भारतीय मानक

IS 209 : 2024

Indian Standard

(*Superseding IS 4699 : 1984 & IS 13229 : 1991*)

परिष्कृत जस्ता — विशिष्टि

(पाँचवां पुनरीक्षण)

Refined Zinc — Specification

(Fifth Revision)

ICS 77.120.60

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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Ores and Feed Stock for Non-Ferrous (Excluding Aluminium and Copper) Industry, their Metals/ Alloys and Products Sectional Committee, MTD 09

FOREWORD

This Indian Standard (Fifth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Ores and Feed Stock for Non-Ferrous (Excluding Aluminium and Copper) Industry, their Metals/ Alloys and Products Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1950 and was subsequently revised in 1956, 1966, 1979 and 1992. In the previous revision the requirement of chemical analysis and marking was modified and a new clause on inspection was added. While reviewing the standard the Committee felt to revise this standard keeping in view the latest developments in the tin production and refining process and also to modify the grades in the standard which have international acceptance and traded on various commodity exchanges and to bring the standard in line with the latest style and format of the Indian Standards. In the present revision, the following major modifications have been made:

a) Title of the standard has been modified from 'primary zinc' to 'refined zinc' in line with international practices;

b) Scope has been enlarged and modified to cover refined zinc (both primary and secondary refined zinc) in form of ingots irrespective of the source/raw materials used, in line with the international practices;

c) Clause **3** on terminology has been added;

d) Clause **4** on grades and designation has been added to include more grade of zinc ingots;

e) Clause **5** on supply of material has been modified to include basis for order/enquiry;

f) Clause **6** on manufacture has been modified to cover the manufacturing of zinc ingots from liquid refined zinc as per the definitions accepted international standards;

g) Clause **7** on chemical composition has been modified to include more grades of zinc in the standard and align the grades with internationally accepted and traded specifications; Grade 99.5 known as intermediate grade has been added, Grade 98.65 known as prime western grade used for general galvanizing purposes has been included in this revision which was separately covered in IS 13229 : 1991 'Zinc for galvanizing — Specification';

h) Clause **8** on shape and mass of ingots has been modified to include the supply of zinc in different forms other than ingot;

j) Clause **10** on sampling has been modified to refer different method of preparing samples for chemical analysis in accordance with IS 18519/ISO 20081; and

k) Annex A has been added to compare the equivalent or related chemical composition grades of zinc existing in various international standards and the Indian Standard.

Since, the requirements of primary zinc and refined secondary zinc which were previously covered in separate standards IS 209 : 1992 'Zinc ingot — Specification (*fourth revision*)' and IS 4699 : 1984 'Specification for refined secondary zinc (*first revision*)' respectively are now covered in this standard with a single title of refined zinc and also, the prime western grade of zinc Zn98.65 which was earlier mentioned in IS 13229 : 1991 'Zinc for galvanizing — Specification' has been included in this revision. Hence, this current revision of IS 209 supersedes the IS 209 : 1992 'Zinc ingot — Specification (*fourth revision*)', IS 4699 : 1984 'Specification for refined secondary zinc (*first revision*)' and IS 13229 : 1991 'Zinc for galvanizing — Specification'.

For the information of the purchaser and the supplier, the equivalent or related grades existing in various International standards, are given in the Annex B.

In the formulation of this standard, assistance has been derived from ISO 752 : 2004 'Zinc ingots' issued by International Organization for Standardization.

(*Continued on third cover*)

Indian Standard

REFINED ZINC — SPECIFICATION

(Fifth Revision)

1 SCOPE

1.1 This standard covers the requirements for refined zinc in the form of ingots. The grades of zinc included in the standard are those which are recognized nationally and in worldwide commerce.

1.2 This standard does not cover the requirements of re-melted secondary zinc produced by 'sweating' or 'remelting' of secondary zinc bearing materials.

2 REFERENCES

The standards listed in Annex A contain provisions, which through references in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Ingot — Cast product intended for remelting such as block, jumbo or slab.

