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IEEE Standard for the Surge Parameters of Isolating Transformers Used in Networking Devices and Equipment

IEEE Power and Energy Society

Sponsored by the
Surge Protective Devices Committee

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IEEE Std C62.69™-2016

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Approved 29 January 2016

IEEE-SA Standards Board

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Abstract: Terms, test methods, test circuits, measurement procedures, and preferred result values for the surge mitigation parameters of isolating transformers used in networking devices and equipment are set in this standard. Three types of isolating transformer are considered: mains low frequency power, high frequency power (switching mode power supplies) and signal (e.g., Ethernet data).

Keywords: 1.2/50, breakdown, IEEE C62.69™, impulse voltage, insulation, insulation resistance, lightning overvoltage, surge, transformer

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Introduction

This introduction is not part of IEEE Std C62.69™-2016, IEEE Standard for the Surge Parameters of Isolating Transformers Used in Networking Devices and Equipment.

Optical fiber to the home has been gradually replacing the wire feed telephone service since about 2005. Fiber to the home deployment rapidly increased from 2010 onward. Along with the increase of installations there was a reported increase in the failures of home networking equipment [B27], [B28], and [B24] due to lightning overvoltages.[1] Failures of the Ethernet Local Area Network (LAN) ports have been attributed to use of inappropriate surge protective devices (SPDs) and lack of insulation coordination, which caused the breakdown of transformers, associated wiring, and connectors. This is a global problem with home networking equipment failures being reported in Japan [B26] and the U.S. [B23].

[1] The numbers in brackets correspond to those of the bibliography in Annex A.

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Contents

1. Overview 9
1.1 Scope 9
1.2 Purpose 10

2. Definitions, symbols, acronyms, and abbreviations 10
2.1 Definitions 10
2.2 Symbols 12
2.3 Acronyms and abbreviations 14

3. Surge parameters 14
3.1 Transformer surge mitigation 14
3.2 Common-mode surges 16
3.3 Differential-mode surges 16

4. Characteristics 17
4.1 Characteristic measurement 17
4.2 Inter-winding capacitance 18
4.3 Insulation resistance (IR) 20
4.4 Signal transformer voltage-time product 22

5. Ratings 23
5.1 Rating verification 23
5.2 Rated impulse voltage 24
5.3 Signal transformer rated winding dc 28

Annex A (informative) Bibliography 31

Annex B (informative) 1.2/50 Impulse 33
B.1 Introduction 33
B.2 Term definitions 33
B.3 1.2/50 waveform parameters 34

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1. Overview

1.1 Scope

This standard sets terms, test methods, test circuits, measurement procedures, and preferred result values for the surge parameters of isolating transformers used in networking devices and equipment. Three types of isolating transformer are considered: mains low frequency power, high frequency power (switching mode power supplies) and signal (e.g., Ethernet data). The surge parameters of the isolating transformer insulation barrier covered by this standard are as follows:

— Rated impulse voltage

— Input winding to output winding capacitance

— Insulation resistance

Additional parameters for signal isolating transformers are as follows:

— Core saturation voltage-time product

— Rated input winding rms current for a given temperature rise

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This standard does not cover the transformer parameters required to help ensure appropriate operation on the service (e.g., signal transformer return loss).

1.2 Purpose

The main purpose of this standard is to define a series of transformer impulse withstand voltage ratings that are higher than those of IEEE Std 802.3™ [B21][1] with the intent to improve transformer insulation performance in uncontrolled environments. In the interests of international standardization, the voltage values used are harmonized with the series defined in IEC 60664-1[B11] for low-voltage equipment insulation coordination. This IEEE standard is applicable to home networking installations, which are typically uncontrolled environments, where the surge voltage levels and the corresponding required transformer impulse withstand voltages can be higher than the LAN A controlled environment as defined by IEEE Std 802.3™ [B21].

2. Definitions, symbols, acronyms, and abbreviations

2.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* and the *IEC Glossary*[2] should be consulted for terms not defined in this clause.[3,4]

breakdown: Failure, at least temporarily, of the insulating properties of an insulating medium under electric stress.

NOTE—See IEC 61340-1:2012, ed. 1.0 [B15]

component type: Identification number assigned to a component, based on an identification system used by a particular organization.

NOTE—Model number, product ID, product name, product number; product type, part number; part ID are used as synonyms to component type.

clearance: Shortest distance in air between two conductive parts.

NOTE—See IEC/TR 60664-2-1:2011, ed. 2.0 [B12]

creepage distance: Shortest distance along the surface of a solid insulating material between two conductive parts.

NOTE—See IEC/TR 60664-2-1:2011, ed. 2.0 [B12]

guarded measurement (three terminal network): Measurement technique that allows the direct impedance between two terminals to be measured correctly by applying a compensating voltage to the third terminal that removes the shunting effects of any impedances to the third terminal.

[1] The numbers in brackets correspond to those of the bibliography in Annex A.
[2] *International Electrotechnical Commission Glossary* is available at http://std.iec.ch/terms/terms.nsf/welcome?OpenForm
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