

IEEE Recommended Practice: Test Procedure for Utility-Interconnected Static Power Converters

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**IEEE Recommended Practice:
Test Procedure for Utility-Interconnected
Static Power Converters**

Sponsor

**IEEE Standards Coordinating Committee on
Dispersed Storage and Generation (SCC 23)**

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Foreword

(This Foreword is not a part of ANSI/IEEE Std 1035-1989, IEEE Recommended Practice: Test Procedure for Utility-Interconnected Static Power Converters.)

This Recommended Practice was prepared by the Working Group on the Test Procedure for Utility-Interconnected Static Power Converters of IEEE Standards Coordinating Committee on Dispersed Storage and Generation (SCC 23). The procedure is intended to provide equipment manufacturers and users with the criteria for verification of safe and effective interconnection and operation with electric utility networks of static power converters (also referred to as power conversion systems/equipment, or solid-state converters, in the literature) through testing and evaluation of equipment performance.

The test procedure is not intended to verify equipment specifications or establish a pass/fail criteria. It is generally recognized that certain test parameters, such as harmonic distortion levels and degree of power factor correction, will be site- and utility-specific. For equipment rated over 100 kW, the suppliers and users of utility-interconnected power conversion equipment are generally advised to consult with the local electric utility on specific performance, instrumentation, grounding, and protection requirements.

It should be noted that the test procedure does not include a verification of environmental effects and hazards, and of certain occupational concerns, such as acoustic emissions produced by the equipment. Applicable standards relating to these parameters are listed in 1.2.

IEEE SCC 23 does not make recommendations on the selection of a testing agency or on the location of the tests.

The prospective users of this test procedure are advised that under the provisions of the Public Utility Regulatory Policies Act (PURPA), their local electric utility may require initial testing, inspection, and evaluation of the equipment to be interconnected with the utility network.

This Recommended Practice was developed by a Working Group of IEEE SCC 23. The membership of the Working Group was:

K. Hoffman, *Chairman*

Warren S. Bollmeier, II
Ward I. Bower
Ralph J. Ferraro
J. H. Galloway

F. M. Heck
Thomas S. Key
Paul Longrigg
Hans Meyer

Gerald L. Park
Al Pivec
Marek Samotyj
Larry Suelzle
Philip B. Winston

Past Members: R. J. Mauro
D. C. Sheperd
A. Pautzke

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C. H. Griffin, *Chairman*

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Rene Castenschiold
D. C. Dawson
Richard DeBlasio*
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R. J. Fernandez
N. Richard Friedman

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E. W. Kalkstein
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J. L. Koepfinger
T. J. Kolenda
Robert L. Linden
Paul Longrigg
Hans Meyer

Joseph Miller
William J. Moylan
Philip A. Nobile
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*Member Emeritus

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1. Scope and References

1.1 Scope. This test procedure is a Recommended Practice for testing utility-interconnected static power converters (SPC's). The test procedure applies to single- and three-phase units rated from 1 kW to 500 kW and may also be applied in principle to larger units. The objective of this test procedure is the measurement of electrical parameters at the ac terminals of the power converter.

The test procedure may serve as a basis for factory or acceptance testing. It focuses on equipment that lends itself to mass production and is readily interconnected to an electric utility, rather than on equipment subject to site-specific design and testing. Test results may be used in evaluating or comparing different types of static power converters.

Only equipment with the primary function of delivering electric energy to circuits interconnected with the electric utility is covered by this procedure. The test procedure does not cover static power converters for controlling rotating machines (motor controllers) if the primary function of this equipment is the conversion of electric energy to mechanical energy.

1.2 References. The following references should be used in conjunction with this guide:

[1] ANSI C84.1-1982, Voltage Ratings for Electric Power Systems and Equipment (60 Hz).¹

[2] FEDERAL COMMUNICATIONS COMMISSION, Rules and Regulations, Radio Frequency Devices, Part 15, Subpart J, 1981.

[3] KLEIN, J., KOENER, T., RIPPEL, W., and KALBACH, J. "Requirements for a Transfor-

merless Power Conditioning System," JPL Publication 83-83 for Sandia National Laboratories and U.S. Department of Energy, Mar 1984.

2. Terms and Definitions

2.1 Static Power Converter (SPC). Any static power converter with control, protection, and filtering functions used to interface an electric energy source with an electric utility system. Sometimes referred to as power conditioning subsystems, power conversion systems, solid-state converters, or power conditioning units.

2.2 Islanding. Operation of the power converter and part of the utility load while isolated from the remainder of the electric utility system.

2.3 Utility Interconnection Point. Point of interconnection between the utility-owned equipment (conductors) and that of the SPC owner. This is usually the metering location.

2.4 Total Harmonic Distortion (THD). The ratio of the root-mean-square (rms) value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

2.5 Total Distortion (TD). A measure of the difference between a pure sine waveform of a specified frequency and a test voltage waveform. Usually measured by an audio distortion analyzer (see the appendix).

3. Testing Overview

The purpose of the tests defined by this test procedure is to provide information to deter-

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