

Specification for

Tests on hollow insulators for use in high voltage electrical equipment

UDC 621.315.612-46:[621.317.333 + 620.1]

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Co-operating organizations

The Electrical Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Associated Offices' Technical Committee
- Association of Consulting Engineers*
- Association of Manufacturers of Domestic Electrical Appliances
- Association of Mining Electrical and Mechanical Engineers
- Association of Supervisory and Executive Engineers
- British Electrical and Allied Manufacturers' Association
- British Electrotechnical Approvals Board for Household Equipment
- British Radio Equipment Manufacturers' Association
- British Railways Board*
- British Steel Corporation
- Crown Agents for Oversea Governments and Administrations
- Department of Employment (HM Factory Inspectorate)
- Department of the Environment
- Department of Trade and Industry*
- Electric Cable Makers' Confederation*
- Electrical Contractors' Association
- Electrical Contractors' Association of Scotland
- Electrical Research Association*
- Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales*
- Electronic Engineering Association
- Engineering Equipment Users' Association
- Institution of Electrical Engineers
- Institution of Electrical and Electronics Technician Engineers
- Lighting Industry Federation Ltd.
- Ministry of Defence
- National Inspection Council for Electrical Installation Contracting
- National Physical Laboratory (Department of Trade and Industry)
- Oil Companies' Materials' Association
- Post Office
- South of Scotland Electricity Board*

The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Aluminium Federation
- Association of Manufacturers Allied to the Electrical and Electronic Industry
- BEAMA Transmission and Distribution Association
- British Electro-Ceramic Manufacturers' Association
- Electrical and Electronic Insulation Association
- North of Scotland Hydro-Electric Board

This British Standard, having been approved by Electrical Industry Standards Committee, was published under the authority of the Executive Board on 20 October 1973

© BSI 12-1999

The following BSI references relate to the work on this standard:
Committee reference ELE/70/2
Draft for comment 68/8527

ISBN 0 580 07965 1

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Co-operating organizations	Inside front cover
Foreword	ii
1 General	1
1.1 Scope	1
1.2 Object	1
1.3 Tests	1
1.4 Classification of tests	1
2 Routine tests	2
2.1 Visual inspection	2
2.2 Electrical routine test	3
3 Sample tests	3
3.1 Verification of dimensions	3
3.2 Porosity test	5
3.3 Temperature cycle test	5
3.4 Re-test procedure	7
Appendix A Notes on the dimensional tolerances of porcelain insulators	9
Figure 1 — Measurement of camber	4
Figure 2 — Measurement of dimensions near ends	4
Figure 3 — Thickness of material	7
Figure 4 — Effect of grinding on specified dimensions	10
Figure 5 — Dimensioning of drawings	11
Table 1 — Temperature difference between the hot and the cold water in the immersion test	6
Table 2 — Temperature difference for spray test	7

Foreword

This British Standard is technically identical with a forthcoming revision of International Electrotechnical Commission (IEC) Publication 233, "*Tests on hollow insulators for use in electrical equipment*", which has been accepted by the British Electrotechnical Committee, acting as British National Committee of the IEC. The re-test procedure is, however, more comprehensive than that of the IEC Publication because it is considered in the United Kingdom that the IEC procedure does not adequately cater for all the cases that may arise. Attention is drawn to the notes on the dimensional tolerances of porcelain insulators given in Appendix A, which do not form part of IEC Publication 233. A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

1.1 Scope

This British Standard applies to insulating weather shields and containers made of porcelain or similar ceramic material or glass and applies before any metal fittings are attached. These components are collectively referred to in this British Standard as hollow insulators. They are intended for use in high voltage electrical equipment operating on direct current or alternating current at a frequency not greater than 100 Hz.

The hollow insulators covered by this standard consist of hollow bodies open from end to end, with or without sheds, intended for use in electrical apparatus such as:

- instrument transformers;
- surge diverters (lightning arresters);
- capacitors;
- bushings;
- cable sealing ends;
- circuit-breakers.

A hollow insulator may consist of a single insulating element or of several parts permanently joined together.

Hollow insulators are characterized by their shape and the dimensions given on the relevant drawings.

Insulators are considered to be open from end to end if the smallest internal diameter is not less than 0.25 times the largest internal diameter. By agreement between the purchaser and the manufacturer this British Standard may be applied to other hollow insulators, for example insulators with closed ends or diaphragms (but see 3.3).

1.2 Object

The object of this British Standard is:

- to prescribe methods of test;
- to prescribe acceptance criteria.

It is not the object of this standard to prescribe impulse voltage or power-frequency voltage type tests, because the withstand voltages are not characteristics of the hollow insulator itself but of the apparatus of which it ultimately forms a part.

1.3 Tests

The hollow insulators shall be submitted to the following tests, as applicable:

- visual inspection;
- electrical routine test;
- verification of dimensions;
- porosity test;
- temperature cycle test.

NOTE For certain applications hollow insulators may have to be submitted to other tests, for example internal pressure tests or bending tests. Such tests should always be the subject of agreement between the purchaser and the manufacturer and will generally be considered as additional tests and not replacements for the normal tests listed above. Although the scope of this British Standard is limited to hollow insulators before the metal fittings are attached, these special tests may have to be done after the attachment of the metal fittings.

1.4 Classification of tests

The tests in this standard are classified as routine tests and sample tests.

Routine tests comprise:

- visual inspection (see 2.1);
- electrical routine test (see 2.2).

These tests are made on every hollow insulator offered for acceptance.

NOTE In some cases the verification of certain dimensions may need to be a routine test. In such cases, the relevant drawing or the order should specify which dimensions are to be verified as a routine test.

Sample tests comprise:

- verification of dimensions (see 3.1);
- porosity test (see 3.2);
- temperature cycle test (see 3.3).

These tests are made on a small number of hollow insulators taken from the batch¹⁾ after passing the routine tests (see 2.1 and 2.2).

Unless otherwise specified the number of samples shall be in accordance with the following table:

Number (<i>n</i>) of hollow insulators of one type forming the batch ^a	Number of hollow insulators to be taken for sample tests
12 or less	None, provided that tests have already been made on hollow insulators of the same type and the test report is approved by the purchaser. One, if an approved test report is not available.
13 to 24	One
25 to 100	Two
101 to 300	Three
301 to 500	Four
501 or more	The whole number equal to or next greater than $\left(4 + \frac{1.5 n}{1000} \right)$
^a A batch is a number of insulators from the same manufacturer and of the same design, offered for acceptance. It may consist of the whole or part of the quantity ordered.	

2 Routine tests

2.1 Visual inspection

2.1.1 Hollow insulators of ceramic material. The glaze shall be smooth and free from any faults prejudicial to satisfactory performance in service. The colour shall be as specified on the drawing but small variations in colour shall be permitted and shall not constitute cause for rejection.

Glazed and unglazed areas shall be in accordance with the drawing.

In general, glaze faults which affect only the appearance of a hollow insulator shall be permitted on the parts visible in service if:

- 1) their total surface area is less than

$$100 + \frac{DL}{1000} \text{ mm}^2$$

- 2) the area of a single glaze fault is less than

$$50 + \frac{DL}{10\,000} \text{ mm}^2$$

where

D is the greatest external diameter over the sheds, expressed in millimetres, and

¹⁾ A batch is a number of insulators from the same manufacturer and of the same design, offered for acceptance. It may consist of the whole or part of the quantity ordered.