap about 5 cm at one corner and be fastened together.)

A set of twelve or more panels is required for each ageing temperature.

A suitable fixture shall be used for holding the specimen frames in the oven in a vertical position with a minimum spacing of 2.5 cm.

2.2 *Varnish dipping*

Test specimens shall be prepared by dipping the mounted glass cloth panels in the varnish. Specimens shall be prepared at room atmosphere or preferably at 23 ± 2 °C and 50 ± 5 % relative humidity (RH.)