Draft Indian Standard

FERROTUNGSTEN – SPECIFICATION

(*Third Revision*)

FOREWORD

(*formal clause will be added later*)

This standard was first published in 1962 and subsequently revised in 1972 and 1993. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

In addition, the following changes have been made:

a) Reference clause has been updated;

In the preparation of this standard considerable assistance has been taken from the following:

a) ISO 5450 : 1980 Ferrotungsten - Specification and condition of delivery.
b) ASTM A 144-73 Specification for ferrotungsten, the American Society for Testing and Materials.

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.

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FERROTUNGSTEN – SPECIFICATION

(*Third Revision*)

1 SCOPE

This standard covers the requirements of Ferrotungsten used in ferrous industry and for nuclear applications.

2 REFERENCES

The standards listed contain provisions, which through reference 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 the standards listed below:

IS No.	*Title*
IS 460	Test sieves — Specifications:
(Part 1) : 2020	Wire cloth test sieve (*fourth revision*)
(Part 2) : 2020	Perforated plate test sieve (*fourth revision*)
(Part 3) : 2020	Methods of examination of apertures of test sieves (*fourth revision*)
IS 1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
IS 1472 : 1977	Methods of sampling ferro-alloys for determination of chemical composition (*first revision*)
IS 1559 : 1961	Methods of chemical analysis of ferro-alloys
IS 15765 : 2008	Method of sampling ferro alloys for sieve analysis and size determination

3 TERMINOLOGY

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

3.1 Ferrotungsten

A master alloy with a minimum tungsten content of 75.0 percent by mass and a maximum tungsten content of 95.0 percent by mass obtained by reduction.

3.2 Cast (Melt)

The product of any of the following:

a) one furnace heat, or
b) one top of continuous furnace, or
c) a number of furnace or crucible heats of similar composition mixed in a ladle or holding furnace and used for making a cast.

3.3 Consignments

Ferrotungsten shall be delivered in consignments constituted by one of the following methods.

3.3.1 *Tapped Lot Method*

A consignment constituted by the tapped lot method consists of a ferrotungsten mass of one melt (or one part of a continuous tap).

3.3.2 *Graded Lot Method*

A consignment constituted by the graded lot method consists of a number of melts (or parts of continuous taps) of one ferrotungsten designation. The Ferrotungsten content of the melts (or parts of continuous taps) constituting the consignment shall not differ from each other by more than 3 percent absolute.

3.3.3 *Blended Lot Method*

A consignment constituted by the blended lot method consists of a number of melts (or parts of continuous taps) of one of Ferrotungsten designation, which have been crushed to a particle size less than 50 mm and thoroughly mixed. The content of the main constituent of the melts (or parts of continuous taps) constituting the consignment may vary between the minimum and maximum limits specified for the appropriate tungsten designation.

4 GRADES

This standard covers 4 grades of ferrotungsten as specified in Table 1.

5 PARTICULARS TO BE SPECIFIED WHILE ORDERING

For the benefit of the purchaser, particulars to be specified while ordering for the material to this specification shall be as follows:

a) Quantity of the material,
b) Constitution of consignment,
c) Name of the material.
d) Grade designation,
e) Size designation, and
f) Necessary requirements for analysis, and reports, packing, etc, as appropriate.

6 SUPPLY OF MATERIALS

General requirements relating to supply of the material to this specification shall be as laid down in IS 1387.

7 REQUIREMENTS

7.1 Constitution of Consignment

Ferrotungsten shall be delivered in consignments constituted by one of the methods defined in **3.3**.

7.2 Chemical Composition

7.2.1 Each consignment of the material shall conform to the requirements of the chemical composition specified in Table 1 and if so specified by the purchaser at the time of enquiry and order, the manufacturer shall supply a test certificate of the chemical analysis of the sample of material for each melt.

7.2.2 If specified by the purchaser at the time of enquiry and order that each lump of a consignment should conform to the chemical composition specified in Table 1, this shall be agreed between the purchaser and the manufacturer.

7.2.3 The chemical composition given in Table 1 shows only the main constituent elements and usual impurities. If the purchaser requires closer ranges for the main element contents and/or different limits for specified elements and/or non-specified elements, this shall be agreed between the purchaser and the manufacturer.

7.2.4 The percentage of residual elements for all the grades shall be maximum as given in Table 2. If required by the purchaser, the manufacturer shall furnish an analysis for any of these elements on a cumulative basis over a period mutually agreed between the purchaser and the manufacturer.

