



IEEE Guide for the Application of Surge Voltage Protective Equipment on AC Rotating Machinery 1000 V and Greater

Corrigendum 1: Correct Table 2, A.1, and A.2

IEEE Power & Energy Society

Sponsored by the
Surge Protective Devices/High Voltage Committee

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Abstract: Errors identified in IEEE Std C62.21-2003 are addressed.

Keywords: AC rotating machines, coil insulation, generator insulation, groundwall insulation, impulse voltage, insulation strength, insulation withstand, motor insulation, surge arrester, surge voltage, surge withstand, turn insulation, winding insulation

The Institute of Electrical and Electronics Engineers, Inc.
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Introduction

This introduction is not part of IEEE Std C62.21-2003/Cor 1-2008, IEEE Guide for the Application of Surge Voltage Protective Equipment on AC Rotating Machinery 1000 V and Greater—Corrigendum 1: Correct Table 2, A.1, and A.2.

This guide started with the publishing of an IEEE Transactions paper in 1981 by a Working Group of the Rotating Machinery Committee. That paper, “Impulse Voltage Strength of AC Rotating Machines,” made a significant contribution to the ease of protecting electric utility rotating machines from surges. The paper indicated that ac machines could be expected to withstand surge fronts of 5 μ s with magnitude equal to the crest of the factory test voltage, and could withstand surge fronts as short as 200 ns with magnitude equal to two times crest line-to-ground rated voltage. At that time, ac machine manufacturers were usually recommending that large motors be surge protected on the grounds that protection was cheap and failure was costly. It was recognized that most of the knowledge was with the manufacturers, not the users. There was little measured data on the actual surge environment experienced by machines, nor was there measured data of actual withstand voltage or voltage to breakdown of machines in service. In addition, a survey of several thousand motors in industrial service showed that few were equipped with surge protection, and there was almost no evidence of failure due to absence of surge protection. A survey by WG3.4.9 of the Surge Protective Devices Committee found (from a small sample of utility installations) that surge protective capacitors were failing at about the same rate as those motor insulation failures that were not caused by overheating. It was also recognized that capacitor leads as usually installed, and even when of quite short lengths, have sufficient inductance to prevent the capacitor from protecting the machine from steep-front surges. Motor starting surge fronts as short as 200 ns had been measured.

At the instigation of an Edison Electric Institute committee and with electric utility support, the Electric Power Research Institute (EPRI) undertook a research program to investigate the surge environment being experienced by ac rotating machines, and machine surge withstand strength. The effort was directed to understand and be able to predict whether a particular machine was at risk. Both motors and generators were investigated. Particular attention was given to the problem of steep-front surges produced by full-voltage starting of motors (across-the-line). Much of the field and analytical work was contracted by EPRI to Ontario Hydro. By courtesy of EPRI and Ontario Hydro, and at their expense, IEEE Transactions papers were prepared to make the substance of their research generally available to the electric power industry and for preparation of IEEE guides.

Concurrent with the EPRI/Ontario Hydro work, the National Electrical Manufacturers Association (NEMA), the International Electrotechnical Commission (IEC), and the IEEE have developed factory surge test standards for some ac machines.

This corrigendum makes two corrections to the keywords currently found in the frontmatter of IEEE Std C62.21-2003 by changing *groundwall installation* to *groundwall insulation* and changing *turn installation* to *turn insulation*. This corrigendum also corrects Table 2 found in 5.3.4 by correcting the K value for Y grounded primary to Delta secondary connection; and by clarifying the ambiguity in Y ungrounded primary to Y grounded and Y ungrounded secondary connections. In A.1 of Annex A, errors in Equation (A.3) and Equation (A.6) are corrected. In A.2 of Annex A, errors and units in Equation (A.7), Equation (A.8), and Equation (A.9) have been corrected; the example calculations for surge voltage magnitude and front duration at the motor terminal have been corrected; and the word *as*, where defined in the text as the attenuation factor for semi-conductive layer loss, has been corrected to the variable α_s .

The corrections to A.1 and A.2 in Annex A are detailed individually; afterwards, the changes are incorporated into what appears as a corrected version of these two clauses.