SLOVENSKI STANDARD
SIST EN 60455-1:2002

01-oktober-2002

Nadomeġ ļ a:

SIST HD 307.1 S2:1998

Resin based reactive compounds used for electrical insulation - Part 1: Definitions and general requirements (IEC 60455-1:1998)

Resin based reactive compounds used for electrical insulation -- Part 1: Definitions and general requirements

Reaktionsharzmassen für die Elektroisolierung -- Teil 1: Begriffe und allgemeine Anforderungen

Composés réactifs à base de résine utilisés comme isolants électriques -- Partie 1: Définitions et prescriptions générales

Ta slovenski standard je istoveten z: EN 60455-1:1998

ICS:

29.035.01	Izolacijski materiali na splošno	Insulating materials in general

SIST EN 60455-1:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60455-1

October 1998

ICS 29.035.01

Supersedes HD 307.1 S2:1981

Descriptors: Solid electrical insulating materials, resins, composite materials, resin hardeners, reaction inhibitors, solvents, designation, definitions, classifications, specifications

English version

Resin based reactive compounds used for electrical insulation
Part 1: Definitions and general requirements

(IEC 60455-1:1998)

Composés réactifs à base de résine utilisés comme isolants électriques
Partie 1: Définitions et prescriptions générales
(CEI 60455-1:1998)

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(IEC 60455-1:1998)

This European Standard was approved by CENELEC on 1998-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

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

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 60455-1:1998 E

Foreword

The text of document 15C/969/FDIS, future edition 2 of IEC 60455-1, prepared by SC 15C, Specifications, of IEC TC 15, Insulating materials, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60455-1 on 1998-10-01.

This European Standard supersedes HD 307.1 S2:1981.

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) 1999-07-01

— latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-07-01

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 Annex A is informative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60455-1:1998 was approved by CENELEC as a European Standard without any modification.

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

IEC 61006 NOTE Harmonized as EN 61006:1993 (not modified).

Contents

Introduction

This International Standard is one of a series which deals with resin based reactive compounds and their components used for electrical insulation.

The series consists of three parts:

— *Part 1: Definitions and general requirement*; (IEC 60455-1)

— *Part 2: Methods of test*; (IEC 60455-2)

— *Part 3: Specifications for individual materials.* (IEC 60455-3)

1 Scope

This part of IEC 60455 relates to resin based reactive compounds and their components used for electrical insulation. All reactive compounds are solvent-free and may contain reactive diluents and fillers. The reactions involved in curing are polymerization and/or crosslinking. This standard does not relate to reactive compounds used as coating powders.

NOTE It is intended to draw up specifications for coating powders as a separate IEC Standard having a different number.

These materials may be used for a range of applications, of which common ones are shown in Table 1.

Table 1 — Application methods

Application	Code letters
Casting compound	CC
— Embedding compound	EBC
— Potting compound	PC
Encapsulating compound	ECC
Impregnating compound	IC
— for dipping procedure	ICD
— for trickling procedure	ICT
— for vacuum-pressure impregnation	VPI

The code letters associated with the application may be used as abbreviation of the application description. Further applications and associated code letters may be added if so required.

2 Designation

Depending on their composition and reactivity, these compounds cure at ambient or at elevated temperature. The curing reaction may lead to rigid, flexible or elastomeric materials. The designation of a particular compound is based on the composition of its resin content or of its major reactive portion. The commonly used resins are as shown in Table 2. For symbols of resins and polymers and their special characteristics see ISO 1043-1.

Table 2 — Basic resins

Resin	Code letters
Acrylic	A
Epoxy	EP
Polyurethane	PUR
Silicone	SI
Unsaturated polyester	UP

The code letters associated with the designation may be used as abbreviation of the polymer description. Further designations and associated code letters may be added if so required.

NOTE For symbols of fillers and reinforcing materials see ISO 1043-2. For designations of hardeners and accelerators for epoxy resins, see ISO 4597-1.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitutes provisions of this part of IEC 60455. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60455 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below[1]. Members of IEC and ISO maintain registers of currently valid international standards.

IEC 60050(212):1990, *International Electrotechnical Vocabulary (IEV) — Chapter 212: Insulating solids, liquids and gases.*

IEC 60445-2:1977, *Specification for solventless polymerisable resinous compounds used for electrical insulation — Part 2: Methods of test.*

ISO 472:1988, *Plastics — Vocabulary.*

ISO 1043-1:1987, *Plastics — Symbols — Part 1: Basic polymers and their special characteristics.*

ISO 1043-2:1988, *Plastics — Symbols — Part 2: Fillers and reinforcing materials.*

ISO 4597-1:1983, *Plastics — Hardeners and accelerators for epoxide resins — Part 1: Designation.*

[1] In case of dispute, the referenced edition is applicable.

4 Definitions

NOTE If available, definitions are taken from IEC 60050(212) or ISO 472. Where a more specific definition is required, its wording is as close as possible to that given in IEC 60050(212) or ISO 472.

4.1
reactive compound

intimate admixture of a casting resin with other reactive components such as hardener, accelerator, inhibitor or reactive diluent, and with or without filler and certain additives, whereby virtually no volatile matter is released during the subsequent curing reaction. Reactive compounds are solvent-free

NOTE Small quantities of by-products may be evolved during cure of selected resins. In the case where the resinous part of the reactive compound is diluted by means of a reactive diluent, small quantities of monomeric diluent may evaporate during cure mainly due to the application conditions used.

