Doc No. MTD 5 (27446) WC
February 2025

भारतीय मानक ब्यूरो

DRAFT FOR WIDE CIRCULATION

भारतीय मानक मसौदा

फेर्रोमॉलीब्डेनम — विशिष्टि

(*आईएस 1469 का पांचवा पुनरीक्षण*)

Draft Indian Standard

Ferromolybdenum — Specification

(*Fifth Revision of IS 1469*)

ICS 77.100

Ferroalloys Sectional Committee, MTD 05	Last date of comment: 27 March 2025

FOREWORD

(*formal clause will be added later*)

This standard was first issued in 1962 and was subsequently revised in 1963, 1970, 1984 and 1993. While reviewing this standard in view of experience gained during these years, the following main modifications have been made in this revision.

a) References clause has been updated.
b) High carbon grades have been removed and 01FeMo 73 has been added. Residual elements have been removed from **Table 1** and added in clause **7.2.3**.
c) Contradictory and arbitral analysis have been added.
d) Particle size ranges have been modified and aligned with current industrial practices.
e) Minor editorial changes have been made.

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.

Doc No. MTD 5 (27446) WC
February 2025

Draft *Indian Standard*

FERROMOLYBDENUM — SPECIFICATION

(*Fifth Revision*)

1 SCOPE

This standard covers the requirements and conditions of delivery for ferromolybdenum used in ferrous industries.

2 REFERENCES

The following standards contain provisions which through reference in the 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated 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 1607: 2013	Methods of test sieving (Second Revision)
IS 2085: 1962	Code for designation of Ferro alloys
IS 12614	Methods of chemical analysis of ferromolybdenum
(Part 1) : 1988	Determination of molybdenum
(Part 2) : 1988	Determination of carbon
(Part 3) : 1988	Determination of silicon
(Part 4) : 1988	Determination of Sulphur
(Part 5) : 1988	Determination of phosphorus
(Part 6) : 1988	Determination of copper
(Part 7) : 1988	Determination of aluminium
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 Ferromolybdenum – Ferromolybdenum is a master alloy of iron and molybdenum with a minimum molybdenum content of 55 percent by mass and a maximum molybdenum content of 75 percent by mass and commonly used as alloying additive material in the manufacture of molybdenum bearing iron and steels.

3.2 Cast (Melt)

The product of any of the following:

a) One furnace heat; or
b) One tap 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 Consignment

3.3.1 ***Tapped Lot Method***

A consignment constituted by the tapped lot method consists of ferromolybdenum 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 ferromolybdenum designation. The ferromolybdenum content of the melts (or parts of continuous taps) constituting the consignment shall not differ from each other by more than 3 percent.

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 ferromolybdenum 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 part of continuous taps) constituting the consignment may vary between the minimum and maximum limits specified for the appropriate ferromolybdenum designation.

4 GRADES

This standard covers the grades of ferromolybdenum as specified in Table 1 and are designated as per IS 2085.

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;
e) Size range; and
f) Residual element content (if required); and
g) Necessary requirements for analysis and reports, packing, etc., as appropriate

6 SUPPLY OF MATERIALS

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

7 REQUIREMENTS

7.1 Constitution of Consignment

Ferromolybdenum 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 chemical analysis of the sample of material for each consignment.

Table 1 Chemical Composition of Ferromolybdenum

(*Clauses* 4, 8.1)

Grade Designation (as per IS 2085)	**Mass Percent**					
	Mo	C *Max*	Si *Max*	S *Max*	P *Max*	Cu *Max*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
05FeMo 58	55-60	0.50	1.5	0.10	0.10	0.50
01FeMo 62	58-65	0.10	2.0	0.10	0.06	0.50
01FeMo 68	65-70	0.10	2.0	0.10	0.06	0.50
01FeMo 73	70-75	0.10	2.0	0.10	0.06	0.50

NOTE – If agreed upon between both the parties C - 0.5 percent, *Max*, Cu - 1.5 percent, *Max* and P – 0.10 percent, *Max* can also be supplied.

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

7.2.3 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 to between the purchaser and the manufacturer.