NOTE — Usually the shape of the ingot is a rectangular trapezoid with a flat bottom or grooves/notches at the bottom, and with or without protruding ears/lugs at both ends (*see* IS 1817). Generally, the nominal mass of each ingot is not more than 50 kg.

3.2 Refined Zinc — Zinc obtained from ore or other zinc bearing materials, by any refining process such as distillation or by chemical or electrolytic reduction but not by sweating or remelting of secondary zinc.

3.3 Melt or Cast (Non-Continuous Casting) — It is the product of one furnace or crucible melt. Sometimes the furnace contents are tapped into two or more ladles where the product of each ladle may be called a separate cast.

NOTE — All the ingots from the same cast have the same identifying mark.

3.4 Cast (Continuous Casting) — Identified volume of liquid metal.

3.5 Batch/Lot — Number of ingots taken from a single cast.

3.6 Block — Large ingot with end notches suitable for handling by overhead hoist.

NOTE — Normally, a block weighs approximately one metric tonne.

3.7 Bundle — Collection of ingots taken from a single cast and secured, for example by banding, for the purposes of handling, shipment and storage.

3.8 Jumbo — Large ingot suitable for handling by mechanical equipment.

NOTE — Normally, a jumbo weighs approximately one metric tonne.

3.9 Slab — Small ingot suitable for manual handling normally ranging from 18 kg to 30 kg.

3.10 Secondary Zinc — Zinc produced by controlled remelting of secondary materials containing metallic zinc.

4 GRADES AND DESIGNATION

This standard covers five grades of refined zinc ingots, designated as follows, in accordance with minimum zinc content in each grade:

a) Zn99.995;
b) Zn99.99;
c) Zn99.95;
d) Zn99.5; and
e) Zn98.65.

NOTE — For the information of the purchaser and the supplier, the equivalent or related grades existing in various international standards, are given in the Annex B.

5 SUPPLY OF MATERIAL

5.1 General requirements relating to the supply of zinc shall conform to IS 1387.

5.2 Zinc shall be supplied in the form of ingot. However, if required by the purchaser, it may also be supplied in the form of slab, tile or plate.

5.3 Information to be Given by the Purchaser

5.3.1 *Basis for Order/Enquiry*

While placing an order/enquiry for the purchase of material covered by this specification, the purchaser should specify the following information in order to facilitate the enquiry or order and confirmation of order procedures between the purchaser and the supplier:

a) The number of this Indian Standard;
b) Raw materials to be used for manufacture that is whether from ore or scrap or a mix;
c) The grade of the refined zinc required, for example, Zn99.995; (*see* Table 1 and accompanying notes);
d) Chemical composition of each grade (*see* **7**; Table 1 and its accompanying notes);
e) Quantity of product required (mass);
f) Nominal mass of an ingot (in kg) or a bundle (in tonnes);
g) Whether a specific ingot shape is required (*see* **8.1**); and
h) Whether a certificate of analysis or a declaration of conformity is required.

6 MANUFACTURE

6.1 Zinc ingots shall be manufactured from liquid refined zinc by continuous or non-continuous technique.

6.2 When zinc is supplied in any form other than ingot, as given under **5.2**, the method of manufacture of same shall be as agreed between the purchaser and the manufacturer.

7 CHEMICAL COMPOSION

7.1 The zinc ingots shall conform to the chemical composition as specified in Table 1.

7.2 The chemical composition shall be determined either by the, combination of the methods specified in IS 406, IS 2600 (Part 1), IS 2600 (Part 2), IS 2600 (Part 6) and IS 2600 (Part 7) so that the scope of the method of analysis shall fit into the chemical compositions scope of the product or by ICP-OES method specified in IS 2600 (Part 5) or any other established instrumental/chemical method. In case of dispute, the wet chemical analysis procedures specified in IS 406 and IS 2600 (Part 7) shall be the referee method. However, if the method of analysis for a particular element is not given in IS 406 and IS 2600 (Part 7), the referee method for the analysis, shall be as mutually agreed to between the purchaser and the supplier.

