भारतीय मानक **IS 12308 (Part 1) : 2024**

Indian Standard

ढलवाँ लोहा और कच्चा लोहा के रसायनिक विश्लेषण की पद्धतियाँ

भाग 1 तापीय चालकता पद्धति द्वारा कुल कार्बन का निर्धारण (1.00 प्रतिशत से 4.50 प्रतिशत कार्बन के लिए)

(पहला पुनरीक्षण)

Methods for Chemical Analysis of Cast Iron and Pig Iron

Part 1 Determination of Total Carbon by Thermal Conductivity Method (For Carbon 1.00 Percent to 4.50 Percent)

(First Revision)

ICS 77.080.10

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Methods of Chemical Analysis of Metals Sectional Committee, MTD 34

FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards after the finalized by the Methods of Chemical analysis of Metals Sectional Committee had been approved of the Metallurgical Engineering Division Council.

This standard was first published in 1987. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

This standard is published in different parts covering methods for chemical analysis of cast iron and pig iron are as listed below. This standard (Part 1) covers determination of total carbon by thermal conductivity method (for carbon 1.00 percent to 4.50 percent).

The other parts in the series are:

Part 2	Determination of sulphur by iodimetric titration method
Part 3	Determination of manganese by periodate spectrophotometric method
Part 4	Determination of total carbon, graphitic carbon and combined carbon by gravimetric method
Part 5	Determination of phosphorus by alkalimetric method (for phosphorus 0.01 percent to 0.50 percent)
Part 6	Determination of silicon (for silicon 0.1 percent to 6.0 percent)
Part 7	Determination of nickel by dimethylglyoxime (gravimetric) method (for nickel 0.5 percent to 36 percent)
Part 8	Determination of chromium by persulphate oxidation method (for chromium 0.1 percent to 28 percent)
Part 9	Determination of molybdenum by thiocyanate (spectrophotometric) method (for molybdenum 0.1 percent to 1.0 percent)
Part 10	Determination of manganese (up to 7.0 percent) by arsenite (volumetric) method
Part 11	Determination of total carbon by the direct combustion volumetric method (for carbon 1.50 percent to 4.50 percent)
Part 12	Determination of copper by atomic absorption spectrometric method (for copper 0.01 percent to 0.5 percent)
Part 13	Determination of magnesium by atomic absorption spectrometric method (for magnesium upto 0.1 percent)
Part 14	Determination of titanium by hydrogen peroxide (spectrophotometric) method (for titanium up to 0.25 percent)

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

METHODS FOR CHEMICAL ANALYSIS OF CAST IRON AND PIG IRON

PART 1 DETERMINATION OF TOTAL CARBON BY THERMAL CONDUCTIVITY METHOD (FOR CARBON 1.00 PERCENT TO 4.50 PERCENT)

(First Revision)

1 SCOPE

This standard (Part 1) covers method for determination of total carbon in cast iron and pig iron in the range of 1.00 percent to 4.50 percent.

2 REFERENCES

The standard given below contains provisions which through reference in this text, constitutes provisions of this standard. At the time of publication the edition indicated was valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standard:

IS No.	*Title*
IS 266 : 2024	Sulphuric acid — Specification (*fourth revision*)

3 SAMPLING

3.1 The sample shall be drawn and prepared as prescribed in the relevant Indian Standard.

3.2 The sample is to be cleaned with analytical grade organic solvent (like acetone, benzene or ether) by washing it thrice and dried in an air oven at 100 °C ± 5 °C.

4 QUALITY OF REAGENTS

Unless specified otherwise, analytical grade reagents shall be employed in the test.

5 DETERMINATION OF TOTAL CARBON BY THERMAL CONDUCTIVITY METHOD

5.1 Outline of the Method

The sample is burnt in stream of oxygen in presence of metal accelerator. The carbon dioxide formed is selectively adsorbed on the molecular sieve and released by heating at 300 °C. The detector is a thermistor cell, which senses the difference between the thermal conductivity or the carrier gas (oxygen) and that of the carrier gas containing carbon dioxide.

