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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB 20052-2024

Replacing GB 20052-2020

Minimum allowable values of energy efficiency and energy efficiency grades for power transformers

电力变压器能效限定值及能效等级

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020 Directives for Standardization - Part

1.Rules for the Structure and Drafting of Standardizing Documents. This document serves as a replacement of GB 20052-2020 Minimum Allowable Values of Energy Efficiency and the Energy Efficiency Grades for Power Transformers. In comparison with GB 20052-2020, apart from structural adjustments and editorial modifications, the main technical changes are as follows:

---The applicable scope of the Standard is modified. oil-immersed transformers and dry-type transformers with three-phase 6 kV ~ 35 kV voltage level, non-excitation voltage regulation, rated frequency of

50 Hz and rated capacity of 500 kVA and above for photovoltaics, wind power and energy storage on the new energy power generation side are added; oil-immersed transformers with three-phase 66 kV voltage level, non- excitation voltage regulation, rated frequency of

50 Hz and rated capacity of 3,150 kVA ~ 20,000 kVA for photovoltaics, wind power and energy storage on the new energy power generation side are added; "high-impedance transformers" are deleted (see Chapter 1; Chapter 1 of Version 2020);

---The requirements for the minimum allowable values of energy efficiency for 6 kV, 10 kV, 35 kV and 66 kV transformers for photovoltaics, wind power and energy storage on the new energy power generation side are added (see 5.2);

---The minimum allowable values of load loss of the 10 kV / 2,500 kVA oil-immersed three-phase dual-winding non-excitation voltage regulating distribution transformers for Grade 1 and Grade 2 energy efficiency are modified (see Table 1; Table 1 of Version 2020);

---The short-circuit impedance of some 10 kV dry-type three-phase dual-winding non-excitation voltage regulating distribution transformers is modified (see Table 2; Table 2 of Version 2020);

---The short-circuit impedance of some 66 kV oil-immersed three-phase dual-winding on-load voltage regulating power transformers is modified (see Table 6; Table 6 of Version 2020);

---The short-circuit impedance of some 110 kV oil-immersed three-phase dual-winding on-load voltage regulating power transformers is modified (see Table 10; Table 10 of Version 2020);

---The short-circuit impedance of some 220 kV oil-immersed three-phase three-winding on-load voltage regulating auto-coupling power transformers is modified (see Table 17; Table 17 of Version 2020); Minimum Allowable Values of Energy Efficiency and the Energy Efficiency Grades for Power Transformers

1 Scope

GB 20052-2024 sets the minimum energy efficiency values and the efficiency grades for power transformers in China. A transformer is a device with no moving parts that runs continuously for thirty years, so its no-load and load losses, small as a percentage, add up to an enormous quantity of energy across a national grid; China has used this mandatory standard repeatedly as the instrument for clearing inefficient transformers out of the market. The document sets the scope of the transformers covered by rating and type, oil-immersed and dry-type, the definitions of the losses and the conditions at which they are measured, the energy efficiency grades from grade 1 to grade 3 with the loss limits for each rating and voltage class, the minimum allowable values that constitute the market access threshold, the target values, the test methods, the inspection rules and the marking of the efficiency grade. The 2024 edition replaces GB 20052-2020 and tightens the limits again. For a transformer maker, a utility or an importer, this is the threshold a product has to clear to be sold in China.

This document specifies the minimum allowable values of energy efficiency, the energy efficiency grades and test methods for power transformers. This document is applicable to oil-immersed distribution transformers and dry-type distribution transformers with three-phase 10 kV voltage level, non-excitation voltage regulation, rated frequency of

50 Hz and rated capacity of 30 kVA ~ 2,500 kVA; oil-immersed power transformers with 35 kV ~ 500 kV voltage level, rated frequency of

50 Hz and rated capacity of 3,150 kVA and above; oil-immersed transformers and dry-type transformers with three-phase 6 kV ~ 35 kV voltage level, non-excitation voltage regulation, rated frequency of

50 Hz and rated capacity of 500 kVA and above for photovoltaics, wind power and energy storage on the new energy power generation side; oil-immersed transformers with three-phase 66 kV voltage level, non-excitation voltage regulation, rated frequency of

50 Hz and rated capacity of 3,150 kVA ~ 20,000 kVA for photovoltaics, wind power and energy storage on the new energy power generation side. This document is not applicable to inflatable transformers, tower transformers and engine room transformers.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1094.1 Power Transformers - Part

3 Terms and Definitions

The terms and definitions defined in GB/T 1094.1, GB/T 1094.11, GB/T 1094.16 and GB/T 2900.95, and the following are applicable to this document.

3.1 minimum allowable values of energy efficiency for power transformer Under the specified test conditions, the maximum allowable limit of no-load loss and load loss of the transformer.

4 Energy Efficiency Grades

The energy efficiency grades of power transformers are divided into three grades, among which, Grade 1 has the highest energy efficiency and the lowest loss. The measured no-load loss and load loss of power transformers of each grade under the rated capacity shall not be higher than those specified in Table 1 ~ Table 28. The measured no-load loss and load loss of transformers of each grade for photovoltaics, wind power and energy storage on the new energy power generation side under the rated capacity shall not be higher than those specified in Table 29 ~ Table

35.For rated capacity products not listed in the Table, the no-load loss and load loss shall be determined by linear interpolation.

5 Technical Requirements

5.1 Basic Requirements The technical parameters and technical requirements of power transformers shall comply with GB/T 1094.1 and GB/T 6451.The technical parameters and technical requirements of oil- immersed amorphous alloy core transformers shall also

comply with GB/T 25446, and the technical parameters and technical requirements of three-dimensional wound core distribution transformers shall also comply with GB/T 25438.The technical parameters and technical requirements of dry-type distribution transformers shall also comply with GB/T 1094.11 and GB/T 10228.The technical parameters and technical requirements of dry-type amorphous alloy core transformers shall also comply with GB/T 22072.The technical parameters and technical requirements of transformers for wind power generation shall also comply with GB/T 1094.16.

11 Dry-type Transformers

GB/T 1094.16 Power Transformers - Part

16 Transformers for Wind Turbine Applications

GB/T 2900.95 Electrotechnical Terminology - Transformers, Voltage Regulators and Reactors

GB/T 6451 Technical Parameters and Requirements for Oil-immersed Power Transformers

GB/T 10228 Technical Parameters and Requirements for Dry-type Power Transformers

GB/T 22072 Specifications and Technical Requirements for Dry-type Amorphous Alloy Core Distribution Transformers

GB/T 25438 Specification and Technical Requirements for Three-phase Oil-immersed Tridimensional Toroidal-core Distribution Transformers

GB/T 25446 Specification and Technical Requirements for Oil-immersed Amorphous Alloy Core Distribution Transformers