

Australian Standard[®]

**Insulators—Ceramic or glass—
Station post for indoor and
outdoor use—Voltages greater
than 1000 V a.c.**

Part 1: Characteristics

[Based on and including the full text of IEC 273:1990,
Characteristics of indoor and outdoor post insulators for
systems with nominal voltages greater than 1000 V]

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- Australasian Railways Association
 - Australian Chamber of Commerce and Industry
 - Australian Electrical and Electronic Manufacturers Association
 - Australian Porcelain Insulators Association
 - Electricity Supply Association of Australia
 - Electricity Engineers Association of New Zealand
-

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Station post for indoor and
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Part 1: Characteristics

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL/10 on Overhead Lines.

This Standard is based on and has been reproduced from IEC 273 (1990), *Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V*. For the purposes of this Australian Standard, the IEC text is amended, supplemented or replaced as set out in Appendix ZZ. The changes are indicated by a marginal bar against each clause, table or figure affected by a reference to Appendix ZZ.

This Standard is Part 1 of AS 4398, *Insulators — Ceramic or glass — Station post for indoor and outdoor use — Voltages greater than 1000 V a.c.* The two Parts are as follows:

- Part 1: Characteristics
- Part 2: Tests

The objective of the two parts of AS 4398 is to provide users and manufacturers of station post insulators with definitions of terms, requirements and acceptance criteria to facilitate the specifications of insulators.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. Appendices designated ‘normative’ are essential to the understanding or implementation of this Standard.

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References to international Standards should be replaced by equivalent Australian Standards, as follows:

Reference to International Standard		Australian Standard	
IEC		AS	
71	Insulation co-ordination	1824	Insulation co-ordination
71-1	Part 1: Definitions, principles and rules	1824.1	Definitions, principles and rules
168	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V.	4398	Insulators—Ceramic or glass—Station post for indoor and outdoor use—Voltages greater than 1000 V a.c.
		4398.2	Part 2: Tests
506	Switching impulse tests on high-voltage insulators	—	

IEC		AS
660	Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to but not including 300 kV	—
815	Guide for the selection of insulators in respect of polluted conditions	—

The following Australian documents are referred to in this Standard.

AS

- 1111 ISO metric hexagon commercial bolts and screws
- 1137 Insulators
- 1137.3 Part 3: Porcelain and glass indoor and outdoor station post insulators (for voltages greater than 1000 V a.c.)
- 1214 Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)

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Previous edition AS 1132.3 —1981.
Revised and redesignated in part as AS 4398.1— 1996.

AUSTRALIAN STANDARD

Insulators—Ceramic or glass—Station post for indoor and outdoor use—Voltages greater than 1000 V a.c.

Part 1: Characteristics

SECTION ONE—GENERAL

1. Scope

This standard applies to post insulators and post insulator units of ceramic material or glass intended for indoor or outdoor service, and to post insulators of organic material intended for indoor service in electrical installations or equipment operating on alternating current systems with a nominal voltage greater than 1000 V and a frequency not greater than 100 Hz. It may also be regarded as a provisional standard for insulators for use on direct current systems.

The insulators covered by this standard are primarily intended for use in isolators (disconnectors) or as bus-bar or fuse supports.

This standard covers five types of post insulators:

- a)* indoor post insulators of ceramic material or glass and with internal metal fittings;
- b)* indoor post insulators of organic material and with internal metal fittings;
- c)* outdoor cylindrical post insulators of ceramic material or glass and with internal metal fittings;
- d)* outdoor cylindrical post insulators of ceramic material or glass and with external metal fittings;
- e)* outdoor pedestal post insulators of ceramic material or glass.

The term “cylindrical insulators” is intended to cover insulators of the truncated conical form also.

The five types of insulators are distinguished by their electrical, mechanical and dimensional characteristics. Figures 1, 2, 3, 4 and 5 illustrate typical examples of each type of insulator.

These drawings are only general illustrations and other shapes and constructions are permitted.

2. Object

This standard is intended to establish standard values of those electrical characteristics, mechanical characteristics and dimensions which are essential for the interchangeability of post insulators and post insulator units of the same type.

Notes 1. — General definitions and methods of test for insulators of ceramic material or glass are covered by IEC Publication 168.

General definitions and methods of test for insulators of organic material are covered by IEC Publication 660.

