AS 1243—1982

Australian Standard®

Voltage transformers for measurement and protection

Represented on the committee which was responsible for the preparation of this standard were the following:

Australian Electrical and Electronic Manufacturers Association

CSIRO, National Measurement Laboratory

Electrical testing laboratories

Electricity Supply Association of Australia

Railways of Australia Committee

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PREFACE

This edition of this standard was prepared by the Association's Committee on Measurement and Protection Transformers to supersede AS 1243—1972.

The standard has been revised in recognition of developments since 1972 and in order both to further its alignment with IEC standards and to improve comprehension by increased separation of less common aspects from general aspects.

This edition differs from the first edition as follows:

(a) It makes reference to AS 1824, Insulation Coordination, Part 1 — Basic Principles, Standard Insulation Levels and Test Procedures, and AS 1931, High Voltage Testing Techniques, Part 1 — General Definitions, Test Requirements, Test Procedures and Measuring Devices.

(b) The following (previously misleading) terms have been changed:

  (i) 'Non-earthable' voltage transformers are now referred to as being 'uniformly insulated' (see Clause 1.3.2.8).

  (ii) 'Earthable' voltage transformers are now referred to as being 'non-uniformly insulated' (see Clause 1.3.2.9).

(c) The term 'reference primary voltage' has been discarded because it was not widely understood. The term was previously introduced to refer to the phase-to-neutral voltage associated with the rated phase-to-phase voltage of three-phase Category B or Designation R voltage transformers. In this edition 'rated primary voltage' has been redefined for this type of voltage transformer (see Clause 13.3.8).

(d) The whole voltage transformer is now required to withstand the thermal effects of the most onerous combination of rated voltage factor and rated duration assigned to any secondary winding.

(e) Particular requirements for single-phase electromagnetic voltage transformers are now specified separately (see Section 2).

(f) Category of performance and secondary residual voltage are now restricted to three-phase voltage transformers (see Section 4).

(g) Particular requirements for Designation L voltage transformers are now specified separately (see Section 5).

(h) The symbol for voltage is now *U* in accordance with AS 1046, Part 1, published in 1978. Previously it was *V*. However, the symbol *V* is retained for the unit volt (see AS 1000).

(j) The measurement of partial discharges and their permissible levels have been specified as a routine test for certain HV voltage transformers (see Clause 1.14.5).

(k) A method for measuring radio influence voltage is included but no limits are specified (see Clause 1.16).

(l) Mention is made of measurements of dielectric dissipation factor (tangent delta) but no recommendations are included (see Clause 1.14.7).

This standard also differs from the IEC standard for voltage transformers in such areas as rated voltage factor for continuous operation, phase-error limits, and ranges of compliance with error limits. In addition IEC standards do not specify detailed requirements for three-phase voltage transformers.

In the preparation of this standard reference was made to the following publications:

IEC 186 Voltage Transformers (First edition (1969) including Supplement A (1970) and Amendment No. 1 (1978))

IEC 358 Coupling Capacitors and Capacitor Dividers

BS 3941 Voltage Transformers

Acknowledgment is made of the assistance received therefrom.

In the application of this standard, reference may be necessary to the following Australian, IEC and British standards:

AS 1000 The International System of Units (SI) and Its Application

AS 1013 Shunt Capacitors for Connection to Power Frequency Systems

AS 1018 Recommendations for Partial Discharge Measurements

AS 1024 Direct Recording Electrical Measuring Instruments and Their Accessories

AS 1042 Direct-acting Indicating Electrical Measuring Instruments and Their Accessories

AS 1046 Letter Symbols for Use in Electrotechnology
Part 1—General

AS 1052 Electromagnetic Interference Measuring Equipment
Part 2—Equipment for the Frequency Range 0.15 MHz to 1000 MHz

AS 1255 Methods of Test for Electrical Characteristics of Solid Plastics Insulating materials
Part 4 —Method 4—Determination of the Permittivity and Dielectric Dissipation Factor at Power, Audio and Radio Frequencies up to 300 MHz

AS 1265 Bushings for Alternating Voltages above 1000 V

AS 1284 Electricity Meters

AS 1306 High Voltage Isolators (Disconnectors) and Earthing Switches

AS 1384 Transducers for Electrical Measurements

AS 1767 Insulating Oil for Transformers and Switchgear

AS 1824 Insulation Coordination
Part 1—Basic Principles, Standard Insulation Levels and Test Procedures

