

IEEE Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems

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Abstract: Activities related to short-circuit analysis, including design considerations for new systems, analytical studies for existing systems, as well as operational and model validation considerations for industrial and commercial power systems are addressed. Fault current calculation and device duty evaluation is included in short-circuit analysis. Accuracy of calculation results primarily relies on system modeling assumptions and methods used. The use of computer-aided analysis software with a list of desirable capabilities recommended to conduct a modern short-circuit study is emphasized. Examples of system data requirements and result analysis techniques are presented.

Keywords: ac decrement, asymmetrical fault current, available fault current, bolted fault, breaking capacity, breaking duty, data collection, dc component, dc decrement, dc offset, device duty calculation, fault calculation, fault duty, IEEE 3002.3, interrupting capacity, interrupting duty, making capacity, making duty, momentary capacity, momentary duty, short-circuit analysis, short-circuit current, short-circuit studies, short-circuit withstand, symmetrical component, symmetrical fault current, system modeling, system validation, X/R ratio

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IEEE Std 3002.3™

The material in this recommended practice partially comes from IEEE Std 551™, IEEE Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Power Systems (*IEEE Violet Book™*) and IEEE Std 399™, IEEE Recommended Practice for Industrial and Commercial Power System Analysis.^{1, 2}

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Contents

1. Scope	1
2. Normative references.....	1
3. Definitions, acronyms, and abbreviations	2
3.1 Definitions	2
3.2 Acronyms and abbreviations	7
4. Introduction	9
4.1 Overview	9
4.2 Objectives for short-circuit analysis	10
4.3 Methodology and standards	10
5. Description of short-circuit current	11
5.1 Introduction	11
5.2 Available short-circuit current	11
5.3 Symmetrical and asymmetrical currents	12
5.4 Short-circuit calculations	14
5.5 Total short-circuit current	16
5.6 Why short-circuit currents are asymmetrical	18
5.7 DC component of short-circuit currents	18
5.8 Significance of current asymmetry	18
5.9 The application of current asymmetry information	19
5.10 Maximum peak current.....	20
5.11 Types of faults	25
5.12 Arc resistance	27
6. General short-circuit calculation method.....	28
6.1 Introduction	28
6.2 Fundamental principles.....	28
6.3 Short-circuit calculation procedure.....	32
6.4 One-line diagram	33
6.5 Per-unit and ohmic manipulations	40
6.6 Network theorem and calculation techniques	42
6.7 Symmetrical components—modeling method for unbalanced faults calculation.....	50
6.8 Representing transformers with non-base voltages	54
6.9 Specific time period and variations on fault calculations	62
6.10 Determination of X/R ratios for fault calculations	64
7. Equipment modeling for short-circuit calculation	65
7.1 Introduction	65
7.2 Power grid	66
7.3 Synchronous machines	66
7.4 Induction machines.....	71
7.5 Transformers.....	78
7.6 Duplex reactor	79
7.7 Transmission lines and cables.....	80
7.8 Capacitor and capacitive shunt components	81
7.9 Equivalent circuits	82
7.10 Zero sequence line representation.....	82

8. Short-circuit calculation method and device duty per ANSI standards	83
8.1 Introduction	83
8.2 Basic assumptions and system modeling.....	83
8.3 ANSI recommended practice for ac decrement modeling.....	84
8.4 ANSI practice for dc decrement modeling	88
8.5 ANSI-conformable fault calculations	95
8.6 ANSI-approved standards and interrupting duties.....	97
8.7 Unbalanced short-circuit calculations.....	98
9. Application of short-circuit interrupting equipment per ANSI standard	106
9.1 Introduction	106
9.2 Application considerations	106
9.3 Equipment data	107
9.4 Fully-rated systems.....	108
9.5 Low-voltage series-rated equipment.....	108
9.6 Low-voltage circuit breaker short-circuit capabilities less than rating	109
9.7 Equipment checklist for short-circuit currents evaluation	110
9.8 Equipment phase duty calculations.....	111
9.9 Equipment ground fault duty calculations	116
9.10 Capacitor switching	117
10. Short-circuit calculation method and device duty per IEC standard.....	117
10.1 Introduction	117
10.2 System modeling and methodologies	118
10.3 Voltage factors.....	119
10.4 Short-circuit currents per IEC 60909.....	119
10.5 Short-circuits far from generator	120
10.6 Short-circuits near generator.....	125
10.7 Influence of the motors.....	132
10.8 Fault calculations in complex systems.....	134
10.9 Low-voltage systems	138
11. Comparison of ANSI and IEC short-circuit calculation methods.....	142
11.1 Introduction	142
11.2 Difference in equipment modeling	142
11.3 Difference in calculation method.....	143
12. Equipment data required for short-circuit calculation	144
12.1 Introduction	144
12.2 Utility sources.....	145
12.3 Generators.....	145
12.4 Synchronous motors	146
12.5 Induction motors.....	147
12.6 Transformers.....	147
12.7 Reactors	148
12.8 Capacitors.....	149
12.9 Static regenerative drives.....	149
12.10 Circuit breakers, contactors, and current transformers	150
12.11 Cables	150
12.12 Transmission lines	151
12.13 Protective device ratings.....	151
13. Data collection and preparation.....	152
13.1 Introduction	152
13.2 Utility short-circuit parameters.....	152
13.3 Equipment data from existing system.....	152

13.4 Typical data for short-circuit calculation	153
13.5 Library data from computer software	154
14. Model and data validation	154
14.1 Introduction	154
14.2 Parameters and model to be validated	154
14.3 Methods for model and data validation	155
15. Study scenarios and solution parameters	155
15.1 Introduction	155
15.2 Maximum and minimum short-circuit contributions	155
15.3 System configurations	156
15.4 System operating conditions	156
16. Results and reports	157
16.1 Introduction	157
16.2 ANSI standard based studies	157
16.3 IEC standard based studies	158
17. Features of analysis tools.....	158
17.1 Introduction	158
17.2 Essential features for ANSI-based studies	158
17.3 Essential features for IEC based studies	160
17.4 Essential features for all standards.....	161
17.5 Optional features.....	162
18. Illustration examples	163
18.1 ANSI example system	163
18.2 IEC Example system.....	166
Annex A (informative) Bibliography	168

IEEE Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems

1. Scope

This recommended practice describes how to conduct short-circuit studies and analysis of industrial and commercial power systems. It is likely to be of greatest value to the power-oriented engineer with limited experience in this area.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI/IEEE Std C37.5™, IEEE Guide for Calculation of Fault Currents for Application of AC High-Voltage Circuit Breakers Rated on a Total Current Basis.¹

IEC 60909, Short-circuit currents in three-phase a.c. systems.²

IEC 61363-1:1998, Electrical installations of ships and mobile and fixed offshore units—Part 1: Procedures for calculating short-circuit currents in three-phase a.c.

IEEE Std 141™, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (*IEEE Red Book™*).^{3, 4}

IEEE Std 241™, IEEE Recommended Practice for Electric Power Systems in Commercial Buildings (*IEEE Gray Book™*).

IEEE Std 242™, IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (*IEEE Buff Book™*).

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