Element	Percent, *Max*
Pb	0.01
Sn	0.03
Al	0.50

7.2.4 The chemical composition of the material shall be determined either by the method specified in IS 12614 (Part 1 to 7) or any other established instrumental/chemical method. In case of dispute the procedure given in IS 12614 (Part 1 to 7) shall be the referee method. However, where the method is not given in IS 12614 (Part 1 to 7), the referee method shall be agreed to between the purchaser and the manufacturer.

In case of dispute, one of the following two procedures described in **7.2.5** and **7.2.6** may be used.

7.2.5 *Contradictory analysis*

7.2.5.1 When carrying out the analysis of samples provided by the supplier along with the consignment, the result shall be satisfied using Formula (1):

$$| X_1 - X_2 | < R \qquad (1)$$

Where

X_1 is the value of the quality provided by the supplier;

X_2 is the result of the analysis by the purchaser;

R is the reproducibility limit of used methods.

7.2.5.2 When carrying out the analysis of samples provided by the purchaser with an independent sampling of consignment, the result shall be satisfied using Formula (2):

$$| X1 - X2 | < 1.4\ \beta_{SDM} \qquad (2)$$

where β_{SDM} is the overall precision and control of quality

Table 2 Overall precision of the determination of the Chemical composition of a consignment

Sl. No.	**Mass of consignment,** t		**Overall precision, ± β_{SDM}** % (*m/m*)
	Over	Up to and including	**FeMo Mo**
i)	40	64	—
ii)	25	40	—
iii)	16	25	0.90

iv)	10	16	0.91
v)	5	10	0.92
vi)	3	5	0.93
vii)	1	3	0.95
viii)	0.5	1	0.98
ix)		0.5	1.03

7.2.5.3 If the results of the contradictory analysis are consistent with the conditions of Formula (1) or Formula (2), the final value of the quality (X) can be specified by the Formula (3)

$$X = (X_1 + X_2)/2$$

7.2.5.4 If the conditions of Formula (1) or Formula (2) are not satisfied, then, provided that no other agreement is reached, arbitral analysis shall be carried out by an arbitrator chosen by mutual agreement between the supplier and the purchaser.

7.2.6 Arbitral analysis

7.2.6.1 Arbitral analysis should be carried out by the method specified in IS 12614 (Part-1). Other methods of chemical analysis with a similar accuracy may be used, but should be agreed between the supplier, the purchaser and the arbitrator.

8 SIZE RANGES

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

8.2 The undersize and oversize values shall be valid at the point of delivery to the purchaser. The size analysis shall be carried out as per IS 1607. 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.

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

Table 3 Particle Size
(*Clause* 8.1 *and* 8.2)

Sl No.	**Size Designation**	**Particle size Range mm**		**Undersize Percent by Mass, *Max***	**Oversize, Percent by Mass, *Max***
		Over	Up to and including		
(1)	(2)	(3)	(4)	(5)	(6)

i)	1	10	100	10	10
ii)	2	2	10	10	10
iii)	3	0	2	-	5

NOTES

1 For oversize, no piece to exceed 1.15 times the maximum limit of the size range specified in two or three directions.

2 In the undersized material –3.15 mm fraction shall not exceed 5 percent. If exceeds, this shall be agreed upon between the supplier and the purchaser

9 EXTRANEOUS CONTAMINATIONS

The material shall be reasonably free from extraneous contamination like slag, and non-metallic inclusion etc. A quantity of slag and anti-burning materials shall be specified by mutual agreement between the supplier and the purchaser.

10 SAMPLING

Each consignment of the material shall be sampled in accordance with IS 1472 for chemical analysis and in accordance with IS 15765 for size designation.

11 PACKING

The material shall be packed in suitable packaging/bags, or shipped in bulk, in quantities as mutually agreed to between the supplier and the purchaser.

12 MARKING

12.1 The packing containing the material shall be marked legibly and indelibly with the following:

a) Indication of the source of manufacture;
b) Grade designation,
c) Constitution of consignment
d) Size range;
e) Quantity;
f) Consignment number

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.