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Australian Standard®

ELECTRICAL INSULATING MATERIALS— EVALUATION AND CLASSIFICATION BASED ON THERMAL ENDURANCE

This Australian standard was prepared by Committee EL/9, Rotating Electrical Machinery, in conjunction with Committee EL/2, Electrical Approvals Standards. It was approved on behalf of the Council of the Standards Association of Australia on 1 November 1984 and published on 4 March 1985.

The following interests are represented on Committees EL/9 and EL/2:

Australian British Chamber of Commerce
Australian Chamber of Commerce
Australian Consumers Association
Australian Electrical and Electronic Manufacturers Association
Bureau of Steel Manufacturers of Australia
Confederation of Australian Industry
Consumers Electronics Suppliers Association
Department of Defence
Electrical Apparatus Approvals Authorities
Electrical Testing Laboratories
Electricity Supply Association of Australia
Institution of Engineers, Australia

Chairmen of other equipment committees also participated in the drafting of this standard.

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PREFACE

This standard was prepared on behalf of the Association's Committees on Rotating Electrical Machinery, and on Electrical Approvals Standards, to supersede AS C320, Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service.

The standard is based on the second edition of IEC 85, 1984, but differs from it in the following ways:

(a) This standard specifies that the preferred system of classification be numerical rather than part-alphabetical, part-numerical.

NOTE: Previous alphabetical classifications Y, A, E, B, F, H are retained as an alternative for the time being.

(b) This standard does not permit different systems of identification of insulating materials even where standards for particular products permit temperatures attained to be higher (or require temperatures attained to be lower) than the relevant temperatures assigned herein.

The history of standardization of this subject goes back about 30 years, the principal events being as follows:

(i) Between 1952 and 1955, a subcommittee of IEC TC 2, Rotating Machinery, work on the thermal classification of electrical insulating materials, resulting in the publication, in 1957, of IEC 85, Recommendations for the Classification of Materials for the Insulation of Electrical Machinery and Apparatus in Relation to Their Thermal Stability in Service.

(ii) In 1956, BSI publish BS 2757, Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service, the standard being essentially identical to IEC 85, being based on the voting draft of IEC 85.

(iii) In 1958, SAA endorse BS 2757:1956, without Australian amendment. Designated AS C320.

(iv) In 1966, responsibility for the proposed revision of IEC 85 is allotted to SC 15B, Endurance Tests, a subcommittee of TC 15, Insulating Materials, in conjunction with TC 63, Insulation Systems.

(v) In 1984, IEC publish the second edition of IEC 85.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

ELECTRICAL INSULATING MATERIALS—EVALUATION AND CLASSIFICATION BASED ON THERMAL ENDURANCE

1 SCOPE. This standard describes a well-recognized system for the classification of materials for the electrical insulation of electrotechnical products based on their thermal endurance. It considers the thermal evaluation of insulating materials, of insulation systems, their inter-relationship, and the influence of service conditions, and defines the responsibility for assigning a thermal classification to a particular insulating material.

2 REFERENCED DOCUMENTS. The following standards and documents are referred to in this standard:

IEC 216 Guide for the Determination of Thermal Endurance Properties of Electrical Insulating Materials
- 216-1 Part 1— General Procedures for the Determination of Thermal Endurance Properties, Temperature Indices and Thermal Endurance Profiles
- 216-2 Part 2— List of Materials and Available Tests
- 216-3 Part 3— Statistical Methods
- 216-4 Part 4— Instructions for Calculating the Thermal Endurance Profile

IEC 505 Guide for the Evaluation and Identification of Insulation Systems for Electrical Equipment

IEC 610 Principal Aspects of Functional Evaluation of Electrical Insulation Systems: Ageing Mechanisms and Diagnostic Procedures

IEC 611 Guide for the Preparation of Test Procedures for Evaluating the Thermal Endurance of Electrical Insulation Systems

IEC 791 Performance Evaluation of Insulation Systems Based on Service Experience and Functional Tests.

3 DEFINITION. For the purpose of this standard, the following definition applies:

Electrotechnical product (hereinafter referred to as product) — a machine, equipment or apparatus.

NOTE: An insulating material is considered a component of a product.

4 GENERAL.

4.1 Ageing factors. The endurance of the electrical insulation of products is affected by many factors such as temperature, electrical and mechanical stresses, vibration, deleterious atmospheres and chemicals, moisture, dirt and radiation.

4.2 Classification

4.2.1 *General*. As temperature is very often the dominating factor of influence on insulating materials and insulation systems, certain basic classifications have been established and are recognized throughout the world. The classifications and the temperatures assigned to them, are set out in Table 1.

TABLE 1
CLASSIFICATIONS AND ASSIGNED TEMPERATURES

1	2	3
Preferred classification	**Alternative classification (see Note 1)**	**Assigned temperature, °C (see Note 2)**
Class 90	Class Y	90
Class 105	Class A	105
Class 120	Class E	120
Class 130	Class B	130
Class 155	Class F	155
Class 180	Class H	180
Class 200		200
Class 220	(See Note 3)	220
Class 250		250
Thereafter in intervals of 25		Corresponding intervals of 25

NOTES:
1. The alternative classification may be withdrawn at a later date.
2. It should be noted that column 3 specifies **assigned** temperatures rather than **maximum** temperatures. Depending on the product and its application, the appropriate committee of the Association may specify temperature rises where the sum:

   Ambient temperature + Temperature rise + Hot spot allowance

   is equal to, less than, or greater than the assigned temperature. (See Clause 4.2.6).

   It is suggested that, in standard tables of temperature rise, the individual parameters mentioned be stated.
3. In AS C320, 'Class C' indicated 'above 180°C.

Notwithstanding differences between temperatures assigned herein and operating temperatures permitted by standards for particular products (see Clause 4.2.6), different systems of identification shall not be used.

Where a class is ascribed to a product, it normally represents the maximum temperature appropriate to that product under rated load and other conditions. Thus, insulating materials subjected to maximum temperature will need to have a thermal capability at least equal to the temperature classification of the product. (See also Clause 4.2.3.).

NOTE: The term 'Class' was formerly used to refer to products, to insulating materials and also to insulating systems; however IEC 216 has introduced the term 'Temperature Index' for insulating materials, and IEC 505 has introduced the term 'Identification' for insulation systems. The identification of systems is relevant only to the particular product for which the system is designed. The term 'Classification' may be reserved for insulating materials and for products.

4.2.2 *Operating conditions*. Experience has proved that, under usual operating conditions, satisfactory economic life is obtained for products such as