8 SHAPE AND MASS OF INGOTS

8.1 The shape and mass of the ingots shall be at the discretion of the supplier, unless a specific shape and the mass of each ingot is agreed between the purchaser and the manufacturer and is stated in the enquiry and/or order.

8.2 When zinc is supplied in any form other than ingot, that is slab, tile or plate etc, the mass of the same shall be mutually agreed to between the purchaser and the manufacturer.

9 FREEDOM FROM DEFECTS

9.1 The surface of the ingots shall be reasonably free of surface corrosion and adhering foreign matter.

9.2 Unless otherwise agreed between the supplier and the purchaser, the appearance quality/surface condition of ingots shall be determined visually.

10 SAMPLING

Unless otherwise agreed to between the purchaser and the manufacturer, the number of ingots to be taken from a lot and the method of sample preparation for chemical analysis shall be in accordance with IS 18519/ISO 20081.

11 RETEST

If the sample prepared under **10** and tested for chemical composition as per **7.2**, fails to meet the requirements specified under **7.1,** two further samples shall be taken from the same lot of metal and tested for chemical analysis as per **7.2**. If both the test results satisfy the relevant requirements, the lot shall be accepted. Should either of the re-tests fail, the lot represented shall be deemed as not complying with this standard.

12 MARKING

12.1 All ingots or bundles of ingots shall be marked, or labelled, with the following minimum information, unless specifically agreed otherwise by the producer and user:

a) The cast/lot number;
b) The grade of the material;
c) Indication of source of manufacture that is the name or trademark of manufacturer; and
d) The mass of ingot or bundle.

12.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder and the product(s) may be marked with the Standard Mark.

Table 1 Chemical Composition of Zinc

(*Clauses* 5.3.1 *and* 7.1)

Sl No.	**Grade Designation**	**Limit of Elements in Mass Percent**							
		Zn, *Min* (by Difference)	Pb, *Max*	Fe, *Max*	Cd, *Max*	Al, *Max*	Cu, *Max*	Sn, *Max*	Total of All Impurities, *Max*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	Zn99.995	99.995	0.003	0.002	0.003	0.001	0.001	0.001	0.005
ii)	Zn99.99	99.990	0.003	0.003	0.003	0.002	0.002	0.001	0.010
iii)	Zn99.95	99.95	0.03	0.02	0.01	0.01	0.002	0.001	0.05
iv)	Zn99.5	99.5	0.45	0.05	0.01	0.01	0.20	–	0.5
v)	Zn98.65	98.65	0.5 to 1.23	0.02	0.02	–	0.02	–	1.35

NOTES

1 The possible presence of other unnamed/incidental elements is not precluded. However, analysis shall regularly be made only for the impurities listed in the table. The major element (Zinc) shall be determined by difference between the sum of total elements analysed and 100 percent. By agreement between manufacturer and the purchaser, analysis may be required and limits established for elements not specified in Table 1.

2 For some applications, the purchaser may require individual elements to be specified at the lower levels than the maxima given in this Table 1 and the same shall be stated in the order and/or enquiry by the purchaser.

3 Copper content shall not exceed 0.001 percent for the above grades when used for dry battery cans.

ANNEX A

(*Clause* 2)

LIST OF REFFERED STANDARD

IS No.	*Title*
IS 406 : 1964	Methods of chemical analysis of slab zinc (spelter) (*revised*)
IS 1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
IS 1817 : 1961	Methods of sampling non-ferrous metals for chemical analysis
IS 2600	Methods of chemical analysis of zinc and zinc base alloys for die castings:
(Part 1) : 1988	Determination of copper, iron, nickel, tin and thallium by spectrophotometric method (*first revision*)
(Part 2) : 1988	Determination of copper, iron, lead and cadmium by atomic absorption spectrophotometric method (*first revision*)
(Part 5) : 2022	Analysis by inductively coupled plasma optical emission spectrometry (*first revision*)
(Part 6) : 2022	Determination of magnesium by atomic absorption spectrometric method (*first revision*)
(Part 7) : 2022	Determination of aluminium by titrimetric method (*first revision*)
IS 18519 : 2023/ ISO 20081 : 2005	Zinc and zinc alloys — Method of sampling — Specifications (*under preparation*)

