SLOVENSKI STANDARD

SIST EN 61006:2005

januar 2005

Električni izolacijski materiali – Preskusne metode za ugotavljanje temperaturne prehodnosti stekla (Tg) (IEC 61006:2004)

(istoveten EN 61006:2004)

Electrical insulating materials - Methods of test for the determination of the glass transition temperature (IEC 61006:2004)

ICS 29.035.01

Referenčna številka
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EUROPEAN STANDARD **EN 61006**

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English version

Electrical insulating materials – Methods of test for the determination of the glass transition temperature
(IEC 61006:2004)

Matériaux isolants électriques – Méthodes d'essai pour la détermination de la température de transition vitreuse (CEI 61006:2004)

Elektroisolierstoffe – Prüfverfahren zur Bestimmung der Glasübergangstemperatur (IEC 61006:2004)

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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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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 15E/222/FDIS, future edition 2 of IEC 61006, prepared by SC 15E, Methods of test, of IEC TC 15, Insulating materials, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61006 on 2004-03-01.

This European Standard supersedes EN 61006:1993

Changes from EN 61006:1993 are as follows:

– the standard has been completely revised from an editorial point of view and adapted to the state of the art;

– a figure to demonstrate the dynamic mechanical analysis has been introduced.

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)	2004-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-03-01

Endorsement notice

The text of the International Standard IEC 61006:2004 was approved by CENELEC as a European Standard without any modification.

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
61006

Deuxième édition
Second edition
2004-01

Matériaux isolants électriques – Méthodes d'essai pour la détermination de la température de transition vitreuse

Electrical insulating materials – Methods of test for the determination of the glass transition temperature

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSULATING MATERIALS – METHODS OF TEST FOR THE DETERMINATION OF THE GLASS TRANSITION TEMPERATURE

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61006 has been prepared by subcommittee 15E: Methods of test, of IEC technical committee 15: Insulating materials.

This second edition cancels and replaces the first edition, published in 1991, and constitutes an editorial revision.

Changes from the first edition are as follows:

– the standard has been completely revised from an editorial point of view and adapted to the state of the art;
– a figure to demonstrate the dynamic mechanical analysis has been introduced.

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

FDIS	Report on voting
15E/222/FDIS	15E/226/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 2.

The committee has decided that the contents of this publication will remain unchanged until 2010. At this date, the publication will be

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

ELECTRICAL INSULATING MATERIALS – METHODS OF TEST FOR THE DETERMINATION OF THE GLASS TRANSITION TEMPERATURE

1 Scope

This International Standard specifies procedures for test methods for the determination of the glass transition temperature of solid electrical insulating materials. They are applicable to amorphous materials or to partially crystalline materials containing amorphous regions which are stable and do not undergo decomposition or sublimation in the glass transition region.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
glass transition
physical change in an amorphous material or in amorphous regions of a partially crystalline material from (or to) a viscous or rubbery condition to (or from) a hard one

NOTE The glass transition generally occurs over a relatively narrow temperature region and is similar to the solidification of a liquid to a glass state; it is not a first order transition. Not only do hardness and brittleness undergo rapid changes in this temperature region, but other properties such as thermal expansion and heat capacity also change rapidly. This phenomenon is also referred to as a second order transition, rubber transition or rubbery transition. Where more than one amorphous transition occurs in a material, the one associated with changes in the segmental motions of the molecular backbone or accompanied by the largest change in properties is usually considered to be the glass transition. Blends of amorphous materials may have more than one glass transition, each associated with a separate component of the blend.

2.2
glass transition temperature
T_g
midpoint of a temperature range over which the glass transition takes place

NOTE 1 The glass transition temperature can be determined readily only by observing the temperature range in which a significant change takes place in some specific electrical, mechanical, thermal, or other physical property. Moreover, the observed temperature can vary significantly depending on the property chosen for observation and on details of the experimental technique (e.g., heating rate, frequency of test). Therefore, the observed T_g should be considered only an approximate value, valid only for that particular technique and test conditions.

NOTE 2 For the purpose of test method C (see Clause 7), the temperature of the peak of the mechanical dissipation factor curve accompanying the glass transition is taken to be the glass transition temperature.

2.3
differential scanning calorimetry
DSC
technique in which the difference in heat flow energy inputs into a tested material and a reference material is measured as a function of temperature while the tested material and the reference material are subjected to a controlled temperature programme

NOTE The record is the differential scanning calorimetric or DSC curve.

2.4
differential thermal analysis
DTA
technique in which the temperature difference between a tested material and a reference material is measured as a function of temperature while the common environment of the tested material and the reference material is subjected to a controlled temperature programme

NOTE 1 The record is the differential thermal analysis or DTA curve.

NOTE 2 There are four characteristic transition points associated with a glass transition (see Figure 1).

– Extrapolated onset temperature (T_f) in °C – The point of intersection of the tangent drawn at the point of greatest slope on the transition curve with the extrapolated baseline prior to the transition.

– Extrapolated endset temperature (T_e) in °C – The point of intersection of the tangent drawn at the point of greatest slope on the transition curve with the extrapolated baseline following the transition.

– Midpoint temperature (T_m) in °C – The point on the thermal curve corresponding to half the heat flow difference between the extrapolated onset and extrapolated endset.

– Inflection temperature (T_i) in °C – The point on the thermal curve corresponding to the peak of the first derivative (with respect to temperature) of the parent thermal curve. This point corresponds to the inflection point of the parent thermal curve.

Two additional transition points are sometimes identified and are defined.

– Temperature of first deviation (T_o) in °C – The point of first detectable deviation from the extrapolated baseline prior to the transition.

– Temperature of return-to-baseline (T_r) in °C – The point of last deviation from the extrapolated baseline beyond transition.

For the purpose of this standard T_m will be taken as the glass transition temperature T_g which usually corresponds more closely to the transition determined by the dilatometric and other methods.

NOTE 3 Other temperatures than those previously defined can be used for specification purposes as established by individual contract.

2.5
thermodilatometry
technique in which a dimension of a test specimen under negligible load is measured as a function of temperature whilst the substance is subjected to a controlled temperature programme

2.6
thermomechanical analysis
TMA
technique in which a deformation of a test specimen under non-oscillatory load is measured as a function of temperature whilst the test specimen is subjected to a controlled temperature programme

2.7
dynamic mechanical analysis
DMA
technique in which either the storage elastic or loss modulus, or both, of a substance under oscillatory load or deformation is measured as a function of temperature, frequency or time, or combination thereof

2.8
complex storage modulus
complex quantity equal to the ratio of mechanical stress to mechanical strain under sinusoidal conditions