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

GB/T 47962-2026

**Guide for the application, specification and testing of
phase-shifting transformers**

移相变压器的应用、规范和试验导则

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is modified to adopt IEC 62032:2012 "Application, specifications and test guidelines for phase-shifting transformers".

This document has undergone significant structural adjustments compared to IEC 62032:2012. A table comparing the structural numbering changes between the two documents is provided.

See Appendix A.

The technical differences between this document and IEC 62032:2012, and the reasons therefor, are as follows.

---The original IEC document is compatible with the technical content of both IEC and IEEE standards. This document only uses the content of the IEC standard.

All technical content related to IEEE standards has been removed to conform to my country's actual situation (see IEC 62032:2012).

IEEE Guide for the Application, Specification, and Testing of Phase Shifting Transformers, Chapter 3, 5.1, 5.2, 5.3, Chapter 6, 6.2, 6.3, Chapter 7, 7.2, 8.1.1, 8.1.2, 8.1.3, 9.3.1.2, 10.1, 10.1.3, 11.1, 11.3);

It includes IEC 60076-1, IEC 60076-3, IEC 60076-5 and IEC 60076-7, and adds normative references.

GB/T 2900.95, GB/T 6451, GB/T 17626.5, GB 50260 and DL/T 860 (all parts) are required to comply with Chinese standards.

Technical requirements (see 3.1, 5.2, 5.3, 5.4.1, 6.1, 6.3.1, 6.4, 7.1, 7.3.1, Chapter 8, 9.3.1.2, 10.1, 10.2.3, 11.1) and 11.3);

---Added symbols and abbreviations; removed footnotes related to the introductory text; removed the term "regulation circuit of phase-shifting transformer" and Definition; The definition of "phase-shifting transformer" has been changed; the terms "single-core phase-shifting transformer" and "two-core phase-shifting transformer" have been replaced.

The terms "single-core design" and "dual-core design" are used; the term "dual-core phase-shifting transformer" has been replaced with the terms "series unit" and "excitation unit".

The definitions of "series unit" and "excitation winding of a two-core phase-shifting transformer" have been modified; "lead-lag switch" has been added.

The terms and definitions of "polarity selector" and "Laryngeal system" are provided in Chapter 3.

---The calculation method for the load phase shift of the phase-shifting transformer was modified, and the phase shift angle diagrams of the phase-shifting transformer under different load conditions were analyzed.

Modifications and additions were made to conform to the actual situation in my country [see 4.3, Figures 3-6, Formulas (3)-16, IEC 62032:2012].

[4.3, Figure 3, Formulas (2) to (4)];

---The increased impedance of the parallel phase-shifting transformers is in accordance with the principle of "considering the base capacity as unchanged" to reflect the actual situation in my country (see 4.7.2);

---The seismic requirements have been modified to suit my country's specific circumstances, increasing the design seismic acceleration and the allowable differential motion between the two oil tanks.

The value requirements must conform to my country's usage conditions [see 5.2d)];

---Increased limits for short-circuit impedance deviation and no-load phase angle deviation at the zero-phase-shift tap position when phase-shifting transformers are operating in parallel, in order to in addition, the limits for the rated voltage ratio deviation and total phase shift angle deviation of adjacent equipment during series operation are specified to clarify the core requirements for series and parallel operation.

Heart-to-heart matching index (see 5.4.2);

---Change the terminal markings of the additional windings to aw, bw, and cw to conform to the actual situation in my country (see 6.2.1, IEC 62032:2012).

---The requirements for control system deviation have been revised, adding factors affecting deviation and stipulations for total deviation, in order to further clarify the control system...

Requirements for statistical deviation (see 9.2.3.1, IEC 62032:2012, 9.2.3);

---The control system now supports new communication protocols and is required to have self-diagnostic faults and remote alarm functions to improve its performance.

Compatibility and ease of operation and maintenance (see 9.2.4);

---The rated voltage of the phase-shifting transformer to which the "Special Operation Impact Test" applies has been changed from "345kV and above" to "330kV".

The specification includes "and above", and adds specific methods for special operation impulse test voltages and the voltages appearing on non-test terminals during the test.

The limits are set to conform to my country's actual conditions, and the test voltage and wiring requirements are further clarified (see 10.3.1.3).

(IEC 62032:2012, 10.2.1.2)

---Added. "Due to the special structure of phase-shifting transformers, deviations exceeding the requirements of GB/T 1094.1 should be resolved through negotiation between the manufacturer and the user." "Commerce" should be adopted to conform to my country's actual situation (see 11.1);

---Added. "Under normal circumstances, the no-load phase angle deviation of each device should not exceed $\pm 0.5^\circ$, and the short-circuit impedance deviation should not exceed $\pm 7.5\%$." the deviation limit takes precedence over general requirements, and the requirement for no-load phase angle deviation is changed from "preferably within 1% of their respective rated phase angles" to...

The change was made to "preferably within $\pm 1\%$ or $\pm 0.1^\circ$ (whichever is greater) of their respective rated phase shift angles" to strengthen deviation control during parallel operation.

The system is designed to conform to my country's actual conditions (see 11.3, IEC 62032:2012, 11.3.1);

---Added requirements to be specified in the tender document for insulating oil testing (including breakdown voltage, moisture content, dielectric loss, etc.) and partial discharge measurement (induced voltage test).

The test includes a local emission rate ≤ 100 pC and a long-term no-load test (lasting 72 hours, detecting dissolved gases in the oil) to refine the test requirements (see [link]).

12.4.5).

The following editorial changes have been made to this document.

---The formula numbering throughout the text has been changed;

---Replace LTC and OLTC with OLTC or on-load tap changers;

---The content of Chapter 1 has been modified;

---Correct the symbol "VLambda" in the original IEC formula (15) to "Vdelta", and correct the " $P=3\delta V_{xl}=P_x2\sin$ " in formula (17) to " $P=3\delta V_{xl}=P_x2\sin$ ".

($\alpha/2$)" should be corrected to " $P_d=3\delta V_{xl}=P_s x 2\sin(\alpha/2)$ ";

---Explanations have been added to the symbols in the IEC original text 4.5.1 formula;

---Change the footnotes below Table 1 to Table 1;

---The headings of clauses 6.1 and 6.2.1 in the original IEC text have been changed;

---The clause number and clause title of IEC 8.1.1 have been deleted;

---In IEC original texts 4.5, 4.6, 6.1.1 and 10.2.2, the letter subscripts 1, 2, and 3 for the three phases involved in the text and figures are A, B, C, D, E, F, G...

C was replaced;

---Correct the symbols "VSN, VLN" in the original IEC formula (18) to "VS-N, VL-N";

---Appendix A of the original IEC text has been changed to a reference, and its content has been modified accordingly;

---Appendix B of the original IEC text has been deleted.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Electrical Equipment Industry Association.

This document is under the jurisdiction of the National Technical Committee on Transformer Standardization (SAC/TC44).