ANNEX B

(*Clause* 4 *and Foreword*)

RELEVANT GRADES OF ZINC IN DIFFERENT INTERNATIONAL STANDARDS

Sl No.	*IS 209*	*ISO 752*	*EN 1179*		*ASTM B6*	*JIS H 2107* / *KS D 2351*	*AS 1242*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Zn99.995	ZN-1	Z1	99.995	LME Grade 99.995	Highest Pure Zinc Metal 99.995	–
ii)	Zn99.99	ZN-2	Z2	99.99	Special High Grade 99.990	Special Zinc Metal 99.99	Special High Grade 99.99
iii)	Zn99.95	ZN-3	Z3	99.95	High Grade 99.95	Ordinary Zinc Metal 99.97	High Grade 99.95
iv)	Zn99.5	ZN-4	Z4	99.5	Intermediate Grade 99.5	Distilled Zinc Metal, Special 99.6	–
v)	Zn98.65	ZN-5	Z5	98.5	Prime Western Grade 98.5	Distilled Zinc Metal, Class 1, 98.5 Distilled Zinc Metal, Class 2, 98.0	Prime Western 98.5

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Ores and Feed Stock for Non-Ferrous (Excluding Aluminium and Copper) Industry, their Metals/ Alloys and Products Sectional Committee, MTD 09

Organization	*Representative(s)*
CSIR – National Metallurgical Laboratory, Jamshedpur	DR ABHILASH **(*Chairperson*)**
Arya Alloys Private Limited, New Delhi	SHRI AMRENDRA K. JHA
Bhabha Atomic Research Centre, Mumbai	DR DHRUVA KUMAR SINGH DR BHASKAR PAUL (*Alternate*)
Bharat Electronics Limited, Bengaluru	SHRI SHREEDHAR NADIGER SHRI AWADESH KUMAR (*Alternate*)
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Chakradhar Chemicals Private Limited, Muzaffarnagar	SHRI NEERAJ KEDIA
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CSIR – National Metallurgical Laboratory, Jamshedpur	DR PRATIMA MESHRAM
Directorate General of Aeronautical Quality Assurance, Ministry of Defence, New Delhi	DR NEERAJ CHAURASIA SHRI MAHENDRA KUMAR GUPTA (*Alternate*)
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Eveready Industries India Limited, Kolkata	SHRI G. PRAHALATHAN SHRI SENTHIL R. PANDIAN (*Alternate*)
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Indian Rare Earths Limited, Mumbai	SHRI D. SINGH DR B. R. MISHRA (*Alternate*)
IZA India (International Zinc Association), New Delhi	DR RAHUL SHARMA SHRI KENNETH DE SOUZA (*Alternate*)
J G Chemicals Limited, Kolkata	SHRI ANIRUDH JHUNJHUNWALA
Khosla Engineering Private Limited, Pune	SHRI VISHAL KOTHARI
Ministry of Mines, New Delhi	SHRI J. N. SHARMA

Organization	*Representative(s)*
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The Tinplate Company of India Limited, Jamshedpur	DR SOURAJYOTI DEY SHRI SUBRATA SADHU (*Alternate*)
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J G Chemicals Limited, Kolkata	SHRI ANIRUDH JHUNJHUNWALA
Khosla Engineering Private Limited, Pune	SHRI VISHAL KOTHARI SHRI NILESH PATEL (*Alternate*)
Madhav KRG Group India, New Delhi	SHRI RANDHIR RATHAUR DR RAHUL GOYAL (*Alternate*)
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Southern Metals & Alloys Private Limited, Mumbai	SHRI VIVEK NORONHA

(*Continued from second cover*)

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

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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