



# Standard Test Methods for Measurement of Energy and Integrated Charge Transfer Due to Partial Discharges (Corona) Using Bridge Techniques<sup>1</sup>

This standard is issued under the fixed designation D 3382; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

<sup>ε1</sup> NOTE—The address in Footnote Four was editorially updated April 2001.

## 1. Scope

1.1 These test methods cover two bridge techniques for measuring the energy and integrated charge of pulse and pulseless partial discharges:

1.2 Test Method A makes use of capacitance and loss characteristics such as measured by the transformer ratio-arm bridge or the high-voltage Schering bridge (Test Methods D 150). Test Method A can be used to obtain the integrated charge transfer and energy loss due to partial discharges in a dielectric from the measured increase in capacitance and  $\tan \delta$  with voltage.

1.3 Test Method B makes use of a somewhat different bridge circuit, identified as a charge-voltage-trace (parallelogram) technique, which indicates directly on an oscilloscope the integrated charge transfer and the magnitude of the energy loss due to partial discharges.

1.4 Both test methods are intended to supplement the measurement and detection of pulse-type partial discharges as covered by Test Method D 1868, by measuring the sum of both pulse and pulseless discharges per cycle in terms of their charge and energy.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precaution statements are given in Section 7.

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials<sup>2</sup>

D 1711 Terminology Relating to Electrical Insulation<sup>2</sup>

D 1868 Test Method for Detection and Measurement of Partial Discharge (Corona) Pulses in Evaluation of Insulation Systems<sup>2</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 *pseudoglow discharge, n*—a type of partial discharge characterized by pulses of relatively small amplitude, and, generally, a long rise time.

3.1.1.1 *Discussion*—As a result of the upper frequency limitation in their Fourier frequency spectrum, pseudoglow discharges are not readily detected by conventional partial-discharge-pulse detectors. Pseudoglow discharges are also characterized by a diffused glow, that cannot be visually distinguished from that due to a true-glow discharge.

3.1.2 *pulse discharge, n*—a type of partial-discharge phenomenon characterized by a spark-type breakdown.

3.1.2.1 *Discussion*—The resultant detected pulse discharge has a short rise time and its Fourier frequency spectrum may extend as far as 100 MHz. Such a pulse discharge may be readily detected by conventional pulse detectors, that are generally designed for partial-discharge measurements within the frequency band from 30 kHz to several megahertz.

3.1.3 *pulseless-glow discharge, n*—a type of partial-discharge phenomenon characterized by a diffused glow.

3.1.3.1 *Discussion*—The overall voltage waveform across a gap-space undergoing a pulseless-glow discharge does not indicate the presence of any abrupt voltage falls, except for the two at the beginning of each half cycle (for example, thyatron behavior) **(1) (2)**.<sup>3</sup> Although discharge energy is expended over the pulseless region, a conventional partial-discharge-pulse detector will give no indication of this as it will only respond to the two initiating breakdowns.

3.1.4 See **(3)** and **(4)** for more information on the previous definitions.

3.1.5 For definitions of other terms pertaining to this standard refer to Terminology D 1711.

### 3.2 Symbols: Symbols:

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and are the direct responsibility of Subcommittee D09.12 on Electrical Tests.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 10.01.

<sup>3</sup> The boldface numbers in parentheses refer to the list of references at the end of these test methods.