

ICS 29.240.20
CCS F 20



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

GB/T 15544-1995

Replacing GB/T 15544.1-2013

**Short-circuit current calculation in three-phase a. c. systems -
Part 1: Calculation of currents
(English Translation)**

Issued on: March 17, 2023

Implemented on: October 1, 2023

Issued by: State Administration for Market Regulation

Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative references	
3 Terms and Definitions	
4 Symbols, superscripts and subscripts	
4.1 Overview	
4.2 Symbol	
4.3 Subscript	
4.4 Superscript	
5 Short-circuit current characteristics: Calculation method	
5.1 Overview	
5.2 Calculation Assumption	
5.3 Calculation method	
6 Short-circuit impedance of electrical equipment	
6.1 Overview	
6.2 Feed network	
6.3 Transformers	
6.4 Overhead lines and cables	
6.5 Current limiting reactor	
6.6 Synchronous motors	
6.7 Generator Transformer Set	
6.8 Wind turbines	
6.9 Full power converter unit	
6.10 Asynchronous motors	
6.11 Static inverter driven motor	
6.12 Capacitors and non-rotating loads	
7 Calculation of initial short-circuit current	
7.1 Overview	
7.2 Initial value of three-phase short-circuit current	
7.3 Two-phase short circuit	
7.4 Two phases to ground short circuit	

7.5	Single phase to ground short circuit
8	Calculation of peak value of short-circuit current
8.1	Three-phase short circuit
8.2	Two-phase short circuit
8.3	Two phases to ground short circuit
8.4	Single phase to ground short circuit
9	Calculation of symmetrical breaking current
9.1	Three-phase short circuit
9.2	Unbalanced short circuit
10	DC component of short-circuit current
11	Steady-state short-circuit current calculation
11.1	Overview
11.2	Three-phase short circuit
11.3	Unbalanced short circuit
12	Transformer low-voltage side short-circuit High-voltage side single-phase disconnection
13	Asynchronous motor terminal short circuit
14	Heating Effects of Short-Circuit Current
Appendix A (Normative) Calculation Formulas of Coefficients m and n	
Appendix B (Informative) Nodal Admittance and Nodal Impedance Matrix	
Reference	

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, 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 $R_Q=0.1X_Q$ and $X_Q=0.995Z_Q$:" (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, c_{maxUn} 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 $R_Q = 0.1X_Q$ and $X_Q = 0.995Z_Q$ "; 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