



Standard Test Method for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets¹

This standard is issued under the fixed designation A 604; 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.

1. Scope

1.1 This test method² covers testing and inspection and is applicable to bars, billets, and blooms of carbon, alloy, and stainless steel which have been consumable electrode remelted.

1.2 For the purpose of this test method, the consumable electrode remelting process is defined as a steel refining method wherein single or multiple electrodes are remelted into a crucible producing an ingot which is superior to the original electrode by virtue of improved cleanliness or lower gas content or reduced chemical or nonmetallic segregation. See Appendix X1 and Appendix X2 for descriptions of applicable remelting processes.

1.3 This test method and the accompanying comparison macrographs³ are generally applicable to steel bar and billet sizes up to 225 in.² in transverse cross section.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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.*

2. Referenced Documents

2.1 ASTM Standards:

E 381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings⁴

2.2 ASTM Adjuncts:

ADJA0604

Adjunct to A604 Test Method for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billet³

3. Description of Macroetch Testing

3.1 Macroetch testing, as described herein, is a method for examining and rating transverse sections of bars and billets to describe certain conditions of macro segregation which are often characteristic of consumable electrode remelted materials. This test method is not intended to define major defects such as those described by Method E 381.

3.2 This test method employs the action of an acid or other corrosive agent to develop the characteristics of a suitably prepared specimen. After etching, the sections are compared visually, or at a very low magnification, if necessary for clarification of conditions, to standard plates describing the various conditions which may be found. Materials react differently to etching reagents because of variations in chemical composition, method of manufacture, heat treatment, and many other variables.

4. Application

4.1 When material is furnished subject to macroetch testing and inspection under this test method, the manufacturer and purchaser should be in agreement concerning the following:

4.1.1 The stage of manufacture at which the test shall be conducted,

4.1.2 The number and location of the sections to be tested,

4.1.3 The condition and preparation of the surface to be macroetched,

4.1.4 The etching reagent, temperature and time of etching, or degree of etching including any special techniques which must be used, and

4.1.5 The type and degree of conditions or combinations thereof that shall be considered acceptable or subject to metallurgical review.

¹ This test method is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.06 on Steel Forgings and Billets.

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² ASTM Committee A01 gratefully acknowledges the help of the AISI Committee on General Metallurgy in preparing the appendix, assembling the macroetch photographs, and assisting with the text of this test method.

³ A complete set of the 20 macrographs on glossy paper is available at nominal cost from ASTM Headquarters, 100 Barr Harbor Drive, W. Conshohocken, PA 19428. Request Adjunct ADJA0604.

⁴ *Annual Book of ASTM Standards*, Vol 03.01.

