



Designation: E 1010 – 84 (Reapproved 2000)

## Standard Practice for Preparation of Disk Specimens of Steel and Iron for Spectrochemical Analysis by Remelting<sup>1</sup>

This standard is issued under the fixed designation E 1010; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice describes the preparation of disk specimens of steel and iron by melting chunks, chips, drillings, turnings, wire, or powder briquets with an electric arc in an argon atmosphere. Solidification of the specimen takes place in the crucible in an argon atmosphere. The disk obtained is suitable for quantitative spectrochemical analysis.

1.2 *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 precautionary statements are given in 6.2.1, and Section 8.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials<sup>2</sup>
- E 876 Practice for Use of Statistics in the Evaluation of Spectrometric Data<sup>2</sup>

### 3. Terminology

3.1 For definitions of terms used in this procedure, refer to Terminology E 135.

### 4. Summary of Practice

4.1 The sample of steel or iron is placed in a water-cooled copper crucible. The furnace is flushed with argon at a controlled rate of flow. An arc is struck between the electrode and the sample material and is maintained until the melting is complete. The molten specimen is allowed to solidify in the crucible in an argon atmosphere. After solidification, the specimen is removed from the crucible and prepared for spectrochemical analysis.

4.2 Partial losses of some elements may be experienced during the preparation of the disk specimen. This procedure, if

carefully followed, will provide consistent losses. Elemental losses can be determined by correlating the analysis of the charge material with the spectrochemical analysis of the remelted specimen.

### 5. Significance and Use

5.1 Most spectrochemical instruments employed for analyzing steel and iron require a solid specimen with a flat surface large enough for analytical excitation and measurement procedures. This practice describes a procedure for converting unusual types of steel and iron samples to satisfactory spectrochemical specimens.

### 6. Apparatus

6.1 *Melting Furnace*,<sup>3</sup> consisting of a chamber that contains the following:

6.1.1 *Crucible*, of copper and water-cooled, in which samples of steel or iron are melted, then solidified to form specimens for spectrochemical analysis.

6.1.2 *Electrode Holder*, water-cooled and of negative polarity, that can be moved up and down easily, and may have provisions for circular motion and adjusting the arc gap to a fixed spacing.

6.1.3 *Viewing Window*, compared of dark welding-type glass with an inner-protective glass that is impervious to heat and splatter from the molten metal.

6.2 *D-C Electric Power Generator*, to supply electric current and voltage equivalent to that required for electric arc welding. It may be a rotating d-c generator or a static rectifier with provisions to adjust the current in the 0 to 600 A range.

6.2.1 **Caution**—A safety interlock shall be provided to prevent electrical shocks to the operator when the melting furnace is open.

6.3 *Vacuum Pump*, with free air capacity of 50 L/min and vacuum of 350  $\mu$ m, minimum.

### 7. Materials

7.1 *Inert Gas*, argon of 99.96 % purity.

7.2 *Electrode*, thoriated tungsten or high-purity graphite.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E-1 on Analytical Chemistry for Metals, Ores and Related Materials and is the direct responsibility of Subcommittee E01.01 on Iron, Steel, and Ferroalloys.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 03.06.

<sup>3</sup> Melting furnaces, manufactured by Hankison Corp., Cannonsburg, PA 15317 and Zeebac Inc., Berea, OH 44017, have been found suitable for this purpose.