

AS/NZS 61050:1998

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IEC 1050:1991 Corr.1:1992

IEC 1050:1991 Amdt 1:1994

Australian/New Zealand Standard[®]

**Transformers for tubular discharge
lamps having a no-load output
voltage exceeding 1000 V (generally
called neon-transformers)—General
and safety requirements**

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Australian Electrical and Electronic Manufacturers Association
Electrical Compliance Testing Association of Australia
Energy Efficiency and Conservation Authority of New Zealand
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL/41, Lamps and Related Equipment.

The objective of this Standard is to specify general and safety requirements for single-phase transformers with separate input and output winding, for use on an a.c. supply up to 1 000 V at 50/60 Hz and having a no-load output voltage exceeding 1 000 V but not exceeding 10 000 V and intended for the supply of cold cathode lighting for electric advertising signs, light signals and similar purposes.

This Standard is identical with, and has been reproduced from, IEC 1050:1991, *Transformers for tubular discharge lamps having a no-load output voltage exceeding 1 000 V (generally called neon-transformers)*, General and safety requirements including Corrigendum 1:1992 and Amendment 1:1994.

The clauses changed by Corrigendum 1:1992 and Amendment 1:1994 are indicated by single marginal bars with the letter 'C' (for Corrigendum) and number '1' (for Amendment) beside them, set adjacent to the affected text. The changes have been incorporated in the text.

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IEC		AS	
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		4695.112	Part 112: Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions
417	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets	1104	Informative symbols for use on electrical and electronic equipment
529	Degrees of protection provided by enclosures (IP Code)	1939	Degrees of protection provided by enclosures for electrical equipment (IP Code)
598	Luminaires	—	
598.1	Part 1: General requirements and tests	3137	Approval and test specification—Luminaires (lighting fittings)
695	Fire hazard testing	4695	Fire hazard testing of electrotechnical products
695.2	Part 2: Test methods	—	
695.2.1	Glow-wire test and guidance	4695.2.11	Part 2.11: Test methods—Glow-wire end-product test and guidance

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IEC		AS	
817	Spring-operated impact-test apparatus and its calibration	—	
1048	Capacitors for use in tubular fluorescent and other discharge lamp circuits. General and safety requirements	2644	Capacitors for use in discharge lamp circuits
ISO			
3	Preferred numbers—Series of preferred numbers	2752	Preferred numbers and their use

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AUSTRALIAN/NEW ZEALAND STANDARD

TRANSFORMERS FOR TUBULAR DISCHARGE LAMPS
HAVING A NO-LOAD OUTPUT VOLTAGE EXCEEDING 1 000 V

(generally called neon-transformers)

General and safety requirements

SECTION 1: GENERAL REQUIREMENTS

1 General

1.1 Scope

This International Standard is applicable to independent and built-in single-phase transformers with separate input and output windings, for use on a.c. supply up to 1 000 V at 50 Hz or 60 Hz, to supply and stabilize cold cathode tubular lamps (or assemblies of such lamps) having a no-load rated output voltage exceeding 1 000 V but not exceeding 10 000 V (see notes 1 and 2) and intended for lighting and for electric advertising signs, light signals and similar purposes.

NOTE - Different requirements apply in Japan and North America, which will be the subject of a future annex to this standard.

In order to ensure the safety of these transformers, it is necessary to check their performance. But since no standardization of the characteristics of these lamps exists, reference loads are defined in this standard to ensure reproducible test results.

In locations where special conditions prevail, as in ships, vehicles and the like, and in dangerous locations, for example, where explosions are liable to occur, special constructions may be required.

This standard does not apply to transformers intended for the supply of lamps or tubes such as low-pressure or high-pressure sodium vapour lamps, high-pressure mercury vapour lamps, halogen lamps, xenon lamps, hot cathode tubular fluorescent lamps, special lamps for document copying machines, etc.

This standard does not apply to auto-transformers and electronic converters.

This standard may, nevertheless, serve as a guide for transformers with applications other than those specified in the scope, for instance transformers for photographic lamps, as long as their characteristics remain within the framework of those specified in the scope and they are not the subject of a particular IEC standard.

Capacitors shall comply with IEC 1048, where applicable.

NOTES

- 1 See definition of 2.9
- 2 Other limits may be specified in national standards or wiring rules, see annex A.

