



Designation: A247 – 06^{e1}

Standard Test Method for Evaluating the Microstructure of Graphite in Iron Castings¹

This standard is issued under the fixed designation A247; 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.

This standard has been approved for use by agencies of the Department of Defense.

^{e1} NOTE—Section 2 was corrected editorially in August 2009.

1. Scope

1.1 This test method covers the classification of graphite in cast irons in terms of type, distribution, and size. This test method is intended to be applicable for all iron-carbon alloys containing graphite particles, and may be applied to gray irons, malleable irons, and the ductile (nodular) irons.

1.2 The reference standards included in this test method are in no way to be construed as specifications. In an appropriate specification for a specific material where graphite microstructure is an important consideration this test method may be used as a reference to define concisely the graphite microstructure required.

1.3 These standards are offered primarily to permit accurate reporting of microstructures of cast irons and to facilitate the comparison of reports by different laboratories or investigators.

1.4 *This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E3 Guide for Preparation of Metallographic Specimens

2.2 *ASTM Adjuncts:*

Graphite Microstructure in Gray Iron (3 Plates)³

3. Summary of Test Method

3.1 The reference diagrams included in this standard form the basis for classification. Characteristic features of graphite particles are designated by numerals and letters. Type, distribution, and size of observed graphite are compared with the idealized microstructures in the standard charts and rated accordingly as closely as possible to the equal or similar microstructures in the charts.

4.1 The comparison of observed graphite particles with the structures shown in the charts give only purely descriptive information on the type, distribution, and size of the graphite in the sample being evaluated. It does not indicate except in a very broad way the origin of the graphite, or the suitability of the iron-carbon alloy for a particular service.

4. Significance and Use

5.1 The preferred sample is a section cut from an actual casting that is being evaluated. When this is impractical, a test lug or projection often can be cast attached to the casting and sawed or broken off to be used as the sample. If neither of these methods is convenient, microscopical test coupons, such as that recommended by the Ductile Iron Research Committee (12K) of the American Foundrymen's Society⁴ should be cast from metal representative of the castings poured.

5. Test Specimens or Samples

6.1 Grinding and polishing may follow the usual accepted metallographic procedures as covered in Methods **E3**, except that care must be taken that the graphite is retained at the polished surface and not torn or dragged out. Use of diamond powder polishing compound in one of the final stages of polishing is very effective in retaining the graphite at the polished surface.

6. Polishing

7.1 The graphite form type chart (Plate D)⁵ is used as a reference standard by scanning the polished specimen under the microscope and noting the graphite forms in the microstructure that more nearly correspond to type designations on the chart.

7. Classification of Graphite Form with Chart

¹ This test method is under the jurisdiction of ASTM Committee **A04** on Iron Castings and is the direct responsibility of Subcommittee **A04.21** on Testing.
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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from ASTM International Headquarters. Order Adjunct No. **ADJA0247**. Original adjunct produced in 1977.

⁴ *Transactions*, American Foundrymen's Society, 1960, p. 655.

⁵ Plates I, II, and III may be obtained from ASTM Headquarters. Order **ADJA0247**.