



SLOVENSKI STANDARD
SIST EN 60505:2000
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Evaluation and qualification of electrical insulation systems

Evaluation and qualification of electrical insulation systems

Bewertung und Kennzeichnung von elektrischen Isoliersystemen

Evaluation et qualification des systèmes d'isolation électrique

Ta slovenski standard je istoveten z: EN 60505:2000

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English version

**Evaluation and qualification of electrical insulation systems
(IEC 60505:1999)**

Evaluation et qualification
des systèmes d'isolation électrique
(CEI 60505:1999)

Bewertung und Kennzeichnung
von elektrischen Isoliersystemen
(IEC 60505:1999)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Comité Européen de Normalisation Electrotechnique

Europäisches Komitee für Elektrotechnische Normung

Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

The text of document 98/85/FDIS, future edition 2 of IEC 60505, prepared by IEC TC 98, Electrical insulation systems (EIS), was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60505 on 2000-01-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-01-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A and B are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60505:1999 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60085 NOTE: Harmonized as HD 566 S1:1990 (not modified).

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Annex ZA (normative)**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60216-3	¹⁾	Determination of thermal endurance of solid organic materials Part 3: Instructions for calculating thermal endurance characteristics	-	-
IEC 60493-1	1974	Guide for the statistical analysis of ageing test data Part 1: Methods based on mean values of normally distributed test results	-	-
IEC 60727-1	1982	Evaluation of electrical endurance of electrical insulation systems Part 1: General considerations and evaluation procedures based on normal distributions	-	-
IEC 60727-2	1993	Part 2: Evaluation procedures based on extreme-value distributions	-	-
IEC 61356	1995	Functional evaluation of electrical insulation systems - Principles for test procedures when comparative testing is not feasible	-	-

¹⁾ To be published.

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International Electrotechnical Commission
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EVALUATION AND QUALIFICATION
OF ELECTRICAL INSULATION SYSTEMS

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60505 has been prepared by IEC technical committee 98: Electrical insulation systems (EIS).

This second edition cancels and replaces the first edition published in 1975, and constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
98/85/FDIS	98/100/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A and B are for information only.

The committee has decided that this publication remains valid until 2003. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

The service life of electrical equipment is frequently determined by the life of its electrical insulation system(s) (EIS). The life of an EIS can be affected by electrical, thermal, mechanical, or environmental stresses acting either individually or in combination.

Intended, estimated or proven service life times are essential parameters for describing the life of electrical insulation systems. In the early days of electrotechnical engineering life figures were rather vague. The limitation of the life of the insulation under thermal stress was one of the first indicators of the effect of ageing in some equipment in service. As experience in using insulation systems increased, it was appreciated that there was a need to select specific materials that were amenable for use in manufacturing processes, to enable the required service life to be achieved and to allow for the calculation of the thermal capability of equipment.

IEC 60085 standardized a number of maximum temperature values and presented a list of insulating materials related to these temperatures (classes) which, when used for insulation systems, would "ensure an economical life for the insulation in a wide range of apparatus".

This was a clearly defined attempt to qualify insulation systems on the basis of (service) experience or tests and a quantification of an insulation system life in terms of time. The limitation of this approach, based entirely on thermal stressing, was recognized and there was a demand for an improved life concept. This requirement and the impossibility of using the material tables in IEC 60085 at a time when many new, synthetic materials were being produced which did not fit neatly into the existing thermal classification, led to a worldwide effort to improve the situation. This led to the elaboration of the present standard, which serves as a guide to IEC technical committees responsible for equipment (ETC) to enable them to develop adequate standards and technical documents.

[SIST-EN 60505:2000](https://standards.iec.ch/catalog/standards/sist/0aa8128e-64bd-49c7-89e9-8e9e3ea3f0b7/sist-en-60505-2000)

To determine the intended life is a fundamental task when developing and designing an EIS. Estimated service life of an EIS has to be established for several reasons:

- for type testing when introducing a new EIS into production;
- for quality assurance of production; and
- for estimating the remaining life for maintenance purposes.