2. — The values of creepage distance as well as information on design aspects are provisional. These values are not directly related to the specified electrical characteristics.

The performance of insulation under contaminated conditions has been considered, with the object of determining the significant factors influencing performance. An application guide (IEC Publication 815) has been prepared recommending the range of suitable designs. The guide also indicates:

- definitions of the site severity
- different methods for determining the site severity
- corresponding creepage distance
- the significance and influence of different parameters characterising the insulator profiles
- the influence of the diameter
- the influence of the angle of the installation of the insulator
- alternative measures to be considered such as greasing or washing.

3. Electrical characteristics

Each post insulator is designated for a specified lightning impulse withstand voltage based on the standardized values given in IEC Publication 71-1. The minimum height to be chosen is determined by one of the electrical characteristics given in the table, i.e. dry lightning impulse withstand voltage, wet power frequency withstand voltage and wet switching impulse withstand voltage as applicable and according to the relevant insulation coordination requirements. The operating voltage is not specified because depending on service conditions, especially contamination, it cannot strictly be correlated with the height of the post insulator.

The composition of the post insulator, i.e. the number, the size and the positioning of insulator units is not specified. For a given height of a post insulator, however, the composition together with insulator profile and size and shape of metal parts can all affect the electrical performance of the post insulator especially the wet switching impulse withstand voltage value.

The rated switching impulse withstand voltage values are specified taking into account the above-mentioned facts as well as the high dispersion in wet switching impulse tests. However for many post insulator designs higher switching impulse withstand voltage values are obtainable.

The rated withstand voltage requirements given in tables are for tests carried out on single post insulators in accordance with IEC Publication 168. With regard to this test arrangement the test conditions are favourable and may result in higher withstand voltages than in service applications. This applies in particular to complete disconnectors for which the actual withstand values may differ appreciably from those given in the tables. In these cases an insulator with a greater standard height may be chosen or special stress control fittings may be used.

4. Mechanical characteristics

Post insulators are standardized in mechanical strength classes based on values of the specified failing load in the bending test.

These mechanical strength classes are as follows:

- a) *Indoor post insulators of ceramic material or glass and with internal metal fittings*

Strength class 2	2 000 N
Strength class 4	4 000 N
Strength class 8	8 000 N
Strength class 16	16 000 N
Strength class 25	25 000 N
- b) *Indoor post insulators of organic material and with internal metal fittings*

Strength class 2	2 000 N
Strength class 4	4 000 N
Strength class 6	6 000 N
Strength class 8	8 000 N
Strength class 10	10 000 N
Strength class 16	16 000 N
Strength class 25	25 000 N
- c) *Outdoor cylindrical post insulators of ceramic material or glass and with internal metal fittings*

Strength class 2	2 000 N
Strength class 4	4 000 N
Strength class 8	8 000 N
Strength class 16	16 000 N
Strength class 31,5	31 500 N
- d) *Outdoor cylindrical post insulators of ceramic material or glass and with external metal fittings*

Strength class 2	2 000 N
Strength class 4	4 000 N
Strength class 6	6 000 N
Strength class 8	8 000 N
Strength class 10	10 000 N
Strength class 12,5	12 500 N
Strength class 16	16 000 N
Strength class 20	20 000 N
Strength class 25	25 000 N
Strength class 31,5	31 500 N
Strength class 40	40 000 N
- e) *Outdoor pedestal post insulators of ceramic material or glass*

Strength class A	3 000 N to 5 000 N
Strength class B	5 000 N to 7 500 N
Strength class C	7 500 N to 12 000 N
Strength class D	12 000 N to 18 000 N
Strength class E	18 000 N to 30 000 N

Note. — The dimensions of outdoor cylindrical post insulators according to d) above are only specified for strength classes 2 to 20. For strength classes 25, 31,5 and 40 these dimensions are left for future consideration.

The specified strength classes are based on the minimum failing load in the bending test with the post insulator mounted upright and the load applied horizontally at the top surface of the insulator. Where insulators are to be mounted underhung, the standard values of bending strength may not be applicable except for those insulators included in

Table III. Other positions of mounting (e.g. horizontal) may also affect the strength if the weight of the post insulator is not negligible. The appropriate strength rating for methods of mounting other than upright shall be subject to agreement between the manufacturer and the purchaser.