AS 1931	High Voltage Testing Techniques Part 1—General Definitions, Test Requirements, Test Procedures and Measuring Devices
AS 2006	High Voltage Alternating Current Circuit-breakers
AS 2481	All-or-nothing Electrical Relays (Instantaneous and Timing Relays)
AS 2532	Current and Voltage Transformers for Measurement and Protection — Measurement of Partial Discharges
AS 3100	Approval and Test Specification for Definitions and General Requirements for Electrical Materials and Equipment
AS C320*	Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service
IEC 44	Instrument Transformers Part 4—Measurement of Partial Discharges
IEC 358	Coupling Capacitors and Capacitor Dividers
IEC 445	Identification of Apparatus Terminals and General Rules for a Uniform System of Terminal Marking, Using an Alphanumeric Notation
IEC 481	Coupling Devices for Power Line Carrier Systems
BS 1858	Bitumen Based Filling Compounds for Electrical Purposes

* Superseded by AS 2768—1985, Electrical Insulating Materials—Evaluation and Classification Based on Thermal Endurance

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
VOLTAGE TRANSFORMERS FOR MEASUREMENT AND PROTECTION

SECTION 1. SCOPE AND GENERAL REQUIREMENTS

1.1 SCOPE. This standard specifies requirements for voltage transformers for use with electrical measuring instruments and electrical protection devices such as are covered, in general, by the following Australian standards:

AS 1284 Electricity Meters

AS 1024 Direct Recording Electrical Measuring Instruments and Their Accessories

AS 1042 Direct-acting Indicating Electrical Measuring Instruments and Their Accessories

AS 1384 Transducers for Electrical Measurements

AS 2481 All-or-nothing Electrical Relays.

NOTES:

1. Throughout this standard, the words 'voltage transformer' are abbreviated to VT and 'capacitor voltage transformer' to CVT. (The plurals are VTs and CVTs respectively.)
2. In order to facilitate the specification and purchase of VTs, the standard also lists information which should be supplied with enquiry and order (see Appendix N).
3. Particular attention is drawn to the Foreword to AS 1384 concerning possible peculiarities in the burdens imposed on VTs by certain transducers.

1.2 APPLICATION. All voltage transformers shall comply with the relevant requirements of Section 1, and with the relevant requirements of the following Sections, as applicable:

(a) Single-phase electromagnetic voltage transformers .. Section 2.

(b) Capacitor voltage transformers .. Section 3.

NOTE: This standard does not apply to capacitor voltage transformers in which the capacitance of the high-voltage capacitor is such that outputs greater than 10 V.A cannot be obtained, although some of the clauses may apply to such devices.

(c) Three-phase voltage transformers . . Section 4.

(d) Voltage transformers for laboratory use (Designation L) .. Section 5.

1.3 DEFINITIONS.

1.3.1 General. For the purpose of this standard the following definitions apply. For convenience the definitions are indexed in two forms; the Index hereunder lists the aspect groupings and Appendix O lists the individual terms.

Clauses 1.3.2 to 1.3.6 detail the definitions in full.

1.3.2 Definitions Relating to Construction.

1.3.2.1 *Voltage transformer (VT)*—a transformer, for use with electrical measuring instruments and/or electrical protection devices, for the transformation of voltage and in which the voltage across the secondary terminals is, within prescribed error limits, proportional to and in phase with the voltage across the primary terminals.

A three-phase VT, or a three-phase group of single-phase VTs, may also have secondary windings connected to develop secondary residual voltage. These windings may be either broken-delta connected, or wound on the additional limbs of a 5-limb three-phase VT.

1.3.2.2 *Electromagnetic voltage transformer*—a VT consisting of a magnetic core and two or more windings.

1.3.2.3 *Capacitor voltage transformer (CVT)*—a VT comprising a capacitor voltage divider (CVD) and an electromagnetic unit (EMU). (See Clause 1.3.5 and Fig. 1.1.)

1.3.2.4 *Winding*—the assembly of turns forming an electrical circuit associated with a primary or secondary voltage assigned to a VT.

NOTE: A simple three-phase VT has two windings (a primary winding and a secondary winding), not six windings.

1.3.2.5 *Primary winding (of an electromagnetic VT)*— the winding to which is applied the voltage to be transformed.

1.3.2.6 *Secondary winding*—a winding in which the transformed voltage is developed.

1.3.2.7 *Secondary circuit*—the external circuit supplied by the secondary winding of a VT.

1.3.2.8 *Uniformly insulated VT**—a VT having all primary terminals of equal rated insulation level. (See Clause 1.3.3.12.)

1.3.2.9 *Non-uniformly insulated VT*†—a VT having one primary terminal intended for direct or indirect connection to earth, which terminal being assigned a lower rated insulation level than the other primary terminal(s).

1.3.2.10 *Broken-delta connection*—the connection, in delta, of three secondary windings of either a three-phase VT or a three-phase group of single-phase VTs, one of the connections making the delta being open for the purpose of supplying a secondary circuit.

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* Previously known as 'non-earthable VT'.

† Previously known as 'earthable VT'.