AS 2732—1984

Australian Standard®

GUIDE TO THE LIGHTNING IMPULSE AND SWITCHING IMPULSE TESTING OF POWER TRANSFORMERS AND REACTORS

This Australian standard was prepared by Committee EL/8, Static Electrical Machinery. It was approved on behalf of the Council of the Standards Association of Australia on 6 July 1984 and published on 5 October 1984.

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Australian-British Trade Association

Australian Electrical and Electronic Manufacturers Association Limited

Confederation of Australian Industry

Defence Standardization Committee

Electrical Testing Laboratories

Electricity Supply Association of Australia

Electricity Supply Engineers Association of New South Wales

Railways of Australia Committee

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PREFACE

This standard was prepared by the Association's Committee on Static Electrical Machinery. It is technically identical with and has been reproduced from IEC 722—1982, Guide to the Lightning Impulse and Switching Impulse Testing of Power Transformers and Reactors.

The purpose of this guide is to give guidance on the existing procedures for lightning and switching impulse testing of power transformers to supplement the requirements of AS 2374, Power Transformers, Part 3—Insulation Levels and Dielectric Tests. The contents of this guide are also generally applicable to the testing of reactors.

For the purpose of this Australian standard, the text of the IEC standard should be modified as follows:

(a) *Clause 6.3.* Add the following new final paragraph:

Except for the switching surge test, the sensitivity of fault detection circuit chosen should be confirmed by preliminary tests. These tests are usually carried out with a recurrent surge generator. These tests illustrate the kinds of fault which could be detected during impulse testing. All relevant impedance values of the preliminary test measurements and fault detection circuits should be the same as for the full scale test.

(b) *Cross-references.* The references to IEC Publications should be replaced by references to Australian standards as follows:

Reference to IEC Publication	*Appropriate Australian Standard*
IEC 60: High-voltage Test Techniques IEC 60-2: Part 2: Test Procedures IEC 60-3: Part 3: Measuring Devices IEC 60-4: Part 4: Application Guide for Measuring Devices	AS 1931 High-voltage Testing Techniques Part 1—General Definitions, Test Requirements, Test Procedures and Measuring Devices Part 2—Application Guide for Measuring Devices
IEC 76-3: Power Transformers Part 3 — Insulation Levels and Dielectric Tests	AS 2374 Power Transformers Part 3—Insulation Levels and Dielectric Tests
IEC 289: Reactors	AS 1028 Power Reactors and Earthing Transformers

NOTE: References to page numbers in the text relate to IEC page numbers given in parenthesis at the bottom of each page.

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GUIDE TO THE LIGHTNING IMPULSE AND SWITCHING IMPULSE TESTING OF POWER TRANSFORMERS AND REACTORS

1. Scope

The purpose of this guide is to give guidance and explanatory comments on the existing procedures for lightning and switching impulse testing of power transformers to supplement the requirements of I E C Publication 76-3: Power Transformers, Part 3: Insulation Levels and Dielectric Tests. The contents of this guide are also generally applicable to the testing of reactors, see I E C Publication 289: Reactors, modifications to power transformer procedures being indicated where required.

Information is given on wave-shapes, test circuits including test connections, earthing practices, failure detection methods, test procedures, measuring techniques and interpretation of results.

Where applicable, the test techniques are as recommended in I E C Publication 60: High-voltage Test Techniques.

2. General

This guide is primarily based on the use of conventional impulse generators for both lightning and switching impulse testing of transformers and reactors. The practice of switching impulse generation with discharge of a separate capacitor into an intermediate or low-voltage winding is also applicable, but not that method which employs an additional inductance in series with the capacitor.

Note. — This last method, which results in an overvoltage in the form of a slightly damped oscillation transferred to the high-voltage winding, is still under development and further study is necessary before it can be recommended for general use.

Alternative means of switching impulse generation or simulation such as d.c. current interruption on an intermediate or low-voltage winding or the application of a part-period of power frequency voltage are not discussed since these methods are not as generally applicable.

Different considerations in the choice of test circuits (terminal connections) for lightning and switching impulse tests apply for transformers and reactors. On transformers, all terminals and windings can be lightning impulse tested to specified and independent levels. In switching impulse testing, however, because of the magnetically transferred voltage, a specified test level may only be obtained on one winding (see I E C Publication 76-3).

Whilst on reactors lightning impulse testing is similar to that on transformers, i.e., all terminals can be tested separately, different considerations apply and different problems arise in switching impulse testing. Hence, in this guide, lightning impulse testing is covered by a common text for both transformers and reactors whilst switching impulse testing is dealt with separately for the two types of equipment.