Tests in this standard are type tests. Guidance on routine testing is given in annex C.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC standards

IEC 112: 1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.*

IEC 417: 1973, *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.*

IEC 529: 1989, *Degrees of protection provided by enclosures (IP Code).*

IEC 598-1: 1986, *Luminaires - Part 1: General requirements and tests. Amendment No. 1 (1988).*

IEC 695-2-1: 1980, *Fire hazard testing - Part 2: Test methods. Glow-wire test and guidance.*

IEC 817: 1984, *Spring-operated impact-test apparatus and its calibration.*

IEC 1048: 1990, *Capacitors for use in tubular fluorescent and other discharge lamp circuits. General and safety requirements.*

ISO Standard

ISO 3: 1973, *Preferred numbers - Series of preferred numbers.*

2 Definitions

Unless otherwise specified, r.m.s. values are implied.

2.1 rated values: Values (of voltage, of current, etc.) for which the transformer is constructed and which are indicated by the manufacturer on the nameplate of the transformer.

2.2 short-circuit current: Current between output terminals when joined together at rated input voltage and frequency.

2.3 independent transformer: Transformer consisting of one or more separate units which can be mounted separately outside a luminaire, without any additional enclosure. This may consist of a built-in transformer housed in a suitable enclosure which provides all the necessary protection according to its marking.

2.4 built-in transformer: Transformer consisting of one or more separate units exclusively designed to be built into a luminaire, a box, an enclosure, or the like.

2.5 short-circuit proof transformer: Transformer in which the temperature rise does not exceed the specified limits when the transformer is overloaded or short-circuited, and which remains capable of functioning after the overload is removed.

2.6 inherently short-circuit proof transformer: Transformer in which the temperature in the case of overload or short-circuit and in the absence of a protective device does not exceed the specified limits and which continues to function after the overload or short-circuit is removed.

2.7 tubular cold cathode discharge lamp: Discharge tube having cathodes which may be coated with an electron emitting material and which during the starting process without external heating, emits electrons by field emission. These lamps have a low-pressure filling of a rare gas (or a mixture of rare gases) and possibly mercury vapour. They can have an inside coating of fluorescent materials.

2.8 no-load rated output voltage: Maximum voltage between the terminals of the output winding(s) of the transformer connected to rated supply voltage at rated frequency, with no load on the output circuit. It is the peak value divided by $\sqrt{2}$.

2.9 normal load equivalent resistance: Non-inductive resistance connected to the output terminals of the transformer which will allow the rated output current to flow in the output winding(s) when the rated supply voltage at rated frequency is applied to the input winding (see figure 1).

2.10 effective load: Discharge lamps connected to the output terminals of the transformer which allow the rated output current to flow in the output winding(s) when the rated supply voltage at rated frequency is applied to the input winding.

2.11 high power factor transformer: Transformer having an overall power factor of at least 0,85 at 50 Hz or 0,9 at 60 Hz when connected to effective load at rated input voltage and frequency.

2.12 rated maximum ambient temperature, symbol t_a : Temperature assigned to a transformer by the manufacturer to indicate the highest sustained temperature in which the transformer may be operated under normal conditions.

2.13 rated maximum operating temperature (of a capacitor case), symbol t_c : Highest permissible temperature which may occur at any place on the outer surface of the component under normal operating conditions.

NOTE - The internal losses in a capacitor, though small, will result in the surface temperature being above ambient air temperature and due allowance for this should be made. The temperature difference will depend upon the nature of the enclosure.

2.14 rated maximum operating temperature (of a winding), symbol t_w : Winding temperature assigned by the manufacturer as the highest declared winding temperature which gives the transformer an expectancy of five years continuous operation at that temperature.

2.15 rated temperature rise (of a winding), symbol Δt : Temperature rise assigned by the manufacturer to the winding under the specified conditions.

NOTE - See clause 10 for heating test.

2.16 working voltage: Highest r.m.s. voltage which may occur across any insulation, transients being neglected, in open-circuit conditions or during lamp operation, when the transformer is supplied at its rated voltage.

2.17 detachable part: Part which can be removed only by hand, without the use of a tool, coin or any other object.

2.18 type test: Test, or a series of tests, made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant specification.

2.19 type test sample: Sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test.

3 General requirements

Transformers shall be so designed and constructed that in normal use they operate without danger to the user or surroundings. Capacitors and other components incorporated in transformers shall comply with the requirements of the appropriate IEC standards.

In general, compliance for transformers and other elements is checked by carrying out all the tests specified. In addition, the enclosure of independent transformers shall comply with the requirements of IEC 598-1, including the classification and marking requirements according to that standard.

