



Designation: G 144 – 96

Standard Test Method for Determination of Residual Contamination of Materials and Components by Total Carbon Analysis Using a High Temperature Combustion Analyzer¹

This standard is issued under the fixed designation G 144; 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.

1. Scope

1.1 This test method covers the determination of residual contamination in an aqueous sample by the use of a total carbon (TC) analyzer. When used in conjunction with Practice G 131, this procedure may be used to determine the cleanliness of systems and components requiring a high level of cleanliness, such as oxygen systems. This procedure is applicable for aqueous-based cleaning and sampling methods only.

1.2 This test method is not suitable for the evaluation of particulate contamination, or contaminants that are not soluble in or that do not form an emulsion with water.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 1193 Specification for Reagent Water²

D 2579 Test Methods for Total and Organic Carbon in Water³

F 331 Test Method for Nonvolatile Residue of Halogenated Solvent Extract from Aerospace Components (Using Rotary Flash Evaporator)⁴

G 121 Practice for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents⁵

G 131 Practice for the Cleaning of Materials and Components by Ultrasonic Techniques⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *contaminant (contamination), n*—unwanted molecular and particulate matter that could affect or degrade the performance of the components upon which they reside.

3.1.2 *nonvolatile residue (NVR), n*—molecular and particulate matter remaining following the filtration and controlled evaporation of a liquid containing contaminants.

3.1.3 *Discussion*—In this test method, the NVR may be uniformly distributed as in a solution or an emulsion, or in the form of droplets. Molecular contaminants account for most of the NVR.

3.1.4 *particle (particulate contaminant), n*—a piece of matter in a solid state with observable length, width, and thickness.

3.1.5 *Discussion*—The size of a particle is usually defined by its greatest dimension and is specified in micrometres.

3.1.6 *molecular contaminant (non-particulate contamination), n*—the molecular contaminant may be in a gaseous, liquid, or solid form.

4. Summary of Test Method

4.1 A test method is described for the quantitative analysis of aqueous samples and may be used in the determination of contamination on parts, components, and materials used in systems requiring a high degree of cleanliness. The residue removed during aqueous cleaning or sampling, using a cleaning method such as Practice G 131, is analyzed using a high-temperature combustion analyzer with a sensitivity of ± 0.2 mgC/L (milligrams of carbon per litre). An aqueous sample is injected into the sample port. A stream of oxygen or air carries the sample into the catalytic combustion chamber, which is maintained at a temperature high enough to completely pyrolyze the sample. The sample is combusted in the catalytic combustion chamber and the products are carried by the oxygen or air stream into a nondispersive infrared (NDIR) detector where the amount of carbon dioxide in the gas stream is determined. Additional information on the use and operation of carbon analyzers is provided in Test Methods D 2579.

4.2 Experience has shown that the bulk of the contaminants are oils and greases; therefore, the samples will typically be emulsions rather than solutions. Thus, proper handling and preparation techniques are necessary in order to obtain good sample homogeneity.

5. Significance and Use

5.1 It is expected that this test method will be suitable for the quantitative determination of total carbon in water that has been used to clean, extract, or sample parts, components,

¹ This test method is under the jurisdiction of ASTM Committee G-4 on Compatibility and Sensitivity of Materials in Oxygen-Enriched Atmospheres and is the direct responsibility of Subcommittee G04.01 on Test Methods.

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² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 11.02.

⁴ Annual Book of ASTM Standards, Vol 15.03.

⁵ Annual Book of ASTM Standards, Vol 14.02.