



UL 5085-3

STANDARD FOR SAFETY

Low Voltage Transformers – Part 3:
Class 2 and Class 3 Transformers

UL Standard for Safety for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3

First Edition, Dated April 17, 2006

Summary of Topics

This revision of ANSI/UL 5085-3 dated January 28, 2022 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this harmonized standard jointly. However, the revision pages dated January 28, 2022 will not be jointly issued by UL and CSA as these revision pages only address UL ANSI approval dates.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated December 3, 2021.

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This ANSI/UL Standard for Safety consists of the First Edition including revisions through January 28, 2022. The most recent designation of ANSI/UL 5085-3 as a Reaffirmed American National Standard (ANS) occurred on January 26, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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Preface

This is the harmonized CSA Group and UL standard for low voltage transformers. It is the first edition of CSA C22.2 No. 66.3 and the first edition of UL 5085-3. This harmonized standard has been jointly revised on November 30, 2012. For this purpose, CSA Group and UL are issuing revision pages dated November 30, 2012.

This harmonized standard was prepared by a Technical Harmonization Committee comprised of members from CSA Group, Underwriters Laboratories Inc. (UL), and representatives of the low voltage transformer manufacturing industry. The efforts and support of the members of the Technical Harmonization Committee are gratefully acknowledged.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This standard was reviewed by the CSA Subcommittee on C22.2 No. 66, under the jurisdiction of the CSA Technical Committee on Industrial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard uses the IEC format but is not based on, nor is it to be considered equivalent to, an IEC standard. This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for Differences from IEC

The Technical Harmonization Committee identified the following IEC Standard within the scope of this standard: IEC 61558-1 (1998-07), Safety of power transformers, power supply units, and similar - Part 1: General requirements.

The THC determined that the safe use of transformers and reactors is critically dependent on the electrical system in which they are intended to be installed. Significant investigation is required to assess safety and system compatibility issues that may lead to harmonization of traditional North American transformers and reactors with those presently addressed in the known IEC standards. The THC agreed such future investigation might be facilitated by completion of harmonization of North American standards for transformers and reactors.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedure.

of the standards development organization. If more than one literal interpretation has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

Parts

The Standard for Low Voltage Transformers is divided into the following parts:

Part Number	Standard Title	Standard Number
1	General Requirements	CSA C22.2 No. 66.1/UL 5085-1
2	General Purpose Transformers	CSA C22.2 No. 66.2/UL 5085-2
3	Class 2 and Class 3 Transformers	CSA C22.2 No. 66.3/UL 5085-3
NOTES – 1. Part 1 covers the general requirements for transformer characteristics, marking, construction, and tests. Additional specific requirements are provided in the subsequent parts. 2. Part 2 and Part 3 supplement requirements and/or modify the corresponding clauses in Part 1 and should be applied together with Part 1. The numbered clauses in Part 2 and Part 3 correspond to the numbered clauses in Part 1.		

PART 3: CLASS 2 AND CLASS 3 TRANSFORMERS

1 Scope

1.1 As noted in Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, or CSA C22.2 No. 66.1, Low Voltage Transformers – Part 1: General Requirements, the requirements in Part 3 cover Class 2 transformers for use with Class 2 circuits in accordance with the National Electrical Code, ANSI/NFPA 70, or the Canadian Electrical Code, Part I, CSA C22.1. They are intended for connection to essentially sinusoidal supply sources.

Advisory Note: For transformers intended for use in the United States, these requirements also cover Class 3 transformers for use with Class 3 circuits in accordance with the National Electrical Code, ANSI/NFPA 70, unless otherwise specified in this standard. See Annex D for Class 3 requirements.

1.3 In addition to the items specified in Clause 1.3 of Part 1, the requirements of Part 3 do not cover:

- a) Power supplies (a transformer provided with a rectifier is considered a power supply);
- b) Toy transformers;
- c) Cord and plug connected transformers other than Class 3;
- d) Direct plug-in transformers;
- e) Transformers intended for use in audio, radio, or television type appliances; or
- f) Other special types of transformers covered in requirements for other electrical devices or appliances.

Advisory Note: The requirements of Part 3 do not cover transformers intended for use in the United States having a nominal primary rating of more than 600 V and transformers having overvoltage taps rated over 660 V.

1.7 This part is intended to be used in conjunction with Part 1. The numbering of the clauses in Part 3 corresponds to the numbered clauses in Part 1. The requirements in Part 1 apply unless modified by Part 3.

1.8 A Class 2 transformer that includes a separate current-limiting impedance such as a resistor or a positive temperature coefficient device (PTC) is covered by these requirements.

1.9 A Class 2 transformer that includes a resonance regulating circuit is covered by these requirements.

4 Construction

4.2 A Class 2 transformer shall have only one secondary winding, which shall be insulated from the primary winding. A winding having intermediate taps is considered a single winding.

Note 1: Two or more secondary windings may be considered as a single winding and interposing insulation between the secondary windings is not required if the windings, when interconnected, are in compliance with the performance requirements for a single-winding construction.