4.2
cured compound

the reactive compound after it is cured. The cured compound is self-supporting

4.3
reactive component

any part of the reactive compound, for example resin, initiator, hardener, accelerator, inhibitor and reactive diluent, that reacts with other components or by chain reaction

4.4
resin

a solid, semi-solid, or pseudo-solid organic material that has an indefinite and often high relative molecular mass, exhibits a tendency to flow when subjected to stress, usually has a softening or melting range, and usually fractures conchoidally. In a broad sense, the term is used to designate any polymer that is a basic material for plastics

4.5
acrylic resin (A)

a resin made of acrylic acid or a structural derivative of acrylic acid, or their copolymers with other monomers, the acrylic monomer(s) being in the greatest amount by mass

4.6
epoxy resin (EP)

a resin containing epoxy groups capable of crosslinking

4.7
polyurethane resin (PUR)

a resin in which, after curing, the repeated structural unit in the chain is of the urethane type

4.8
silicone resin (SI)

a resin in which, after curing, the main polymer chain consists of alternating silicon and oxygen atoms

4.9
unsaturated polyester resin (UP)

a polyester resin characterized by carbon-carbon unsaturation in the polymer chain, which permits subsequent crosslinking with an unsaturated monomer or prepolymer

4.10
reactive diluent

a low-viscosity liquid, which is added to a high-viscosity solvent-free thermosetting resin and which reacts chemically with the resin or the hardener during curing

NOTE Reactive diluents allow the decrease of viscosity without significant loss of other properties.

4.11
hardener

an agent that promotes or regulates the curing reaction of resins by taking part in the reaction

4.12
accelerator

a substance used in a small proportion to increase the reaction rate of a reactive compound

4.13
inhibitor

a substance used in a small proportion to suppress a chemical reaction

4.14
filler

a relatively inert solid material added to a reactive compound to modify its working properties or other qualities of the uncured compound, or the physical, electrical, chemical or thermal properties of the cured compound, or to lower cost

4.15
cure; curing

the process of converting the reactive compound into a stable, usable condition by polymerization and/or crosslinking

4.16
polymerization

the process of converting a monomer or a mixture of monomers into a polymer

4.17
crosslinking

the process of multiple intermolecular covalent or ionic bonding between polymer chains

4.18
pot life

the period of time during which a reactive compound, prepared for application, remains in a usable state

4.19
shelf life

the storage time under specified conditions during which a material retains its essential properties

4.20 casting compound (CC)

a reactive compound poured or otherwise introduced into a mould and subsequently cured

NOTE Casting compounds in general and casting compounds to be used for specific application such as embedding and potting are not defined in IEC 60050(212) or the definition is inadequate as in the case of potting compound. IEC 60050(212) does not distinguish between resin and compound.

4.20.1
embedding compound (EBC)

a casting compound poured into a mould completely encasing an electrical or electronic component. After subsequent curing, the encased component is removed from the mould

NOTE Connecting wires or terminals of the electrical or electronic component may protrude from the embedment.

4.20.2
potting compound (PC)

a casting compound poured into a mould completely encasing an electrical or electronic component. After subsequent curing, the mould remains attached to the encased component as a permanent part of the unit

4.21
encapsulating compound (ECC)

a reactive compound applied without a mould as a protective or insulating coating to enclose an electrical or electronic component by suitable means such as brushing, dipping, spraying, or spreading

4.22
impregnating compound (IC)

a reactive compound which is capable of penetrating or impregnating windings and coils or electrical components with the purpose to fill interstices and voids and thus protect and bond the winding and coil. This compound can be applied by dipping (ICD), by trickling (ICT) or by vacuum pressure impregnation (VPI)

5 Classification

Table 3 gives a classification of cured compounds based on the glass transition temperature. For the method of test for glass transition temperature see **6.4.4.1** of part 2 of this standard,

NOTE The glass transition temperature according to IEC 61006 [1][2] is an indication of the thermo-mechanical performance of the material. It provides a means of judgement of the degree of conversion of a reactive compound. It also provides a method to distinguish between different types of material with respect to their thermo-mechanical behaviour.

Table 3 — Classification of cured compounds

Glass transition class	Glass transition temperature °C	
	Above	Up to and inclusive
1	160	
2	135	160
3	125	135
4	110	125
5	100	110
6	75	100
7	50	75
8	25	50
9	0	25
10	– 20	0
11		– 20

6 General requirements

All material in a consignment shall comply with the requirements of this standard and shall, in addition, comply with the specifications given in part 3 of this standard.

6.1 Colour

The colour of the cured compound shall match with the colour as agreed between supplier and purchaser.

6.2 Conditions of supply

The resin and other components shall be supplied in strong, dry and clean containers, which ensure protection during transport, handling and storage. Each container shall be legibly and durably marked with at least the following information:

— number of this standard;

— designation of the material;

— batch number;

— date of manufacture;

— manufacturer's name or trade mark;

— specified storage temperature or range of storage temperature and final date for use;

[2] The figure in square brackets refers to the bibliography given in Annex A.

— any hazard warning notices, for instance flammability (flash point) and toxicity;

— mixing instructions where appropriate (for instance for two-pack materials);

— quantity in the container.

Preferred sizes of containers are 1; 2,5; 5; 25 and 205 l.

6.3 Shelf life

When stored in its original sealed container under specified temperature conditions, the material shall retain its specified properties up to the final date for use.