7.2.5 The chemical composition of the material shall be determined either by the methods specified in IS 1559 or by any established instrumental/chemical method. In case of dispute procedure given in IS 1559, shall be the referee method. However, where the method is not given in IS 1559, the referee method shall be agreed to between the purchaser and the manufacturer.

Table 1 Chemical Composition of ferrotungsten; Percent
(*Clause* 7.2.2)

Sl No.	Grade Designation	W		C *Max*	Si *Max*	P *Max*	S *Max*	Mo *Max*	Al *Max*	Fe
		Over	Upto and including							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	FeW90C05	85.0	95.0	0.05	0.10	0.01	0.020	0.20	0.10	balance
ii)	FeW80C10	75.0	85.0	0.10	0.50	0.02	0.020	0.35	0.10	balance
iii)	FeW80C60	75.0	85.0	0.60	1.0	0.06	0.050	1.0	-	balance
iv)	FeW80C60	75.0	85.0	0.60	1.0	0.06	0.050	3.0	-	balance
NOTE — The material belonging to a cast (melt) which is out of specification, shall not be blended or mixed with the material of another cast/melt.										

Comment : The molybdenum content of Grade FeW80C10 varies from the equivalent grade specified in the ASTM standard A 144-73. (Table 1).

Table 2 Residual Element, Percent[1]
(Clause 7.2.4)

Sl No.	Grade Designation	Mn *Max*	Cu *Max*	Ni *Max*	As *Max*	Sb *Max*	Sn *Max*	Bi *Max*	Total As, Sb, Sn *Max*	Total As, Sb, Sn, Bi	Fe

										Max	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	FeW90C05	0.10	0.50	0.05	0.10	0.010	0.010	0.010	-	0.040	balance
ii)	FeW80C10	0.30	0.07	0.05	0.020	0.020	0.020	0.030	-	0.090	balance
iii)	FeW80C60	0.75	0.10	-	0.10	0.080	0.10	-	0.20	-	balance
iv)	FeW80C60	0.75	0.10	-	0.10	0.080	0.10	-	0.20	-	balance
[1] Analysis of each lot is not required**.**											

8 SIZE

8.1 Unless otherwise specified the material shall be supplied in lumps or as crushed and screened particles. The particle size ranges and tolerances shall be as given in Table 3. The under size values shall be valid at the point of delivery to the purchaser.

8.2 If the purchaser requires particles size ranges and/or tolerances other than those given in Table 3, these shall be agreed upon between the supplier and the purchaser.

8.3 The undersize and oversize values shall be valid at the point of delivery to the purchaser. The test sieves used shall be in accordance with sizes specified in IS 460 (Part 1) and IS 460 (Part 2). As the standard test sieve will become less accurate after period of time, the sieve shall therefore be periodically checked according to IS 460 (Part 3) and the correction factor shall be determined and applied to the result.

8.4 For conducting the sieve analysis and size determination, the methods specified in IS 15765 shall be applied.

Table 3 Particle Size
(Clause 8)

Sl No.	Size Designation	Size Range mm		Undersize, Percent by mass, *Max*	Oversize, Percent by Mass *Max*
		Over	Upto and including		
(1)	(2)	(3)	(4)	(5)	(6)
i)	1	50	100	5	10
ii)	2	25	50	5	10
iii)	3	2	25	5	10
iv)	4	Up to 2		-	10

9 EXTRANEOUS CONTAMINATIONS

The material shall be reasonably free from extraneous contaminations like slag and non-metallic inclusions, etc. A quantity of slag and anti-burning materials shall be specified by mutual agreement between the supplier and the purchaser.
Comment : The following statement lacks meaningful interpretation.

"The material shall be reasonably free from extraneous contamination like slag and non-metallic inclusions, etc.".

A more precise and detailed statement is needed to ensure meaningful interpretation

10 SAMPLING

Each consignment of the material shall be sampled in accordance with IS 1472.

11 PACKING

The material shall be packed in suitably containers, in quantities as mutually agreed between the supplier and the purchaser.

12 MARKING

12.1 The package containing the material shall be marked as follows:

a) Supplier's name or trade name,
b) Grade number and size designation,
c) ~~Quality,~~ quantity
d) Date of manufacture, and
e) Shelf life, if any.
f) Heat or Cast no/s.

12.2 BIS Certification Marking

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

Comment : With reference to the ASTM A 144-73 standard, the Inspection and Rejection clauses need to be included as separate points.