4 General notes on tests

4.1 Tests in this standard are type tests.

NOTE - The requirements and tolerances permitted by this standard are related to testing of a type test sample submitted for that purpose. Compliance of the type test sample does not ensure compliance of the whole production of a manufacturer with this safety standard. Conformity of production is the responsibility of the manufacturer and may include routine tests and quality assurance in addition to type testing.

4.2 The tests are carried out in the order of the clauses unless otherwise specified.

4.3 Unless otherwise specified, the tests shall be carried out on the sample placed in normal conditions and positions of use, the ambient temperature being within the range of 20 °C to 27 °C.

4.4 The following number of units shall be submitted for the type test:

- for transformers without temperature markings: one unit;
- for transformers with temperature markings: eight units (of which seven are for the test of clause 11 - Endurance - and one for all other tests);
- for independent transformers, for the tests of 16.5: three units.

In general all the tests shall be made for each type of transformer or where a range of similar transformers is involved on a representative selection from the range as agreed with the manufacturer. A reduction of the number of samples for the endurance test according to clause 11, or even the omission of this test is allowed when transformers of the same construction but with different characteristics are submitted together for approval, or when test reports from the manufacturer or other authority are accepted by the testing station.

The transformers shall contain, or shall be supplied with the series capacitors if needed to ensure the correct operation of the transformer.

4.5 For the test of clause 11, the results shall be considered to be satisfactory if at least six of the seven units satisfy the requirements of 11.3. The test shall be considered to be negative if more than two units fail the test.

In the case of two failures, the test shall be repeated with seven more units and no failure shall then be permitted.

4.6 *Transformers designed for more than one rated supply voltage, for a rated supply voltage range, or for more than one rated frequency, shall be tested at the most unfavourable supply voltage and/or frequency for each test.*

4.7 *Supply voltage and frequency*

a) *Stability of supply voltage and frequency*

For the majority of the tests, the supply voltage and frequency shall be maintained constant within $\pm 0,5\%$. However, during the actual measurement, the voltage shall be adjusted to within $\pm 0,2\%$ of the specified testing value.

The temperature of the transformer depends on the supply voltage and therefore a stabilized source shall be used. After possible adjustments the transformer shall be given enough time to reach the final temperature on the reset voltage.

Supply mains which are subject to frequency fluctuations require special provisions. The currents in inductances respond to mains frequency changes: lower frequencies will increase the current of a transformer and consequently increase its temperature. A fluctuation in frequency of not more than $\pm 0,5\%$ is considered to be acceptable.

For tests of long duration (e.g. endurance tests), the variation of voltage may be $\pm 2\%$ and of frequency $\pm 1\%$ of the specified values.

b) *Supply voltage waveform*

The total harmonic content of the supply voltage shall not exceed 3% , the harmonic content being defined as the root-mean-square (r.m.s.) sum of the individual harmonic components using the fundamental voltage as 100% .

The power source used shall have an impedance that is low compared to the impedance of the transformer. Care shall be taken to see that this requirement is met under conditions that occur during the measurement.

5 *Rating*

5.1 Preferred values of the rated no-load output voltage are:

1 250, 1 600, 2 000, 2 500, 3 150, 4 000, 5 000, 6 300, 8 000 and 10 000 V.

5.2 Preferred values of the rated output current are:

10 - 12,5 - 16 - 20 - 25 - 31,5 - 40 - 50 - 63 - 80 - 100 mA.

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The preferred values are taken from the R10 series.

The values underlined are recommended values from the R5 series.

NOTE - R series of preferred numbers in accordance with ISO 3.

Other values than those specified are permissible.

6 Classification

6.1 Transformers are classified according to method of installation as:

- a) independent transformers;
- b) built-in transformers.

6.2 Transformers the output windings of which are to be earthed are classified as follows:

- a) transformers provided with one earthing terminal;
- b) transformers provided with two earthing terminals: one intended for the earthing of the body of the transformer, the other for the earthing of the windings, through a protective device.

7 Marking

7.1 *Mandatory markings*

- a) mark of origin, which may take the form of a trade mark, or the manufacturer's name or the name of the responsible vendor;
 - b) model number or type reference of the manufacturer;
 - c) rated supply voltage, or voltage range;
 - d) rated input current, in amperes, or rated input, in voltamperes;
 - e) rated supply frequency;
 - f) rated no-load output voltage;
- this marking shall be in the following terms:

- if the output winding is not connected to an earthing terminal: ... V (e.g. 4 000 V),
- if one end of the output winding is connected to an earthing terminal: E - ... V (e.g. E - 4 000 V),
- if the centre point of the output winding is connected to an earthing terminal: ... - E - ... V (e.g. 3 000 - E - 3 000 V);