AS 3851—1991

Australian Standard®

The calculation of short-circuit currents in three-phase a.c. systems

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Australian Electrical and Electronic Manufacturers Association

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PREFACE

This Standard was prepared by the Standards Australia Committee on Power Switchgear, in response to requests from the industry for standard methods suitable for both manual and computer calculation of prospective short-circuit currents.

It is based technically on the following IEC documents and acknowledgement is made of the assistance received from these documents:

73(Central Office)5: Draft—Short-circuit calculation in three-phase a.c. systems

73(Central Office)17: Draft—Application guide for the calculation of short-circuit currents in low-voltage radial systems neglecting the influence of motors

IEC 865: Calculation of the effects of short-circuit currents

The editorial presentation of this Standard does not follow these IEC documents but adopts a concise and systematic approach which should be more readily understood by non-specialist electrical engineers and students of electrical engineering.

The calculation procedure is divided into two basic steps—

(a) calculating the impedances of the circuit elements from their characteristics independent of the fault; and

(b) the calculation of fault currents from the fault voltage and impedances.

This Standard is concerned with the calculation of the current in the fault. The distribution of resulting currents in the network would need to be determined from detailed circuit analysis.

The major differences between this Standard and the above IEC documents are as follows:

(i) The IEC concept of a power station unit has been deleted, generators and transformers being treated independently. This results in a different treatment of faults around power station units.

(ii) The concept of I^2t (joule integral) of the short-circuit has been substituted for the thermal equivalent short-circuit current in IEC 865, which permits a uniform presentation of results with regard to both fuse and circuit-breaker characteristics.

(iii) The reader is provided with data to be assumed in the absence of known data. This is particularly useful for calculations requiring zero-sequence data.

(iv) Values of the voltage factor *(c)* have been chosen to be representative of Australian practice.

(v) A more general equation has been provided for overhead line impedance.

(vi) Figure 8.2 for determination of the type of short-circuit producing the highest current when the phase angles of the sequence impedances are equal, has been redrawn to cover a wider range, allowing an improved appreciation of the relative significance of line-to-line-earth faults.

(vii) Appendix A has been included to cover standard calculations on a per unit basis.

(viii) Appendix C has been included showing equivalent circuits for the determination of zero-sequence short-circuit currents in transformers.

(ix) The Appendices D and E provide different examples for the calculation of short-circuit currents on ohmic and per unit bases respectively.

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