BS EN IEC 60455-2:2023

BSI Standards Publication

# Resin based reactive compounds used for electrical insulation

Part 2: Methods of test

bsi.

# National foreword

This British Standard is the UK implementation of EN IEC 60455-2:2023. It is identical to IEC 60455-2:2023. It supersedes BS EN 60455-2:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/15, Solid electrical insulating materials.

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Published by BSI Standards Limited 2023

ISBN 978 0 539 12217 6

ICS 17.200.99; 17.220.99; 29.035.01

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2023.

**Amendments/corrigenda issued since publication**

| Date | Text affected |
|---|---|

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN IEC 60455-2

September 2023

ICS 17.220.99; 29.035.01

Supersedes EN 60455-2:2015

English Version

# Resin based reactive compounds used for electrical insulation - Part 2: Methods of test (IEC 60455-2:2023)

Composés réactifs à base de résines utilisés comme isolants électriques - Partie 2: Méthodes d'essai (IEC 60455-2:2023)

Reaktionsharzmassen für die Elektroisolierung - Teil 2: Prüfverfahren (IEC 60455-2:2023)

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Comité Européen de Normalisation Electrotechnique
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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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# European foreword

The text of document 15/1006/FDIS, future edition 4 of IEC 60455-2, prepared by IEC/TC 15 "Solid electrical insulating materials" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60455-2:2023.

The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2024-05-31 |
| • latest date by which the national standards conflicting with the document have to be withdrawn | (dow) | 2026-08-31 |

This document supersedes EN 60455-2:2015 and all of its amendments and corrigenda (if any).

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

ISO 2578:1993 NOTE Approved as EN ISO 2578:1998 (not modified)

# Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60050 | series | International electrotechnical vocabulary | - | series |
| IEC 60068-2-10 | 2005 | Environmental testing - Part 2-10: Tests - Test J and guidance: Mould growth | EN 60068-2-10 | 2005 |
| IEC 60112 | 2020 | Method for the determination of the proof and the comparative tracking indices of solid insulating materials | EN IEC 60112 | 2020 |
| IEC 60216 | series | Electrical insulating materials - Thermal endurance properties | EN 60216 | series |
| IEC 60296 | 2020 | Fluids for electrotechnical applications - Mineral insulating oils for electrical equipment | EN IEC 60296 | 2020 |
| IEC 60426 | 2007 | Electrical insulating materials - Determination of electrolytic corrosion caused by insulating materials - Test methods | EN 60426 | 2007 |
| IEC 60455-1 | 1998 | Resin based reactive compounds used for electrical insulation - Part 1: Definitions and general requirements | EN 60455-1 | 1998 |
| IEC 60455-3 | series | Resin based reactive compounds used for electrical insulation - Part 3: Specifications for individual materials | EN 60455-3 | series |
| IEC 60455-3-8 | 2021 | Resin based reactive compounds used for electrical insulation - Part 3-8: Specifications for individual materials - Resins for cable accessories | EN IEC 60455-3-8 | 2021 |
| IEC 60695-11-10 | 2013 | Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods | EN 60695-11-10 | 2013 |
| IEC 60814 | 1997 | Insulating liquids - Oil-impregnated paper and pressboard - Determination of water by automatic coulometric Karl Fischer titration | EN 60814 | 1997 |
| IEC 61033 | 1991 | Test methods for the determination of bond strength of impregnating agents to an enamelled wire substrate | - | - |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61099 | 2010 | Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes | EN 61099 | 2010 |
| ISO 37 | 2011 | Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties | - | - |
| ISO 62 | 2008 | Plastics - Determination of water absorption | EN ISO 62 | 2008 |
| ISO 75 | series | Plastics and ebonite – Determination of temperature of deflection under load | EN ISO 75 | series |
| ISO 175 | 2010 | Plastics - Methods of test for the determination of the effects of immersion in liquid chemicals | EN ISO 175 | 2010 |
| ISO 178 | 2010 | Plastics - Determination of flexural properties | - | - |
| ISO 179-1 | 2010 | Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test | - | - |
| ISO 179-2 | 1997 | Plastics - Determination of Charpy impact properties - Part 2: Instrumented impact test | - | - |
| ISO 291 | - | Plastics - Standard atmospheres for conditioning and testing | EN ISO 291 | - |
| ISO 306 | 2013 | Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST) | - | - |
| ISO 527 | series | Plastics – Determination of tensile properties | EN ISO 527 | series |
| ISO 584 | 1982 | Plastics - Unsaturated polyester resins - Determination of reactivity at 80 degrees C (conventional method) | EN ISO 584 | 1997 |
| ISO 604 | 2002 | Plastics - Determination of compressive properties | EN ISO 604 | 2003 |
| ISO 868 | 2003 | Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) | EN ISO 868 | 2003 |
| ISO 1183-1 | 2019 | Plastics – Methods for determining the density of non-cellular plastics – Part 1: Immersion method, liquid pycnometer method and titration method | EN ISO 1183-1 | 2019 |
| ISO 1513 | 2010 | Paints and varnishes - Examination and preparation of test samples | EN ISO 1513 | 2010 |
| ISO 1523 | 2002 | Determination of flash point - Closed cup equilibrium method | EN ISO 1523 | 2002 |
| ISO 1675 | 1985 | Plastics - Liquid resins - Determination of density by the pyknometer method | - | - |
| ISO 2039-1 | 1993 | Plastics - Determination of hardness - Part 1: Ball indentation method | - | - |
| ISO 2114 | 2000 | Plastics (polyester resins) and paints and varnishes (binders) - Determination of partial acid value and total acid value | EN ISO 2114 | 2000 |
| - | - | | + AC | 2005 |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| ISO 2431 | 1993 | Paints and varnishes - Determination of flow time by use of flow cups | - | - |
| ISO 2535 | 1997 | Plastics - Unsaturated polyester resins - Measurement of gel time at 25 degrees C | - | - |
| ISO 2554 | 1997 | Plastics - Unsaturated polyester resins - Determination of hydroxyl value | EN ISO 2554 | 1998 |
| ISO 2555 | 1989 | Plastics - Resins in the liquid state or as emulsions or dispersions - Determination of apparent viscosity by the Brookfield test method | - | - |
| ISO 2592 | 1973 | Petroleum products - Determination of flash and fire points - Cleveland open cup method | - | - |
| ISO 3001 | 1997 | Plastics - Epoxide compounds - Determination of epoxide equivalent | - | - |
| ISO 3219 | 1993 | Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate | - | - |
| ISO 3451-1 | 1997 | Plastics - Determination of ash - Part 1: General methods | - | - |
| ISO 3521 | 1997 | Plastics - Unsaturated polyester and epoxy resins - Determination of overall volume shrinkage | EN ISO 3521 | 1999 |
| ISO 3679 | 1983 | Paints, varnishes, petroleum and related products; Determination of flashpoint; Rapid equilibrium method | - | - |
| ISO 4573 | 1978 | Plastics - Epoxide resins and glycidyl esters - Determination of inorganic chlorine | - | - |
| ISO 4583 | 1998 | Plastics - Epoxide resins and related materials - Determination of easily saponifiable chlorine | - | - |
| ISO 4615 | 1979 | Plastics - Unsaturated polyesters and epoxide resins - Determination of total chlorine content | EN ISO 4615 | 1999 |
| ISO 4625 | 1980 | Binders for paints and varnishes - Determination of softening point - Ring-and-ball method | - | - |
| ISO 4895 | - | Plastics - Liquid epoxy resins - Determination of tendency to crystallize | - | - |
| ISO 7056 | - | Plastics laboratory ware - Beakers | - | - |
| ISO 9396 | 1997 | Plastics - Phenolic resins - Determination of the gel time at a given temperature using automatic apparatus | EN ISO 9396 | 2000 |
| ISO 11357-2 | 1999 | Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature | - | - |
| ISO 11359-2 | 1999 | Plastics - Thermomechanical analysis (TMA) – Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature | - | - |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| ISO 11359-3 | 2002 | Plastics - Thermomechanical analysis (TMA) - Part 3: Determination of penetration temperature | - | - |
| ISO 14896 | 2009 | Plastics – Polyurethane raw materials – Determination of isocyanate content | EN ISO 14896 | 2009 |
| ISO 15528 | 2000 | Paints, varnishes and raw materials for paints and varnishes - Sampling | - | - |

