

C37.20.7™

IEEE Guide for Testing Medium-Voltage Metal-Enclosed Switchgear for Internal Arcing Faults

IEEE Power Engineering Society

Sponsored by the
Switchgear Committee



Published by
The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

20 May 2002

Print: SH94967
PDF: SS94967

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Approved 7 December 2001

IEEE-SA Standards Board

Abstract: A procedure for testing and evaluating the performance of medium-voltage metal-enclosed switchgear for internal arcing faults is covered in this guide. A method of identifying the capabilities of this equipment is given. Service conditions, installation, and application of equipment are also discussed.

Keywords: accessibility, arc, internal arcing fault, bus, compartment, metal-clad switchgear, metal-enclosed interrupter switchgear, metal-enclosed switchgear, overpressure, protection

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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Print: ISBN 0-7381-3076-1 SH94967
PDF: ISBN 0-7381-3077-X SS94967

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Introduction

(This introduction is not a part of IEEE Std C37.20.7-2001, IEEE Guide for Testing Medium-Voltage Metal-Enclosed Switchgear for Internal Arcing Faults.)

The standards and guides in the C37 series have been developed over a period of many years through the cooperative efforts of users, specifiers, manufacturers, and other interested parties. Failure within a switchgear assembly—whether from a defect, an unusual service condition, lack of maintenance, or mis-operation—may initiate an internal arc. There is little likelihood of an internal arc in equipment meeting the requirements of IEEE Std C37.20.2-1999 or IEEE Std C37.20.3-2001,^a but the possibility cannot be completely disregarded. The intent of this guide is to address the testing procedure for internal arcing faults in metal-enclosed switchgear.

In the 1970s, principally in Europe, interest arose in evaluating electrical equipment under conditions of internal arcing. As a result, a draft Annex AA to IEC 298, A.C. Metal-Enclosed Switchgear and Controlgear for Rated Voltages Above 1 kV and Up to and Including 52 kV, was prepared in 1976 and approved by the IEC in 1981. The present edition of IEC 298 (currently IEC 60298 [B1])^b was approved in 1990.

Knowledge of the arc resistance testing guide in IEC 298 spread to North America and was used as the basis for EEMAC G14-1, 1987, Procedure for Testing the Resistance of Metal-Clad Switchgear Under Conditions of Arcing Due to an Internal Fault. EEMAC G14-1 incorporated improvements in knowledge and understanding in more than a decade of use of Annex AA of IEC 298-1981 in Europe.

The development of IEEE Std C37.20.7-2001 rests heavily on Annex AA of IEC 298-1981 and Amendment 1-1994, and incorporates many of the refinements originated in EEMAC G14-1.

Even when arc-resistant construction is specified, it is strongly recommended that supplemental power system protection be provided. This supplemental protection should limit the total energy that can be delivered in the event of internal arcing faults. This protection can be provided in a variety of ways, depending on the nature of the system. Among the forms of protection that may be appropriate are current-limiting fuses on the primary side of power transformers, zone differential or bus differential relaying, ground differential protection, or arc sensing systems sensitive to light or pressure effects that accompany internal arcing faults. The objective of such protection must be to cause the interruption of all sources of power to the arcing fault in a time interval that is shorter than the arcing duration capability demonstrated by the tests contained within this guide (see 4.3).

^aInformation on references can be found in Clause 2.

^bThe numbers in brackets correspond to those of the bibliography in Annex B.

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