5.2 Reagents

5.2.1 *Oxygen* (O_2) — 99.5 percent pure (minimum)

5.2.2 *Ascarite or Sodalime* — 0.80 mm to 2.00 mm

5.2.3 *Magnesium Perchlorate* — 0.80 mm to 2.00 mm

5.2.4 *Concentrated Sulphuric Acid* — relative density = 1.84 (conforming to IS 266)

5.2.5 *Sulphur Trap* — containing activated manganese-dioxide (MnO_2)

5.2.6 *Carbon Dioxide Convertor* — containing copper oxide maintained at 300 °C

5.2.7 *Accelerators* — copper, tin or iron granules (free from carbon and sulphur)

5.2.8 *Crucibles* — pre-ignited crucibles of precise dimensions which may be accommodated in the combustion tube of induction furnace.

5.3 Apparatus

Any analyzer consisting of induction furnace, molecular sieve, chromatographic column and thermistor type detector.

5.4 Procedure

5.4.1 *Standardization*

5.4.1.1 Switch on the instrument for 4 h before analyzing the sample for attaining the thermal stability of the cell.

5.4.1.2 Start the flow of purified oxygen gas and pass it continuously through the system at a rate of 1 000 ml/min to 1 500 ml/min.

5.4.1.3 Transfer into the pre-ignited crucible 0.5 g standard sample which has a value of carbon in the range of interest and add 0.5 g accelerator.

5.4.1.4 Insert the crucible into the induction furnace, wait for 30 s and start the induction.

5.4.1.5 Note the percentage of carbon, adjust, if necessary, the standardization until the certified value of carbon for the standard sample is obtained and with the desired reproducibility.

5.4.2 *For Sample*

5.4.2.1 Transfer 0.5 g of accurately weighed sample into the pre-ignited crucible and add 0.5 g of accelerator.

5.4.2.2 Insert into the induction furnace and proceed until the percentage of carbon is read out.

5.4.3 *Reproducibility* — ± 0.5 percent

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Methods of Chemical Analysis of Metals Sectional Committee, MTD 34

Organization	*Representative(s)*
CSIR - National Metallurgical Laboratory, Jamshedpur	DR SANCHITA CHAKRAVARTY **(*Chairperson*)**
Arcelor Mittal Nippon Steel, Mumbai	SHRI MANOJ GUPTA SHRI KIRIT TAILOR (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	MISS SANJUKTA A. KUMAR SHRI M. V. RANA (*Alternate*)
CSIR - National Metallurgical Laboratory, Jamshedpur	DR ASHOK K. MOHANTY
Defence Metallurgical Research Laboratory, Ministry of Defence, Hyderabad	SHRI S. S. KALYAN KAMAL
Directorate General of Quality Assurance, Ministry of Defence, New Delhi	SHRI KESAVAMOORTHY M. SHRI E. SUMAN. KUMAR (*Alternate*)
Geological Survey of India, New Delhi	SHRI NITIN PURUSHOTTAM SHRIMATI SANJUKTA DEY PAL (*Alternate*)
Hindalco Industries Limited, Mumbai	SHRI KRISHANU MAHAPATRA SHRI ASHUTOSH ACHARYA (*Alternate*)
Indian Metals and Ferro Alloys Limited, Bhubaneswar	SHRI DINESH KUMAR MOHANTY
Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur	DR UPENDRA SINGH
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TRL Krosaki Refractories Limited, Belpahar	SHRI S. K. SUBUDHI

Organization	*Representative(s)*
Tata Steel Limited, Kolkata	DR JATIN MOHAPATRA DR RAVIKRISHNA CHATTI (*Alternate*)
BIS Directorate General	SHRI SANJIV MAINI, SCIENTIST 'F'/ SENIOR DIRECTOR AND HEAD (METALLURGICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI ASHISH PRABHAKAR WAKLE
SCIENTIST 'D'/JOINT DIRECTOR
(METALLURGICAL ENGINEERING), BIS

Bureau of Indian Standards

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This Indian Standard has been developed from Doc No.: MTD 34 (21468).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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