Note 2: An inherently limiting type transformer marked in accordance with Clause 17.4.2 may have two secondary windings that, when interconnected, do not comply with the performance requirements for a single-secondary winding construction.

Note 3: A transformer intended only for use in other equipment may have multiple secondary windings only where isolation of all circuits can be maintained, or where the interconnection of the secondary windings is such that they comply with the performance requirements for an isolated single-secondary winding construction.

4.3 There shall not be electrical connection between the primary and secondary windings of a transformer, or between a primary or secondary circuit and the enclosure.

4.4 A component used to limit the output of a transformer to a value within the required current, power, or safety levels shall be permanent and stable in order to maintain its limiting capabilities. The following factors are to be considered when evaluating a limiting component:

- a) Effect of operating temperature;
- b) Electrical stress level;
- c) Effect of transient surges; and
- d) Resistance to moisture.

6 Enclosure

6.1 General

6.1.16 A transformer shall be provided with an enclosure of sheet steel, sheet aluminum, cast aluminum, cast iron, or equivalent metal, or a polymeric material. The enclosure shall contain all uninsulated live parts and primary circuit wiring.

The secondary leads or terminals of a Class 2 transformer do not have to be enclosed.

The enclosure of the end product may serve as the transformer enclosure for a transformer intended for use only in other equipment. However, the primary and secondary wiring of the transformer shall be separated in accordance with the requirements for the end product.

Note 1: For a transformer mounted on an outlet box cover or intended for mounting in a knockout of an outlet box or cabinet, the primary terminals or leads are considered enclosed by the outlet box or cabinet.

Note 2: A transformer may have exposed primary leads if intended for connection to open wiring or concealed knob-and-tube wiring.

6.1.17 The transformer shall be constructed so that it can be mounted and wired as intended in the field without exposing internal parts such as windings and protective devices to damage. All covers, bases, and similar parts shall be securely fastened in place.

The secondary leads or terminals of a Class 2 transformer do not have to be enclosed.

The enclosure of the end product may serve as the transformer enclosure for a transformer intended for use only in other equipment. However, the primary and secondary wiring of the transformer shall be separated in accordance with the requirements for the end product.

Note 1: For a transformer mounted on an outlet box cover or intended for mounting in a knockout of an outlet box or cabinet, the primary terminals or leads are considered enclosed by the outlet box or cabinet.

Note 2: A transformer may have exposed primary leads if intended for connection to open wiring or concealed knob-and-tube wiring.

8 Connections

8.2 Wiring terminals

8.2.3 Primary wiring terminals

8.2.3.1 Unless otherwise specified, the requirements for wire binding screws and studs and pressure terminal connectors shall comply with Clauses 8.3 and 8.4 of Part 1.

8.2.4 Secondary terminals

8.2.4.1 Wiring terminals, quick-connect terminals, or insulated leads shall be provided for secondary circuit connection.

8.2.4.2 A nominal 0.110-, 0.125-, 0.187-, 0.205-, or 0.250-inch wide quick-connect terminal shall comply with the requirements for the Standard for Electrical Quick-Connect Terminals, UL 310, or CSA C22.2 No. 153, Quick-Connect Terminals.

8.2.4.3 Terminal plates, wire binding screws, studs, and nuts shall be constructed as specified for Primary wiring terminals in Clause [8.2.3](#).

Note 1: Plated steel terminal plates are acceptable for use; cupped washers or similar devices are not required.

Note 2: A No. 4 (2.8 mm diameter) wire-binding screw with not more than 40 threads per inch may be used for a secondary terminal of a Class 2 transformer.

8.5 Leads

8.5.9.1 Primary leads

8.5.9.1.1 A primary field wiring lead of a transformer shall have stranded copper conductors not smaller than 18 AWG (0.82 mm²). Leads on component type transformers shall have an ampacity suitable for the transformer rating but shall not be less than 22 AWG (0.35 mm²).

8.5.9.1.2 Insulation of a primary lead shall be at least 0.76 mm (0.030 in) thick.

8.5.9.1.3 A primary field wiring lead of a transformer shall extend not less than 152 mm (6 in) outside the enclosure, and a lead of 18 or 16 AWG (0.82 or 1.3 mm²) wire shall extend not more than 305 mm (12 in) outside the enclosure.

8.5.9.1.4 A transformer with open wiring or concealed knob-and-tube wiring shall be provided with the following:

- a) A marking in accordance with Clause [17.4.10](#) or [17.4.11](#);
- b) A spacing of not less than 6.4 mm (0.25 in) between the conductors;
- c) A spacing of not less than 12.7 mm (0.5 in) between the conductors and the plane of the transformer support; and
- d) An insulating bushing where the primary leads pass through the enclosure. Either a separate hole for each lead shall be provided in the insulating material or separate bushings shall be provided.

Note: In Canada, the Canadian Electrical Code, Part I, no longer permits concealed knob-and-tube wiring.