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# RESIN BASED REACTIVE COMPOUNDS USED FOR ELECTRICAL INSULATION –

## Part 2: Methods of test

## FOREWORD

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IEC 60455-2 has been prepared by IEC technical committee 15: Solid electrical insulating materials. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Introduction of test methods related to IEC 60455-3-8;
b) Additional and updated test methods for resins.

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| 15/1006/FDIS | 15/1015/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60455 series, published under the general title *Resin based reactive compounds used for electrical insulation*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

# INTRODUCTION

This part of IEC 60455 is one of a series which deals with solvent-free resin based reactive compounds and their components used for electrical insulation.

The series consists of three parts:

- Part 1: Definitions and general requirements;
- Part 2: Methods of test;
- Part 3: Specifications for individual materials.

# RESIN BASED REACTIVE COMPOUNDS USED FOR ELECTRICAL INSULATION –

# Part 2: Methods of test

## 1 Scope

This part of IEC 60455 specifies methods of test to be used for testing resin based reactive compounds, their components and cured compounds used for electrical insulation.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary (available at http://www.electropedia.org)*

IEC 60068-2-10:2005, *Environmental testing – Part 2-10: Tests – Test J and guidance: Mould growth*

IEC 60112:2020, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60216 (all parts), *Electrical insulating materials – Thermal endurance properties*

IEC 60243-1:2013, *Electric strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60296:2020, *Fluids for electrotechnical applications – Mineral insulating oils for electrical equipment*

IEC 60426:2007, *Electrical insulating materials – Determination of electrolytic corrosion caused by insulating materials – Test methods*

IEC 60455-1:1998, *Resin based reactive compounds used for electrical insulation – Part 1: Definitions and general requirements*

IEC 60455-3 (all parts), *Resin based reactive compounds used for electrical insulation – Part 3: Specifications for individual materials*

IEC 60455-3-8:2021, *Resin based reactive compounds used for electrical insulation – Part 3-8: Specifications for individual materials – Resins for cable accessories*

IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60814:1997, *Insulating liquids – Oil-impregnated paper and pressboard – Determination of water by automatic coulometric Karl Fischer titration*