

Sampling and analysis of iron, steel and other ferrous metals —

Part 3: Methods of analysis —

Section 3.8 Determination of carbon —

Subsection 3.8.3 Steel and cast iron: infra-red absorption method after combustion in an induction furnace

Committees responsible for this British Standard

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- BCIRA
- British Forging Industry Association
- British Steel Industry
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Ferro Alloys and Metals Producers' Association
- Ministry of Defence

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
1 Scope	1
2 Normative references	1
3 Principle	1
4 Reagents	1
5 Apparatus	1
6 Sampling	2
7 Procedure	2
8 Expression of results	4
9 Test report	5
Annex A (informative) Additional information on the international co-operative tests	6
Annex B (informative) Graphical representation of precision data	7
Annex C (informative) Features of commercial high-frequency induction furnaces and infrared carbon analysers	7
Figure B.1 — Logarithmic relationship between carbon content [% (<i>m/m</i>)] and repeatability (<i>r</i>) or reproducibility (<i>R</i> and <i>R_w</i>)	7
Table 1	3
Table 2	3
Table 3	4
Table 4	4
Table 5	5
Table A.1	6
Publication(s) referred to	Inside back cover

National foreword

This Subsection of BS 6200 has been prepared under the direction of the Iron and Steel Standards Policy Committee.

It is identical with ISO 9556:1989 “*Steel and iron — Determination of total carbon content — Infrared absorption method after combustion in an induction furnace*”, published by the International Organization for Standardization (ISO).

Cross-references

International Standard	Corresponding British Standard
ISO 1042:1983	BS 1792:1982 <i>Specification for one-mark volumetric flasks</i> (Identical) BS 5497 <i>Precision of test methods</i>
ISO 5725:1986	Part 1:1987 <i>Guide for the determination of repeatability and reproducibility for a standard test method by inter-laboratory tests</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 377, ISO 385-1 and ISO 648, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. Related British Standards for ISO 377:1985, ISO 385-1:1984 and ISO 648:1977 are, respectively, BS 1837:1970 “*Methods for the sampling of iron, steel, permanent magnet alloys and ferro-alloys*”, BS 846:1985 “*Specification for burettes*” and BS 1583:1986 “*Specification for one-mark pipettes*”. Appropriate procedures from ISO 377 will be incorporated in BS 6200-2 “*Methods of sampling and sample preparation*”, which will be published in due course and which will supersede BS 1837.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard specifies an infrared absorption method after combustion in an induction furnace for the determination of the total carbon content in steel and iron.

The method is applicable to carbon contents between 0,003 % (m/m) and 4,5 % (m/m).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 377:1985, *Wrought steel — Selection and preparation of samples and test pieces*.

ISO 385-1:1984, *Laboratory glassware — Burettes — Part 1: General requirements*.

ISO 648:1977, *Laboratory glassware — One-mark pipettes*.

ISO 1042:1983, *Laboratory glassware — One-mark volumetric flasks*.

ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests*.

3 Principle

Combustion of a test portion with accelerator at a high temperature in a high-frequency induction furnace in a current of pure oxygen. Transformation of carbon into carbon dioxide and/or carbon monoxide.

Measurement by infrared absorption of the carbon dioxide and/or carbon monoxide carried by a current of oxygen.

4 Reagents

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

4.1 Water, free from carbon dioxide.

Boil water for 30 min, cool to room temperature and bubble with oxygen (4.2) for 15 min. Prepare just before use.

4.2 Oxygen, 99,5 % (m/m) minimum.

An oxidation catalyst [copper(II) oxide or platinum] tube heated to a temperature above 450 °C must be used prior to a purifying unit (see Annex C), when the presence of organic contaminants is suspected in the oxygen.

4.3 Pure iron, of known low carbon content less than 0,001 0 % (m/m).

4.4 Suitable solvent, appropriate for washing greasy or dirty test samples, for example, acetone.

4.5 Magnesium perchlorate [Mg(ClO₄)₂], particle size: from 0,7 mm to 1,2 mm.

4.6 Barium carbonate

Dry barium carbonate (minimum assay: 99,5 %) at 105 °C to 110 °C for 3 h and cool in a desiccator before use.

4.7 Sodium carbonate

Dry anhydrous sodium carbonate (minimum assay: 99,9 %) at 285 °C for 2 h and cool in a desiccator before use.

4.8 Accelerator: copper, tungsten-tin mixture or tungsten of known low carbon content less than 0,001 0 % (m/m).

4.9 Sucrose, standard solution, corresponding to 25 g of C per litre.

Weigh, to the nearest 1 mg, 14,843 g of sucrose (C₁₂H₂₂O₁₁) (analytical standards grade) previously dried at 100 °C to 105 °C for 2,5 h and cooled in a desiccator.

Dissolve in about 100 ml of water (4.1), transfer to a 250 ml one-mark volumetric flask quantitatively, dilute to the mark with water (4.1) and mix.

1 ml of this standard solution contains 25 mg of C.

4.10 Sodium carbonate, standard solution, corresponding to 25 g of C per litre.

Weigh, to the nearest 1 mg, 55,152 g of sodium carbonate (4.7), dissolve in about 200 ml of water (4.1), transfer to a 250 ml one-mark volumetric flask quantitatively, dilute to the mark with water (4.1) and mix.

1 ml of this standard solution contains 25 mg of C.

4.11 Inert ceramic (attapulugus clay) impregnated with sodium hydroxide, particle size: from 0,7 mm to 1,2 mm.

5 Apparatus

During the analysis, unless otherwise stated, use only ordinary laboratory apparatus.

All volumetric glassware shall be class A, in accordance with ISO 385-1, ISO 648 or ISO 1042 as appropriate.