

Australian Standard[®]

**Composite station post insulators for
substations with a.c. voltages greater
than 1000 V up to 245 kV—Definitions,
test methods and acceptance criteria**



This Australian Standard® was prepared by Committee EL-010, Overhead Lines. It was approved on behalf of the Council of Standards Australia on 1 June 2007. This Standard was published on 12 July 2007.

The following are represented on Committee EL-010:

- Australasian Railway Association
 - Australian Chamber of Commerce and Industry
 - Australian Electrical and Electronic Manufacturers Association
 - Energy Networks Association
-

This Standard was issued in draft form for comment as DR 07011.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting www.standards.org.au

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 62231–2007

**Composite station post insulators for substations with a.c. voltages greater than
1000 V up to 245 kV–Definitions, test methods and acceptance criteria**

RECONFIRMATION NOTICE

Technical Committee EL-010 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 13 March 2018.

The following are represented on Technical Committee EL-010:

Aerial Application Association of Australia
Australian Industry Group
Civil Aviation Safety Authority
Communications, Electrical and Plumbing Union - Electrical Division
Energy Networks Australia
Energy Safe Victoria
Engineers Australia
NSW Department of Industry, Skills and Regional Development

NOTES

Australian Standard[®]

Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV—Definitions, test methods and acceptance criteria

First published as AS 62231—2007.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 8281 7

PREFACE

This Standard was prepared by the Standards Australia Committee EL-010, Overhead Lines.

The objective of this Standard is to specify requirements for composite insulators.

This Standard is identical with, and has been reproduced from IEC 62231, Ed.1.0 (2006), *Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV—Definitions, test methods and acceptance criteria*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text 'IEC 62231' should read 'AS 62231'.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

	<i>Page</i>
INTRODUCTION	v
1 Scope and object	1
2 Normative references	1
3 Terms and definitions	2
4 Identification	5
5 Environmental conditions	6
6 Information on transport, storage and installation	6
7 Classification of tests	6
7.1 Design tests	6
7.2 Type tests	7
7.3 Sample tests	8
7.4 Routine tests	8
8 Design tests	8
8.1 General	8
8.2 Tests on interfaces and connections of end fittings	8
8.3 Assembled core load tests	9
8.4 Tests on shed and housing material	11
8.5 Tests on the core material	11
9 Type tests	11
9.1 Verification of dimensions	11
9.2 Electrical tests	12
9.3 Mechanical tests	13
10 Sample tests	15
10.1 General rules	15
10.2 Verification of dimensions (E1 + E2)	15
10.3 Galvanizing test (E1 + E2)	15
10.4 Verification of the specified mechanical loads (E1)	15
10.5 Re-testing procedure	16
11 Routine tests	16
11.1 Identification of the station post insulator	16
11.2 Visual examination	17
11.3 Tensile load test	17
Annex A (informative) Notes on the mechanical loads and tests	19
Annex B (informative) Determination of the equivalent bending moment caused by combined cantilever and compression (tension) loads	21
Annex C (informative) Example of torsion load test arrangement	23
Annex D (normative) Tolerances of form and position	24
Annex E (informative) Notes on the compression and buckling test	27
Bibliography	28

Figure 1 – Thermal-mechanical pre-stressing test – Typical cycles.....	18
Figure B.1 – Combined loads applied to station post insulators	22
Figure D.1 – Parallelism, coaxiality and concentricity	24
Figure D.2 – Angular deviation of fixing holes: Example 1	25
Figure D.3 – Angular deviation of fixing holes: Example 2	25
Figure D.4 – Tolerances according to standard drawing practice	26
Table 1 – Tests to be carried out after design changes.....	7
Table 2 – Number of samples for sample tests	15

INTRODUCTION

Composite station post insulators consist of a cylindrical solid insulating core made of resin impregnated fibres, bearing the mechanical load, protected by an elastomer housing, the loads being transmitted to the core by metal fittings. Despite these common features, the materials used and the construction details employed by different manufacturers may be different.

Some tests have been grouped together as "design tests" to be performed only once for insulators of the same design. The design tests are performed in order to eliminate insulator designs, materials and manufacturing technologies not suitable for high-voltage applications. The influence of time on the electrical and mechanical properties of the complete composite station post insulator and its components (core material, housing material, interfaces, etc.) has been considered in specifying the design tests in order to ensure a satisfactory lifetime under normal service conditions.

The approach for mechanical testing under bending loads used in this Standard is based on IEC 61952. This approach uses the concept of a damage limit that is the maximum stress that can be developed in the insulator before damage begins to occur. Work is underway to validate the acoustic emission technique to determine the inception of damage.

In some cases, station post insulators can be subjected to a combination of loads. In order to give some guidance, Annex B explains how to calculate the equivalent bending moment in the insulators resulting from the combination of bending, tensile and compression loads.

Pollution tests, as specified in IEC 60507 and IEC 61245, are not included in this document, their applicability to composite station post insulators having not been proven. Such pollution tests performed on composite insulators do not correlate with experience obtained from service. Specific pollution tests for composite insulators are under consideration.

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 the manufacturer. IEC 61467 gives details of a.c. power arc testing of insulator sets.

Impulse (mechanical) loads in substation are typically caused by short-circuits. Post insulators are affected by forces due to the interaction of the currents circulating in conductors/busbars supported by insulators.

The impulse load or peak load may be evaluated using guidance found in the IEC 60865 series.

Work is in progress in CIGRE ESCC (Effects of Short-Circuit Currents) task force to review impulse loads caused by short-circuit currents in substations. The aim of this work is to introduce a new concept: the ESL factor (Equivalent Static Load factor) which is frequency dependent. The actual peak load may be replaced, in a first approximation, by the peak load times the ESL factor. This new value may be used as the MDCL in this document for the determination of the cantilever strength.

Radio interference and corona tests are not specified in this standard since the radio interference and corona performances are not characteristics of the insulator alone.

Composite hollow core station post insulators are currently not dealt with in this standard. IEC 61462 gives details of tests on hollow core composite insulators, many of which can be applied to such station post insulators.

NOTES

STANDARDS AUSTRALIA

Australian Standard**Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV—Definitions, test methods and acceptance criteria**

Any table, figure or text of the international standard that is struck through is not part of this standard. Any Australian/New Zealand table, figure or text that is added is part of this standard and is identified by shading.

1 Scope and object

This International Standard applies to composite station post insulators consisting of a load bearing cylindrical insulating solid core made of resin impregnated fibres, a housing (outside the insulating solid core) made of elastomer material (e.g. silicone or ethylene-propylene) and end fittings attached to the insulating core. Composite station post insulators covered by this standard are subjected to cantilever, torsion, tension and compression loads. They are intended for substations with a.c. voltages greater than 1 000 V up to 245 kV.

The object of this standard is

- to define the terms used,
- to prescribe test methods,
- to prescribe acceptance or failure 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.

References to international standards that are struck through in this clause are replaced by references to Australian or Australian/New Zealand Standards that are listed immediately thereafter and identified by shading. Any Australian or Australian/New Zealand Standard that is identical to the International Standard it replaces is identified as such.

~~IEC 60050-471, International Electrotechnical Vocabulary (IEV)—Chapter 471: Insulators~~

AS 1852.471, *International electrotechnical vocabulary—Insulators*

~~IEC 60060-1, High-voltage test techniques—Part 1: General definitions and test requirements~~

AS 1931.1, *High-voltage test techniques - General definitions and test requirements*

~~IEC 60168:1994, Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V~~