AS 61109:2020

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Insulators for overhead lines — Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V — Definitions, test methods and acceptance criteria (IEC 61109:2008, MOD)

AS 61109:2020

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Aerial Application Association of Australia
Australian Industry Group
Civil Aviation Safety Authority
Communications, Electrical and Plumbing Union — Electrical Division
Department of Regional NSW
Electrical Regulatory Authorities Council
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Insulators for overhead lines — Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V — Definitions, test methods and acceptance criteria (IEC 61109:2008, MOD)

First published as AS 4435.1—1996.
Revised and redesignated as AS 61109:2020.

Preface

This Standard was prepared by the Standards Australia Committee EL-010, Overhead Lines to supersede AS 4435.1—1996, *Insulators — Composite for overhead lines — Voltages greater than 1000 V a.c., Part 1: Definitions, test methods and acceptance criteria for string insulator units.*

The objective of this document is to define terms used and prescribe test methods and acceptance criteria.

This document applies to composite suspension/tension insulators consisting of a load-bearing cylindrical insulating solid core consisting of fibres — usually glass — in a resin based matrix, a housing (outside the insulating core) made of polymeric material and end fittings permanently attached to the insulating core.

This document does not include requirements dealing with the choice of insulators for specific operating conditions.

This document is an adoption with national modifications, and has been reproduced from IEC 61109:2008, *Insulators for overhead lines — Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V — Definitions, test methods and acceptance criteria.*

The modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the source text.

Appendix ZZ lists the variations to IEC 61109:2008, for the application of this document in Australia.

As this document has been reproduced from an International Standard, the following applies:

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(b) A full point substitutes for a comma when referring to a decimal marker.

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The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATORS FOR OVERHEAD LINES – COMPOSITE SUSPENSION AND TENSION INSULATORS FOR A.C. SYSTEMS WITH A NOMINAL VOLTAGE GREATER THAN 1 000 V – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

FOREWORD

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International Standard IEC 61109 has been prepared by subcommittee 36B: Insulators for overhead lines, of IEC technical committee 36: Insulators.

This second edition cancels and replaces the first edition, published in 1992 and amendment 1, published in 1995. This edition constitutes a technical revision.

The main technical changes with respect to the previous edition are listed below:

– removal of tests procedures now given in IEC 62217;
– inclusion of clauses on tolerances, environmental conditions, transport, storage and installation;
– inclusion of hybrid insulators in the scope (see Clause 8);
– clarification and modification of the parameters determining the need to repeat design and type tests;

– general improvement of the description of tests;
– modification of the specification of load application in bending tests to simplify testing;
– mechanical tests adapted to improved knowledge of failure mechanisms;
– additional requirements for visual examination;
– Annex A simplified and adapted to include the damage limit concept;
– addition of a new Annex C on non-standard loads.

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

FDIS	Report on voting
36B/274/FDIS	36B/276/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 the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

INTRODUCTION

Composite insulators consist of an insulating core, bearing the mechanical load protected by a polymeric housing, the load being transmitted to the core by end fittings. Despite these common features, the materials used and the construction details employed by different manufacturers may be quite different.

Some tests have been grouped together as "Design tests", to be performed only once on insulators which satisfy the same design conditions. For all design tests of composite suspension and tension insulators, the appropriate common clauses defined in IEC 62217 are applied. As far as practical, the influence of time on the electrical and mechanical properties of the components (core material, housing, interfaces etc.) and of the complete composite insulators has been considered in specifying the design tests to ensure a satisfactory life-time under normally known stress conditions of transmission lines. An explanation of the principles of the damage limit, load coordination and testing is presented in Annex A.

It has not been considered useful to specify a power arc test as a mandatory test. The test parameters are manifold and can have very different values depending on the configurations of the network and the supports and on the design of arc-protection devices. The heating effect of power arcs should be considered in the design of metal fittings. Critical damage to the metal fittings resulting from the magnitude and duration of the short-circuit current can be avoided by properly designed arc-protection devices. This standard, however, does not exclude the possibility of a power arc test by agreement between the user and manufacturer. IEC 61467 [1][1] gives details of a.c. power arc testing of insulator sets.

Composite insulators are used in both a.c. and d.c. applications. In spite of this fact, a specific tracking and erosion test procedure for d.c. applications as a design test has not yet been defined and accepted. The 1 000 h a.c. tracking and erosion test of IEC 62217 is used to establish a minimum requirement for the tracking resistance of the housing material.

The mechanism of brittle fracture has been investigated by CIGRE B2.03[2] and conclusions are published in [2, 3]. Brittle fracture is a result of stress corrosion induced by internal or external acid attack on the resin bonded glass fibre core. CIGRE D1.14 has developed a test procedure for core materials based on time-load tests on assembled cores exposed to acid, along with chemical analysis methods to verify the resistance against acid attack [4]. In parallel IEC TC36WG 12 is studying preventive and predictive measures.

Composite suspension/tension insulators are not normally intended for torsion or other non-tensile loads. Guidance on non-standard loads is given in Annex C.

Wherever possible, IEC Guide 111 [5] has been followed for the drafting of this standard.

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1 Figures in square brackets refer to the bibliography.

2 International Council on Large High Voltage Electric Systems: Working Group B2.03.

INSULATORS FOR OVERHEAD LINES – COMPOSITE SUSPENSION AND TENSION INSULATORS FOR A.C. SYSTEMS WITH A NOMINAL VOLTAGE GREATER THAN 1 000 V – DEFINITIONS, TEST METHODS AND ACCEPTANCE CRITERIA

1 Scope and object

This International Standard applies to composite suspension/tension insulators consisting of a load-bearing cylindrical insulating solid core consisting of fibres – usually glass – in a resin-based matrix, a housing (outside the insulating core) made of polymeric material and end fittings permanently attached to the insulating core.

Composite insulators covered by this standard are intended for use as suspension/tension line insulators, but it should be noted that these insulators can occasionally be subjected to compression or bending, for example when used as phase-spacers.

This standard can be applied in part to hybrid composite insulators where the core is made of a homogeneous material (porcelain, resin), see Clause 8.

The object of this standard is to

– define the terms used,

– prescribe test methods,

– prescribe acceptance criteria.

This standard does not include requirements dealing with the choice of insulators for specific operating conditions.

2 Normative references

The following referenced documents are indispensable for the application 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 60383-1, *Insulators for overhead lines with a nominal voltage above 1 000 V – Part 1: Ceramic or glass insulator units for a.c. systems – Definitions, test methods and acceptance criteria*

IEC 60383-2, *Insulators for overhead lines with a nominal voltage above 1 000 V – Part 2: Insulator strings and insulator sets for a.c. systems – Definitions, test methods and acceptance criteria.*

IEC 61466-1, *Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V – Part 1: Standard strength classes and end fittings*

IEC 62217:2005, *Polymeric insulators for indoor and outdoor use with a nominal voltage > 1 000 V – General definitions, test methods and acceptance criteria*

ISO 3452 (all parts), *Non-destructive testing – Penetrant testing*