The bending strength at different points along the axis of a post insulator is defined in different ways depending on the type of insulator (see Tables I to VI and notes).

A failing load P_x may also be specified and will refer to a load applied at x mm above the top face of the insulator. The value of such loads shall be subject to agreement between the manufacturer and the purchaser. For indoor insulators, values of P_{50} ($x = 50$ mm) are specified in the tables.

Note. — These values have been determined from the formula $P_x = P_0 \frac{h}{h + x}$ where h is the overall height of the insulator.

Mechanical strengths in tension or compression are not specified.

Mechanical strength in torsion is specified only for outdoor post insulators according to *d)* and *e)* above.

For special applications, additional mechanical characteristics may be required. In such cases, the values of these mechanical characteristics shall be subject to agreement between the manufacturer and the purchaser.

For insulators of organic material according to *b)* above, the following also applies:

For circular cross-sections, the specified failing loads apply for any load direction perpendicular to the axis of the insulator. If this is not the case, the applicable load direction shall be the subject of agreement between the manufacturer and the purchaser.

For non-circular cross-sections, the applicable load directions shall be specified.

Unless otherwise agreed, the specified failing loads apply at ambient temperature.

In Table II the difference in deflection between 20% and 50% of the failing load is given to permit the evaluation of the flexibility of post insulators of organic material.

5. Dimensional characteristics

The following dimensional characteristics are specified:

- overall height;
- maximum nominal diameter of the insulating part;
- fixing arrangements (see Clause 6);
- tolerances;
- minimum nominal creepage distance (for outdoor post insulators only).

The composition of the post insulator is not specified, see Clause 3.

The nominal dimensions of an insulator shall not be greater than the specified maximum nor less than the specified minimum values. The actual dimensions of insulators are subject to the appropriate manufacturing tolerances. Tolerances of the insulator heights are given in Tables I to IV; other tolerances shall be in accordance with Clause 24 of IEC Publication 168, except that in checking the creepage distance the nominal value shall be subject only to the negative tolerance.

The normal maximum values for the tolerances of parallelism, eccentricity and angular deviation, when measured in accordance with Appendix A of IEC Publication 168, are as follows:

Parallelism	for $h \leq 1$ m: 0,5 mm for $h > 1$ m; 0,5 h mm h in metres. Parallelism measured for diameter $D = 250$ mm.
Eccentricity	2 (1 + h) mm h in metres.
Angular deviation	1 ° either clockwise or anti-clockwise

For post insulators of more than one unit, experience shows that if the units comply with the above tolerances there are usually no problems of alignment when they are used in stacks of two or more units.

The above-mentioned values apply in the absence of any agreement to the contrary between the manufacturer and the user. Other values may, however, be agreed upon according to the demands which the application of the insulators makes on the accuracy.

Note. — Reference should be made to IEC Publication 168 regarding action to be taken when units do not comply with the above tolerances.

For post insulators according to Tables III, V and VI, only one class of minimum creepage distance is specified.

For post insulators according to Table IV, there are two classes of creepage distance.

The amount by which the creepage distance of an insulator may be increased within the specified dimensions varies according to the design and size of the insulator, and, where increased creepage distance is required, it should be the subject of agreement between the manufacturer and the purchaser in order to avoid designs which are unsuitable for service in polluted atmospheres.

6. Fixing arrangements

The fixing arrangements of standard post insulators and post insulator units shall be in accordance with the Tables I to VI.

Where applicable, fixing holes shall be equally spaced on the appropriate pitch circle, which shall be concentric with the axis of the insulator. Holes in top and bottom fittings shall be in line, unless otherwise specified, and they shall be so arranged as to permit the use of normal hexagon bolted heads and nuts.

The tapped holes shall be of standard size except that the diameter may be oversize by not more than 0,25 mm (0,01 in). They shall be suitable for steel bolts having

standard dimensions after galvanizing. The length of full thread shall be not less than the nominal bolt diameter for outdoor post insulators and indoor post insulators of ceramic material or glass and not less than 1,5 times the nominal bolt diameter for indoor post insulators of organic material. The threads of tapped holes in galvanized fittings may be cut after galvanizing.

Standard insulators shall have ISO metric threads except for pedestal post insulator units where Unified Coarse (UNC) threads may be used.

