IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission

IEEE Power & Energy Society

Sponsored by the
Transformers Committee

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Abstract: The electrical, mechanical, and physical requirements of oil-immersed and dry-type air-core smoothing reactors for high-voltage direct current (HVDC) applications are specified. Test code is defined and appropriate technical background information is presented or identified.
Keywords: construction, dry-type air-core, HVDC, oil-immersed, rating, smoothing reactors, test code application

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Introduction

This introduction is not part of IEEE Std 1277-2010, IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission.

In 1986 the Transformers Committee of the Institute of Electrical and Electronic Engineers created the HVDC Converter Transformers and Smoothing Reactors Subcommittee. This committee developed from the working group that prepared paper 85 SM 375-1, "Recommended Dielectric Tests and Test Procedures for Converter Transformers and Smoothing Reactors." Although smoothing reactors for HVDC application have been built and operated for over 30 years, prior to IEEE Std 1277 there were only a limited number of papers, guides, and standards available that presented suggested dielectric tests for the HVDC equipment (see Annex G of this standard for a list of some of the most relevant documents). The IEC reactor standard IEC 60076-6:2007 [B9] also covers smoothing reactors in a specific clause; focus is not, however, application-specific.[a] With the increased activity in HVDC transmission, there was a significant need for a standard specifically covering the requirements and testing of smoothing reactors for HVDC applications, and the first responsibility of the new subcommittee was to create proposed standards for converter transformers and smoothing reactors for HVDC application. Two separate standards were developed—one for oil-filled converter transformers and one for both dry-type and oil-filled smoothing reactors. IEEE Std 1277 was originally released in 2000 as "trial use" and, approximately two years later in 2002, was granted "full use" status.

Significant accomplishments of IEEE Std 1277-2000 included:

a) Establishment of dielectric tests on HVDC equipment. In addition to the polarity reversal and 1 h dc tests recommended by previous papers, a special 1 h ac-applied voltage test was included for oil-filled smoothing reactors to demonstrate insulation integrity for service conditions.

b) A consistent test methodology was developed for both oil-immersed and dry-type air-core smoothing reactors that reflects both in-service operating stresses as well as current test equipment capability.

The purpose of this current revision is the same as the original document, which is to define requirements and test code for dry-type and oil-immersed smoothing reactors for HVDC application. Although requirements are usually construction independent, test code is not, and the revision of the standard will continue to reflect this characteristic. This revision is required to upgrade test code, design considerations and application information based on feedback from manufacturers and "end users"—dry-type or oil-immersed specific when required. Test code methodology has been modified to reflect current technology.

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[a] The numbers in brackets correspond to those of the bibliography in Annex G.

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1. Scope

The scope of this standard is the definition and specification of the requirements and test code for dry-type and oil-immersed smoothing reactors for high-voltage direct current (HVDC) power transmission. This standard only applies to smoothing reactors for dc transmission. It does not apply to other smoothing reactors such as reactors for power converters for variable speed drives, etc.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI C68.3-1976, American National Standard Recommended Practice for the Detection and Measurement of Partial Discharges (Corona) During Dielectric Tests.[1]

ANSI S1.4-1983, American National Standard Specification for Sound Level Meters.

[1] ANSI publications are available from the Customer Service Department, American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).