

ICS 29.180
CCS K 41



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 1094.16-2013

Replacing GB/T 1094.16-2013

**Power transformers - Part 16: Transformers for wind turbine
applications**

电力变压器 第16部分：风力发电用变压器

(English Translation)

Issued on: August 1, 2025

Implemented on: February 1, 2026

**Issued by: State Administration for Market Regulation, Standardization
Administration of China**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting is required.

This document is Part 16 of GB/T 1094 "Power Transformers". GB/T 1094 has been published in the following parts.

- Part 1: General provisions;
- Part 2: Temperature rise of liquid immersed transformers;
- Part 3: Insulation levels, insulation tests and external insulation air gaps;
- Part 4: Guidelines for lightning impulse and switching impulse tests on power transformers and reactors;
- Part 5: Ability to withstand short circuit;
- Part 6: Reactors;
- Part 7: Guidelines for loading of oil-immersed power transformers;
- Part 10: Determination of sound levels;

- Part 101: Application Guidelines for Sound Level Determination;
- Part 11: Dry-type transformers;
- Part 12: Guidelines for loading of dry-type power transformers;
- Part 14: Liquid-immersed power transformers using high-temperature insulation materials;
- Part 15: Gas-filled power transformers;
- Part 16: Transformers for wind power generation;
- Part 18: Frequency response measurements;
- Part 23: DC bias suppression devices.

This document replaces GB/T 1094.16-2013 "Power transformers Part 16: Transformers for wind power generation" and is compatible with GB/T 1094.16-2013. Compared with 2013, in addition to structural adjustments and editorial changes, the main technical changes are as follows.

- Changed the scope to increase the maximum applicable voltage of the equipment to 72.5 kV (see Chapter 1, Chapter 1 of the 2013 edition);
- Added the terms and definitions of "effective cooling medium", "box-type transformer", "sealed transformer" and "routine sampling test" (see 3.4, 3.5, 3.6, and 3.7);
- Added requirements for rated values (see Chapter 4);
- Changed the conditions of use (see Chapter 5, Chapter 4 of the 2013 edition);
- Deleted the guaranteed temperature rise values under rated capacity and rated conditions, and changed and improved the electrical performance except the short-circuit withstand capability in accordance with the requirements of the 2013 edition, the requirements for closing frequency (frequency) and overheat protection are added (see Chapter 6, Chapter 5 of the 2013 edition);
- The test items and methods have been changed (see Chapter 8, Chapter 7 of the 2013 edition).

This document is modified to adopt IEC/IEEE 60076-16:2018 "Power transformers Part 16: Transformers for wind power generation".

Compared with IEC/IEEE 60076-16:2018, this document has the following structural adjustments.

- Chapter 4 has been deleted, and subsequent chapters and articles have been numbered forward accordingly;
- Added Appendix A;

--Appendix B corresponds to Appendix A of IEC/IEEE 60076-16.2018.

The technical differences between this document and IEC/IEEE 60076-16.2018 and their reasons are as follows.

--The original IEC document is compatible with the technical contents of both IEC and IEEE standards. This document only uses the contents of the IEC standard and deletes in addition to all technical contents related to IEEE standards (including ANSI standards), to conform to my country's actual conditions;

--GB/T 1094.1, GB/T 1094.2, GB/T 1094.3, GB/T 1094.5, GB/T 1094.7, GB/T 1094.11, GB/T 1094.12, GB/T 1094.14, GB/T 18494.1, GB/T 30790 (all parts) and GB/T 30790.2-2014 replaces IEC 60076-1, IEC 60076-2, IEC 60076-3, IEC 60076-5, IEC 60076-7, IEC 60076-11, IEC 60076-12, IEC 60076-14, IEC 61378-1, ISO 12944 (all parts) 1) and ISO 12944-4, and added normative references to GB/T 2900.53 and GB/T 2900.95 to adapt to my country's Technical conditions (see Chapter 1, Chapter 3, 5.1, 5.2.2, 5.3, 5.6, 5.9, 5.11, 6.1, 6.6~6.8, 6.10, 6.11, Chapter 7, 8.1, 8.2.4 and 8.2.5);

-- The requirement on "use of normative references" has been deleted to conform to my country's actual situation (see Chapter 4);

-- Adjust IEC 60721-3-4 from a reference document to a normative reference document and replace it with GB/T 4798.4 to comply with be in line with my country's actual situation (see 5.2);

--Changed the standard for pressure sealing test and pressure deformation test from EN 50588-1:2015 to GB/T 6451 to comply with be in line with my country's actual situation (see 5.10);

--The requirements for thermal durability testing have been changed to suit my country's actual conditions (see 5.12);

-- Added "The insulation level of the high-voltage winding and low-voltage winding of the dry-type transformer shall comply with the provisions of GB/T 1094.11" and deleted the requirement that "the insulation level can also be improved" has been revised to conform to the actual situation in my country (see 6.6).

The following editorial changes have been made to this document.

--Changed the content of Chapter 1;

-- Changed the introductory words of Chapter 3 and added "Note. Transformers for wind power generation are hereinafter referred to as transformers" in 3.1;

--Added the numbers of some formulas in 5.2.2;

-- Added "For the effects of voltage harmonics, see Appendix B" in 5.5 to reference the appendix in the main text;

--Changed the content of the note in 5.6;

--Change "top oil temperature" in the last paragraph of 6.11 to "top liquid temperature";

--Deleted the "Note" in B.1; changed Bh, Bn, Vh and V1 in B.2 to Bh, Bn, Uh and U1 respectively; changed the symbol V1 Change "rated voltage" in the explanation to "fundamental voltage"; change "magnetic flux density is the integral of voltage over time" in the penultimate paragraph to Change the note to "the magnetic flux is the integral of voltage over time"; change the note to "it is mainly the eddy current loss in the no-load loss that causes the magnetic flux density".

The increase of harmonic components of magnetic flux density is changed to "the harmonic components of magnetic flux density mainly increase the eddy current loss in no-load loss";

-- Changed references.

Introduction

The formulation of power transformer standards is to establish a set of optimal evaluation criteria for power transformers, Provide guidance on the matters needing attention in selection, design, production, inspection, selection, operation and maintenance. The GB/T 1094 series of standards aims to Establish principles and relevant rules applicable to the design, manufacture, testing, operation and maintenance of power transformers, which will be divided into 16 parts.

constitute.

--Part 1: General Principles. The purpose is to establish the principles that need to be followed in the design, manufacture and production testing of various types of power transformers.

General principles and relevant rules.

-- Part 2: Temperature rise of liquid immersed transformers. The purpose is to establish the relevant temperature rise aspects applicable to various types of liquid immersed power transformers.

Technical requirements and test methods.

-- Part 3: Insulation level, insulation test and external insulation air gap. The purpose is to establish the requirements for various types of liquid immersed power transformers.

Technical requirements and insulation test methods for transformers regarding insulation level, insulation test and external insulation air gap.

-- Part 4: Guidelines for lightning impulse and switching impulse tests on power transformers and reactors.

Technical requirements and test methods for lightning impulse tests and switching impulse