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Power transformers – Part 21: Standard requirements, terminology, and test code for step-voltage regulators

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Part 21: Standard requirements, terminology, and test code for step-voltage regulators

FOREWORD

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International Standard IEC 60076-21/IEEE Std C57.15-2017 has been prepared by IEC technical committee 14: Power transformers, in cooperation with the Transformers Committee of the IEEE Power and Energy Society[1], under the IEC/IEEE Dual Logo Agreement.

This publication is published as an IEC/IEEE Dual Logo standard. This second edition cancels and replaces IEC 60076-21, published in 2011, and IEEE Std C57.15-2009.

This edition includes the following significant technical changes with respect to IEC 60076-21:2011/IEEE Std C57.15-2009:

a) updated list of normative and bibliography IEC and IEEE references and their associated text;
b) updated tables of preferred ratings for inclusion of maximum system voltage (U_m), nominal system voltage and rated voltage (U_r);
c) inclusion of tables for optional fan-cooled ratings, external dielectric clearances and sound pressure levels;
d) revision of short-circuit requirements for distribution and substation voltage regulators;
e) inclusion of an universal interface between control enclosure and apparatus;
f) inclusion of tap-changer routine and type tests;
g) inclusion of audible sound pressure emissions test procedures;
h) inclusion of tank enclosure integrity type test procedures;
i) update of control environmental IEC reference test standard.

The text of this standard is based on the following documents:

FDIS	Report on voting
14/974/FDIS	14/989/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

International standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

A list of parts of the 60076 International Standard, published under the general title *Power transformers*, can be found on the IEC website.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

[1] A list of IEEE participants can be found at the following URL: https://standards.ieee.org/standard/C57.15-2017.html

POWER TRANSFORMERS –

Part 21: Standard requirements, terminology, and test code for step-voltage regulators

1 Scope

This document describes electrical, mechanical and test requirements of liquid-immersed, single- and three-phase, 50 Hz and 60 Hz, self and forced-air cooled, distribution, overhead and substation, step-voltage regulators, 1 000 kVA (single-phase units) or 3 000 kVA (three-phase units) and smaller, 34 500 volts and below (2 400 V minimum) and their associated controls.

Requirements, references and definitions relevant to either IEC or IEEE contexts are given and their use is described in Clause 4.

2 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.1 IEC references

IEC 60050-421, *International Electrotechnical Vocabulary – Chapter 421: Power transformers and reactors*

IEC 60060 (all parts), *High-voltage test techniques*

IEC 60076-2, *Power transformers – Part 2: Temperature rise for liquid-immersed transformers*

IEC 60255-1, *Measuring relays and protection equipment – Part 1: Common requirements*

IEC 60255-21-1, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section One: Vibration tests (sinusoidal)*

IEC 60255-26, *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*

IEC 60255-27, *Measuring relays and protection equipment – Part 27: Product safety requirements*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

2.2 IEEE references

IEEE Std 4™, *IEEE Standard Techniques for High-Voltage Testing*

IEEE Std C37.90.1™, *IEEE Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.2™, *IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers*

IEEE Std C37.90.3™, *IEEE Standard Electrostatic Discharge Tests for Protective Relays*

IEEE Std C57.12.31™, *IEEE Standard for Pole-Mounted Equipment – Enclosure Integrity*

IEEE Std C57.19.00™*, IEEE Standard General Requirements and Test Procedure for Outdoor Power Apparatus Bushings*

IEEE Std C57.91™, *IEEE Guide for Loading Mineral-Oil-Immersed Transformers*

2.3 SAE references

SAE AS50151, *General specification for connectors, electrical, circular threaded, AN type*[2]

[2] SAE (Society of Automotive Engineers) international publications are available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096, USA (http://sae.org/).