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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 15544.1-2023

Replacing GB/T 15544.1-2013

Short-circuit current calculation in three-phase a. c. systems - Part 1: Calculation of currents

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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:

This document is the first part of GB/T 15544 "Short-circuit current calculation of three-phase AC system": GB/T 15544 has released 5

part:

--- Part 1: Current calculation;

--- Part 2: Coefficients applied to the calculation of short-circuit current;

--- Part 3: Electrical equipment data;

--- Part 4: The current and the current flowing through the earth when two independent single-phase ground faults occur simultaneously;

--- Part 5: Examples:

This document replaces GB/T 15544:1-2013 "Short-circuit current calculation of three-phase AC system Part 1: Current calculation", and

Compared with GB/T 15544:1-2013, except for structural adjustment and editorial changes, the main technical changes are as follows:

--- Deleted "When the system nominal voltage is 500kV and above, and contains long-distance AC transmission lines, special consideration is required

consider: ", and omit the 60Hz system in the scope of application (see 1:1 of the:2013 edition);

---Modified the normative references (see Chapter 2, 1:2 of the:2013 edition);

--- Added some terms and definitions (see 3:23~3:27), and deleted the term "transient

potential of synchronous motor" (see:2013

Versions 1:3:16, 3:6:1 and 8);

--- Modified some symbols and subscripts (see 4:2 and 4:3, 1:4:1 and 1:4:2 of the:2013 edition);

--- Modified the nominal voltage, voltage coefficient requirements and footnotes in Table 1 (see Table 1, Table 1 of the:2013 edition);

--- Deleted Figure 5 and related statements (see 2:3:2 and Figure 5 of the:2013 edition);

---Deleted "If the resistance is included in the calculation but the specific value is not known, it can be calculated according to RQ=0:1XQ and XQ=0:995ZQ:" (See

3:2 of the:2013 edition);

--- Added that when calculating the short-circuit current of 110kV and above voltage level, the asynchronous motor of the distribution network can be considered in an equivalent way

contribution (see 7:1:3);

---Deleted the relevant regulations on asynchronous motors connected to the network through transformers (see 3:8:2 of the:2013 edition);

--- "In the high-voltage direct current transmission system, the influence of capacitor banks and filters should be taken into special consideration when calculating the short-circuit current of the AC system:"

Changed to "In HVDC power transmission system, when calculating the short-circuit current of the AC system, special consideration should be given to the relationship between the capacitor bank and the filter

Influence: " (see 6:12, 3:10 of the:2013 edition);

--- Added "KSO=1 when calculating the minimum short-circuit current:" (see 6:7:2);

--- Added new energy and full power converters to provide short-circuit current calculation related content (see 6:8, 6:9, 9:1:3, 9:1:4, 11:2:2,

11:2:3, 11:2:4 and 11:2:5), and the calculation formulas of initial short-circuit current, short-circuit current peak value and symmetrical breaking current have been revised accordingly:

formula (see Chapter 7, Chapter 8 and Chapter 9, 4:2, 4:3 and 4:5 of the:2013 edition):

This document is modified to adopt IEC 60909-0:2016 "Short-circuit current calculation of three-phase AC system - Part 0: Current calculation":

The technical differences between this document and IEC 60909-0:2016 and the reasons are as follows:

--- Deleted "When the nominal voltage of the system is 500kV and above, and contains long-distance AC transmission lines, special consideration is required:"

(See Chapter 1), and omit the 60Hz system in the scope of application: The highest voltage level of my country's AC power grid is 1000kV:

Verify that the calculation method in this document can be applied to 500kV and upper AC systems with appropriate modifications:

---Specific adjustments for normative reference documents are as follows:

* Replaced IEC 60038:2009 with GB/T 156-2017, which adopts international standards;

* Replace IEC 60050-131 with GB/T 2900:74-2008, which adopts international standards;

* Deleted IEC TR60909-1:2002, IEC TR60909-2:2008, IEC 60909-3:2009 that were not cited in the text

and IEC /T R60909-4:2000:

--- Added the term "three-phase short circuit" and "two-phase ground short circuit", and modified the definition of "two-phase short circuit" (see Chapter 3):

--- Deleted some symbols and superscripts that do not appear in this document (see Chapter 4):

--- Modified part of the statement of the equivalent voltage source at the short-circuit point; modified the medium voltage and high voltage nominal voltages in Table 1, added extra high voltage and

The voltage coefficient of UHV; at the same time, footnote a was modified, and "For EHV and UHV systems, cmaxUn can be the highest

Operating voltage" to adapt to the actual situation of my country's power grid (see 5:3:1):

---Deleted "if the resistance is included in the calculation but the specific value is not known, it can be calculated according to RQ=0:1XQ and XQ=0:995ZQ:"; because

Since the scope of application of this document covers low voltage to ultra-high voltage, the recommended values of typical X/R parameters are not applicable to ultra-high voltage and ultra-high voltage systems:

system (see 6:2):

--- Added "Transformer high voltage side zero-sequence impedance is related to transformer model and grounding method"; deleted "If based on full-power converter

When the short-circuit current provided by the power plant station is not higher than 5% of the initial short-circuit current of the bus without the plant station, its contribution can be ignored

short circuit current: ": Because the new energy collection station may gather multiple power plants based on full power converters, a single power plant provides

The short-circuit current supplied by the power plant does not exceed 5%, but the sum of the short-circuit current provided by multiple power plants is very large: If ignored according to this rule, it may cause

to a larger error (see 6:9):

--- Added that when calculating the short-circuit current of 110kV and above voltage level, the asynchronous motor of the distribution network can be considered in an equivalent way

contribution: Because in the short-circuit current calculation data of my country's transmission network, the distribution network is equivalent to 110kV or 220kV

It is not suitable to use the full voltage level model of the asynchronous motor, which is equivalent to simulate the way the asynchronous motor provides short-circuit current

A higher calculation accuracy can be obtained (see 7:1:3):

---Increase the three-phase maximum power supply current of the full-power converter "It can be replaced by the reactive current provided during the failure of the new energy unit:

Generally, the adjustable current source model can be used (see GB/T 19963 and GB/T 19964)" (see 7:2:1):

--- Increased two-phase ground short-circuit peak current "To simplify the calculation, the same kappa value as the three-phase short-circuit can be used:" (see 8:3):

The following editorial changes have been made to this document:

--- Change the name of the standard to "Short-circuit current calculation of three-phase AC system Part 1: Current calculation";

---Modified the references:

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

Introduction

GB/T 15544 "Calculation of Short-Circuit Current in Three-phase AC System" consists of five parts:

--- Part 1: Current calculation: The purpose is to give the calculation method of the short-circuit current of the three-phase AC system, corresponding to IEC 60909-0:

--- Part 2: Coefficients applied to short-circuit current calculations: The purpose is to give an explanation of the correlation coefficients involved in the calculation of the short-circuit current