



Examination Standard for Liquid-Insulated Transformers

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for transformers insulated with certified liquids.
- 1.1.2 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard sets performance requirements for liquid insulated distribution and power transformers, both naturally cooled and transformers utilizing forcibly circulated cooling medium. The standard limits certification for the naturally cooled (KNAN) transformers rated from 5 to 10,000 kVA and 35 kV class or lower. Certification of larger transformers will require the use of forcibly circulated cooling mediums (forced air or forced liquid (water or oil) cooling).
- 1.2.2 This standard applies to any component intended for use as a protective device and that is normally provided as part of the transformer assembly. Use of components previously certified as individual protective devices shall not automatically result in a certification transformer assembly.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of transformers insulated with liquids for the purpose of obtaining certification. Transformers insulated with liquids having characteristics not anticipated by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.4.1 Examination and tests on production samples shall be performed to evaluate:

- the suitability of the product;
- the performance of the product as specified by the manufacturer and required by the certification agency;
- the durability and reliability of the product.

- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agencies product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

ANSI/ASME Boiler and Pressure Vessel Code (BPV) Code, Section VIII, *Pressure Relief Devices*

ANSI/IEEE C57.12.00 - IEEE Standard *General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*

ANSI/IEEE C57.12.90 - IEEE Standard *Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers*

ANSI/IEEE C57.12.80™ - IEEE Standard *Terminology for Power and Distribution Transformers*

ANSI/IEEE/ASTM SI 10 *American National Standard for Metric Practice*

IEC 60076-1 Power Transformers - Part 1: *General*

IEC 60076-2 Power Transformers - Part 2: *Temperature rise*

IEC 60076-3 Power Transformers - Part 3: *Insulation levels, dielectric test and external clearances*

IEC 60076-4 Power Transformers – Part 4: *Guide to lightning impulse testing of power transformers and reactors*

IEC 60076-8 Power Transformers - Part 8: *Application guide*

FM 6933 *Transformer Fluids*

1.9 Terms and Definitions

For purposes of this standard, transformer terminology available in ANSI/IEEE C57.12.80 shall apply. The IEEE Standards Dictionary Online should be consulted for terms not defined in this clause. Various types of tests (routine, design, conformance, and other) are also defined in ANSI/IEEE C57.12.80. Some definitions and short descriptions of tests are offered in the Appendix A to this standard.

2 GENERAL INFORMATION

2.1 Product Information

This standard describes electrical and mechanical requirements of liquid-immersed distribution and power transformers, autotransformers and regulating transformers, single-phase and polyphase, with voltages of 601 V or higher in the highest voltage winding.

This standard applies to all liquid-immersed distribution, power, and regulating transformers that do not belong to the following types of apparatus:

- a) Instrument transformers
- b) Step voltage and induction voltage regulators
- c) Arc furnace transformers
- d) Rectifier transformers
- e) Specialty transformers
- f) Grounding transformers
- g) Mobile transformers
- h) Mine transformers

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, piping and electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures, etc...; and
- The number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing based on the following:

- The manufacturer shall provide instructions and/or illustrations for proper installation, maintenance, and operation of the subject transformer.
- Upon request, the manufacturer shall furnish time/current curves of the fusing or protective relay schemes provided with the transformer. This applies whether the devices are of in-house manufacture or purchased.
- The manufacturer shall provide assembly drawings, component drawings, material lists, labeling format, brochures, sales literature, specification sheets, etc. for certification examination.