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

GB 1094.2-2013

Replacing GB 1094.2-1996

**Power transformers -- Part 2: Temperature rise for
liquid-immersed transformers**

电力变压器 第2部分：液浸式变压器的温升

(English Translation)

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Foreword

Chapter 4 of this section, Chapters 5 and 6 are mandatory, the rest are recommended.

GB 1094 "Power Transformers" currently contains the following sections.

- Part 1. General;
- Part 2. liquid-immersed transformer temperature rise;
- Part 3. Insulation levels, dielectric tests and external insulation air gap;
- Part 4. Power transformers and reactors lightning impulse and switching impulse testing guidelines;
- Part 5. ability to withstand short circuit;
- Part 6. Reactors;
- Part 7. oil-immersed power transformer loading guidelines;
- Part 10. Determination of sound levels;

- Part 10.1. Determination of sound levels - Application guide;
- Part 11. Dry-type transformers;
- Part 12. Dry-type power transformer loading guidelines;
- Part 14. High temperature insulation materials liquid-immersed transformer design and application;
- Part 16. Wind power transformers.

This section GB Part 2 1094.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This Part replaces GB 1094.2-1996 "Power transformers - Part 2. temperature rise" compared with GB 1094.2-1996, the main technical Changes are as follows.

- This section applies only to liquid-immersed transformers;
- Standard name changed to "liquid-immersed transformer temperature rise";
- Gives terms and definitions related to temperature rise;
- Average winding temperature rise from the previous version of the 65K, to ON and OF cooling is 65K, OD cooling to 70K;
- Use the hot temperature limit parameters;
- Clearly defines the measurement method when the ambient temperature rise test;
- Improved temperature rise test methods;
- When the specified temperature rise test, test site cooling air temperature should be between 5 °C and transformer design is based on the maximum ambient temperature Degrees;
- Calculation formulas power off instantly average winding temperature rise;
- Increasing the winding hot spot temperature correction coefficient;
- Details of the hot temperature cooling ON and OD under the model;
- Describes the resistance measuring circuit;
- Details of the numerical calculation of the temperature curve extrapolation process;
- Describes the installation method of direct measurement of the winding hot spot temperature sensor.

This section uses redrafted law revision using IEC 60076-2:2011 "Power transformers - Part 2. liquid-immersed transformers the temperature rise. " this part of IEC 60076-2:2011 technical differences and their reasons are as follows.

--- In order to meet our technical requirements, by modifying the normative references international standards instead of GB 1094.1 IEC 60076-1;

--- In order to meet our climate conditions, in Table 2, increased the average annual temperature is 15 °C, the average monthly temperature is 25 °C and the maximum temperature when the correction value is 35 °C temperature rise limits;

--- When the test site to comply with China's actual situation, in the first paragraph 7.2.1, the temperature rise test conducted by the minimum air temperature 10 °C to 5 °C;

--- To comply with the actual situation of the formula (B.2) in $\theta_{am}(t) = A_0(1-kt)$ is amended as $\theta_{am}(t) = A_0-kt$, in Fig. B.3 $A_0(1-kt)$ is amended as A_0-kt .

This section also made the following editorial changes.

--- 7.3.3 of the contents according to different products divided into 7.3.3.1 and 7.3.3.2;

--- The IEC 60076-2:2011 in Appendix A, Appendix B, Appendix C and Appendix D to Appendix C, Appendix D, and Appendix B attached Record A;

--- Fig B.1 and B.2 of identification 1U, 1V and 1W replaced with A, B and C; 2U, 2V and 2W with a, b and c for Change; 1N replaced with N;

--- Formula (B.1), formula (B.3), formula (B.12), formula (B.13) and B.4 of B is amended as g;

--- B.3 in the temperature measurement with the Variable Table as Table B.1, as the original table B.1 Table B.2.

Please note that some of the content of this document may involve patents. Release mechanism of the present document does not assume responsibility for the identification of these patents.

This part is proposed by the China Electrical Equipment Industrial Association.

This part of the National Standardization Technical Committee transformers (SAC/TC44) centralized.

This section is drafted. Shenyang Transformer Research Institute Co., Ltd., National Transformer Quality Supervision and Inspection Center, State Grid Electric Power Research Institute, Baoding Tianwei Electric Co., Ltd., TBEA Shenyang Transformer Group Co., Ltd., Xi'an Electric transformer limited liability any company, East China Power Grid Co., Ltd., Jilin Electric Power Research Institute, TBEA Hengyang Transformer Co., Ltd., a limited SUNTEN equipment the company, Pearl Electric Co., Ltd., Wolong Electric Group Beijing Huatai Transformer Co., Ltd., Guangdong Julong Electric Power Equipment Co., Ltd., Wujiang change Pressure Factory Ltd., China Electric Power Research Institute, Electric Power (Jiangsu) Co., Ltd., Guangzhou Prosperous Electric Co., Ltd., Wolong Electric Gas Transformer Co., Ltd. Yinchuan Xinhua Electric Co., Ltd. are special.

1 Scope

GB 1094 this section applies to liquid-immersed transformers. This section provides flag transformer cooling mode, the transformer temperature rise limits and temperature rise test methods.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version suitable for use herein Member. For undated references, the latest edition (including any amendments) applies to this document.

GB 1094.1 Power transformers - Part 1. General (GB 1094.1-2013, IEC 60076-1:2011, MOD) GB/T 13499-2002 Application guide for power transformers (idt IEC 60076-8.1997) IEC 60085:2007 for electrical insulation and heat resistance assessment instructions (Electrical insulation-Thermal evaluation and designation) IEC 61181:2007 Mineral oil-impregnated electrical equipment electrical equipment factory test of dissolved gas analysis (DGA) application [Mineral oil-filled electrical equipment-Application of dissolved gas analysis (DGA) to factory tests on electrical equipment] IEC Guide 115:2007 Measurement uncertainty in conformity assessment in the field of Electrical Application (Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector)

3 Terms and Definitions

GB 1094.1 define the following terms and definitions apply to this document.

External cooling medium Transformer cooling liquid circulating outside the system away transformer losses produce heat medium (air or water).

Internal cooling medium Liquid contact with the transformer winding or other components, the heat generated by the loss they will pass the intermediate or external cooling medium.

Note: The liquid may be a mineral oil and other natural or synthetic liquid.

Temperature temperature rise Temperature of the component (parts) under consideration. the difference between the temperature of the external cooling medium (e.g., the average winding temperature).

Top temperature of the liquid top-liquid temperature θ_{top} Tank top (top cooling circuit) of insulating liquid temperature.

Top liquid temperature top-liquid temperature rise $\Delta\theta_{top}$ Top temperature of the liquid cooling medium and the external temperature difference.

The bottom temperature of the liquid bottom-liquid temperature θ_{bot} Insulating liquid or