EVALUATION AND QUALIFICATION OF ELECTRICAL INSULATION SYSTEMS

1 Scope

This International Standard establishes the basis for estimating the ageing of electrical insulation systems (EIS) under conditions of either electrical, thermal, mechanical, environmental or multifactor stresses.

It specifies the principles and procedures that should be followed, during the development of EIS functional test and evaluation procedures, to establish the service life for a specific insulation system.

This standard is applicable to all IEC technical committees responsible for equipment (ETC) having an EIS.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this international standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However parties to agreements based on this international standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of the IEC and the ISO maintain registers of currently valid International Standards.

IEC 60216: (all parts), *Determination of thermal endurance of solid organic materials*

IEC 60216-3:—, *Determination of thermal endurance of solid organic materials – Part 3: Instructions for calculating thermal endurance characteristics* ¹⁾

IEC 60493-1: *Guide for the statistical analysis of ageing test data – Part 1: Methods based on mean values of normally distributed test results*

IEC 60727-1: *Evaluation of electrical endurance of electrical insulation systems – Part 1: General considerations and evaluation procedures based on normal distributions*

IEC 60727-2: *Evaluation of electrical endurance of electrical insulation systems – Part 2: Evaluation procedures based on extreme-value distributions*

IEC 61356: *Functional evaluation of electrical insulation systems – Principles for test procedures when comparative testing is not feasible*

¹⁾ To be published.

3 Terms and definitions

For the purpose of this International Standard, the following terms and definitions apply:

3.1 General terms

3.1.1

electrical insulation system (EIS)

insulating structure containing one or more electrical insulating materials (EIM) together with associated conducting parts employed in an electrotechnical device

3.1.2

electrical insulating material (EIM)

electrically stressed component in an EIS

3.1.3

reference EIS

evaluated and established EIS with either a known service experience record or a known comparative functional evaluation as a basis

3.1.4

candidate EIS

EIS under evaluation to determine its service capability (electrical, thermal, mechanical, environmental or multifactor)

3.1.5

intended life

design life of an EIS under service conditions

3.1.6

estimated life

expected service life derived from either service experience or the results of tests performed in accordance with appropriate evaluation procedures, or both, as established by the responsible organisation or technical committee

3.1.7

evaluation

establishment of relationships between service requirements and life data obtained from service experience analysis or from the results of functional tests

3.2 Terms related to service stresses and ageing

3.2.1

"ageing" stress

action of electrical, thermal, mechanical or environmental nature on an EIS which may cause property changes

3.2.2

factor of influence

stress imposed by conditions of operation, environment or test that affects the life of an EIS

3.2.3**service conditions**

combination of factors of influence and duty that are to be expected in a specific application of an electrical device

3.2.4**reference operating conditions**

service conditions of the equipment to which the test conditions of the functional test procedure are related

3.2.5**service requirements**

specified factors of influence, intended performance and duty of an electrical device

3.2.6**service experience**

the quantitative and/or qualitative record during service, with or without failure of an EIS

3.2.7**ageing**

irreversible changes of the properties of an EIS due to action by one or more factors of influence

NOTE Some changes (e.g. hydrolytic changes) can be partly reversible if the ambient conditions change.

3.2.8**ageing factor**

a factor of influence that causes ageing

3.2.9**intrinsic ageing**

irreversible changes of fundamental properties of an EIS caused by the action of ageing factors

3.2.10**extrinsic ageing**

effect of irreversible changes of EIS properties produced by action of ageing factors on unintentionally introduced imperfections in an EIS

3.2.11**interaction**

modifications of the type or degree of ageing produced by the combination of two or more factors of influence relative to their ageing effect if acting individually on separate objects

3.2.12**direct interaction**

interaction between simultaneously applied factors of influence that differs from that occurring with sequentially applied factors of influence

NOTE All factors producing direct interaction are not necessarily ageing factors.

3.2.13**indirect interaction**

interaction which occurs between simultaneously applied factors of influence, which remains unchanged when the factors are applied sequentially