The axial distance between the bottom mounting face of an insulator of organic material and the lower end of the bottom thread (dimension *l* in Figure 2) is assumed to be zero unless otherwise agreed between the manufacturer and the purchaser. In this case the values in the last column of Table II shall apply.

- Notes 1.* — Post insulators at present in service, although they are in accordance with the other characteristics specified in this standard, may have Whitworth or American National Coarse threads.
2. — To permit interchangeability, fixing screws may be supplied with each post insulator.

7. Plan of the standard

The specified characteristics are given in the following tables:

- Indoor post insulators of ceramic material or glass and with internal metal fittings Table I.
- Indoor post insulators of organic material and with internal metal fittings Table II.
- Outdoor cylindrical post insulators of ceramic material or glass and with internal metal fittings Table III.
- Outdoor cylindrical post insulators of ceramic material or glass and with external metal fittings Table IV.
- Outdoor pedestal post insulator units of ceramic material or glass Tables V to VIII.
- Fixing arrangements Tables IA, IIA, IIIA, IVA, VA and VIA.

In tables which relate to complete post insulators, all insulators of the same lightning impulse withstand voltage are grouped together. In tables relating to pedestal post insulator units, the units are arranged with the type numbers in sequence.

The basis of standardization of cylindrical post insulators is the full specification of the complete post insulator.

The basis of standardization of pedestal post insulators is the full specification of the units in Tables V to VIII. Complete pedestal post insulators are composed of one or more of these units. For stacks of more than one unit, it is often possible to reach a given voltage and strength rating in a number of alternative ways. The alternative pedestal post insulators may differ in certain respects, such as stiffness, radio interference

performance, etc., and it may be necessary to decide the most suitable composition of the post insulator by agreement between the manufacturer and the purchaser. Examples of combinations of units to form pedestal post insulators are given in Appendix A; other combinations are also possible.

8. Designation of post insulators

Each standard post insulator is assigned a reference symbol which indicates:

— Insulator type:

indoor post insulator of ceramic material or glass	destination J
indoor post insulator of organic material	destination JO
outdoor cylindrical post insulator of ceramic material or glass and with internal metal fittings	destination H
outdoor cylindrical post insulator of ceramic or glass and with external metal fittings	destination C
outdoor pedestal post insulator unit of ceramic material or glass	destination E
outdoor pedestal post insulator of ceramic material or glass	destination P

— Mechanical strength class (see Clause 4):

2 - 4 - 8 - 16 - 25	for indoor post insulators of ceramic material or glass
2 - 4 - 8 - 10 - 16 - 25	for indoor post insulators of organic material
2 - 4 - 8 - 16 - 31,5	for outdoor cylindrical post insulators of ceramic material or glass and with internal metal fittings
2 - 4 - 8 - 10 - 12,5 - 16 - 20 - 25 - 31,5 - 40	for outdoor cylindrical insulators of ceramic material or glass and with external metal fittings
A - B - C - D - E	for outdoor pedestal post insulators of ceramic material or glass

— Creepage distance Class I -II for outdoor cylindrical insulators of ceramic material or glass and with external metal fittings

— Lightning impulse withstand voltage (in kilovolts) 60 to 2 550.

Notes 1. — The designation does not always fully specify the insulator, as sometimes alternative constructions are included in the standard.

2. — The strength class and lightning impulse withstand voltage designations are not used for pedestal post insulator units, which are designated by a reference number.

Examples: “IEC post insulator Type J4-125” indicates an indoor post insulator of ceramic material or glass of strength Class 4 and with lightning impulse withstand voltage 125 kV.

“IEC post insulator Type JO8-60” indicates an indoor post insulator of organic material of strength Class 8 and with lightning impulse withstand voltage 60 kV.

“IEC post insulator Type H16-75” indicates an outdoor cylindrical post insulator of ceramic material or glass with internal metal fittings of strength Class 16 and with lightning impulse withstand voltage 75 kV.

“IEC post insulator Type C6-1050-I” indicates an outdoor cylindrical post insulator of ceramic material or glass with external metal fittings of strength Class 6 and with lightning impulse withstand voltage 1 050 kV and Class I creepage distance.

“IEC post insulator Type PD-1050” indicates an outdoor pedestal post insulator of ceramic material or glass of strength Class D and with lightning impulse withstand voltage 1 050 kV.
