



Standard Test Method for Gross Calorific Value of Coal and Coke by Microprocessor Controlled Isoperibol Calorimeters¹

This standard is issued under the fixed designation D 1989; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers the determination of the gross calorific value of coal and coke by an isoperibol bomb calorimeter using electronic temperature sensors and automatic calorimeter controllers.

1.2 The values stated in SI units are to be regarded as the standard, except as noted otherwise. The values given in parentheses are for information only.

NOTE 1—Conversion to other units is discussed in [Appendix X1](#). Time is expressed in minutes. Mass is expressed in grams.

1.3 *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.* For specific hazard statements, see Section 8.

2. Referenced Documents

2.1 ASTM Standards:

- [D 121](#) Terminology of Coal and Coke²
- [D 346](#) Practice for Collection and Preparation of Coke Samples for Laboratory Analysis²
- [D 388](#) Classification of Coals by Rank²
- [D 1193](#) Specification for Reagent Water³
- [D 2013](#) Method of Preparing Coal Samples for Analysis²
- [D 3173](#) Test Method for Moisture in the Analysis Sample of Coal and Coke²
- [D 3177](#) Test Methods for Total Sulfur in the Analysis Sample of Coal and Coke²
- [D 3180](#) Practice for Calculating Coal and Coke Analyses from As-Determined to Different Bases²
- [D 4239](#) Test Methods for Sulfur in the Analysis Sample of Coal and Coke Using High Temperature Tube Furnace

Combustion Methods²

[E 144](#) Practice for Safe Use of Oxygen Combustion Bombs⁴

[E 178](#) Practice for Dealing with Outlying Observations⁴

3. Terminology

3.1 Definitions:

3.1.1 *calorific value, n*—the heat produced by combustion of a unit quantity of a test specimen under specified conditions.

3.1.1.1 *Discussion*—It is expressed in this test method in calories per gram (cal/g), and can also be expressed in British thermal units per pound (Btu/lb), or in the International System of Units (SI) in joules per gram (J/g), when required. The unit equivalents are given in [Table 1](#).

3.1.2 *calorimeter, n*—as used in this test method, not only the bomb and its contents but also includes the bucket, electronic sensing devices, ignition leads, water, and the stirrer when using water.

3.1.3 *calorimeter jacket, n*—the insulating medium surrounding the calorimeter.

3.1.4 *gross calorific value (gross heat of combustion at constant volume), Q_v (gross), n*—see Terminology [D 121](#).

3.1.5 *isoperibol, adj*—a term used in combustion calorimetry meaning constant temperature jacket (environment).

3.1.6 *microprocessor, n*—a central processing chip within the electronic controller section of the apparatus.

3.1.7 *net calorific value (net heat of combustion at constant pressure, Q_p (net), n*—see Terminology [D 121](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *corrected temperature rise*—the temperature change of the calorimeter caused by the process that occurs inside the bomb, that is, the observed temperature change corrected for various affects as noted in [10.4.1](#).

3.2.2 *energy equivalent, heat capacity, or water equivalent*—the energy required to raise the temperature of the calorimeter one arbitrary unit. This is the quantity that when multiplied by the corrected temperature rise, and then adjusted for extraneous heat effects and divided by the mass of the sample, determines the gross calorific value.

¹ This test method is under the jurisdiction of ASTM Committee D-5 on Coal and Coke and is the direct responsibility of Subcommittee D05.21 on Methods of Analysis.

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² *Annual Book of ASTM Standards*, Vol 05.05.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.