Draft ***Indian Standard***

FERROCHROMIUM — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirement of ferrochromium used in ferrous industry.

2 REFERENCES

The following Indian Standards 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 indicated below:

IS	*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 15765 : 2008	Method of sampling ferro alloys for sieve analysis and size determination
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 13452 : 2019	Methods of chemical analysis of ferrochromium (First Revision)

3.1 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.

3.2 Consignments

3.2.1 Tapped Lot Method

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

3.2.2 Graded Lot Method

A consignment constituted by the graded lot method consists of a number of melts (or parts of continuous taps) of one ferrochromium designation. The chromium content of the melts (or

parts of continuous taps) constituting the consignment shall not differ from each other by more than 3 percent absolute.

3.2.3 Blended Lot Method

A consignment constituted by the blended lot method consists of a number of melts (or parts of continuous taps) of one ferrochromium designation, which have been crushed to a particle size 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 ferrochromium designation.

4 MANUFACTURE

Ferrochrome is a master alloy of iron and chromium with chromium content of minimum 45.0 percent and maximum 95.0 percent, by mass, obtained by reduction.

5 GRADES

This standard covers the grades of ferrochromium, with other sub-grades as specified in Table 1 - 6.

6 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 range; and
f) necessary requirements for analysis and reports, packing etc, as appropriate.

7 SUPPLY OF MATERIALS

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

8 REQUIREMENTS

8.1 Constitution of Consignment

Ferrochromium shall be delivered in consignments constituted by one of the methods defined in **3.2**.

8.2 Chemical Composition

8.2.1. The standard chromium ranges specified in Table 1 and their designations cover the whole range of chromium contents from 45.0 to 95.0 % (m/m) as defined for ferrochromium.

Table 1 – Standard Chromium Ranges
(*Clause* 8.2.1)

Sl. No.	Designation	Chromium Range
(1)	(2)	(3)
I)	FeCr50	45.0 to 55.0
II)	FeCr60	55.0 to 65.0
III)	FeCr70	65.0 to 75.0
IV)	FeCr80	75.0 to 85.0

V)	FeCr90	85.0 to 95.0

NOTE — The designations shall be completed by the designation for the carbon content, and other elements if necessary, as indicated in Tables 2 to 6 for the required grade.

8.2.2 Each batch of the material shall conform to the requirements of the chemical composition specified in Table 2 - 6 and if so specified by the purchaser at the time of enquiry and order, manufacturer shall supply a test certificate of chemical analysis of the sample of material for each melt.

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.

8.2.3 If specified by the purchaser at the time of enquiry and order that each lump of the consignment should conform to the chemical composition specified in Table 2 - 6, this shall be agreed to between the purchaser and the manufacturer.

8.3 The chemical composition given in Table 2 - 6 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 to between the purchaser and the manufacturer.

8.4 The chemical composition of the material shall be determined either by the method specified in IS 13452 or any other established instrumental/chemical method. In case of dispute the procedure given in the latest version of IS 13452 shall be the referee method. However, where the method is not given in IS 13452, the referee method shall be agreed to between the purchaser and the manufacturer.

8.5 Residual Element

Unless otherwise agreed upon between the purchaser and the manufacturer, the percentage of residual elements in medium and low-carbon grades of ferrochromium shall be as given below:

Element	*Percent, Max*
Manganese	0.75
Nickel	0.50
Vanadium	0.50
Copper	0.050
Molybdenum	0.050
Columbium	0.050
Tantalum	0.050
Cobalt	0.10
Aluminium	0.10
Titanium	0.050
Zirconium	0.005
Arsenic	0.005

Lead	0.005
Tin	0.005
Zinc	0.005
Boron	0.005
Silver	0.005
Antimony	0.005
Bismuth	0.005

8.5.1 The manufacturer and the purchaser shall agree upon the concentration of other constituents, such as N, H, and O.

Table 2 Chemical Composition of High Carbon Ferrochromium

(*Clauses* 5 *and* 8.2.2)

Grade No.	Grade Designation	*Constituent , percent*					
		Cr	C	Si, *Max*		P, *Max*	S, *Max*
				Over	Upto and including		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
a) High Carbon Ferrochromium, Normal Phosphorus Content							
I)	FeCr…C50	Within the range from 45.0 up to and including 75.0. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	From 4 up to and including 6.0	-	1.5	0.030	0.10
II)	FeCr…C50LS						0.05
III)	FeCr…C50Si2			1.5	3		0.10
IV)	FeCr…C50Si2LS						0.05
V)	FeCr…C50Si4			3	5		0.10
VI)	FeCr…C50Si4LS						0.05
VII)	FeCr…C50Si7			5	10.0		0.05
VIII)	FeCr…C70		From 6 up to and including 8.	-	1.5	0.030	0.10
IX)	FeCr…C70LS						0.05
X)	FeCr…C70Si2			1.5	3		0.10
XI)	FeCr…C70Si2LS						0.05
XII)	FeCr…C70Si4			3	5		0.10
XIII)	FeCr…C70Si4LS						0.05
XIV)	FeCr…C70Si6			5	8		0.05
XV)	FeCr…C90		From 8 up to and	-	1.5	0.030	0.10
XVI)	FeCr…C90LS						0.05

XVII)	FeCr…C90Si2		including 10.	1.5	3		0.10
XVIII	FeCr…C90Si2LS						0.05
XIX)	FeCr…C90Si4			3	5		0.10
XX)	FeCr…C90Si4LS						0.05
b) High Carbon Ferrochromium, Low Phosphorus Content							
I)	FeCr…C50LP	Within the range from 45.0 up to and including 75.0. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	From 4 up to and including 6.0	-	1.5	0.030	0.10
II)	FeCr…C50LSLP						0.05
III)	FeCr…C50Si2LP			1.5	3		0.10
IV)	FeCr…C50Si2LSLP						0.05
V)	FeCr…C50Si4LP			3	5		0.10
VI)	FeCr…C50Si4LSLP						0.05
VII)	FeCr…C50Si7LP			5	10.0		0.05
VIII)	FeCr…C70LP		From 6 up to and including 8.	-	1.5	0.030	0.10
IX)	FeCr…C70LSLP						0.05
X)	FeCr…C70Si2LP			1.5	3		0.10
XI)	FeCr…C70Si2LSLP						0.05
XII)	FeCr…C70Si4LP			3	5		0.10
XIII)	FeCr…C70Si4LSLP						0.05
XIV)	FeCr…C70Si6LP			5	8		0.05
XV)	FeCr…C90LP		From 8 up to and including 10.	-	1.5	0.030	0.10
XVI)	FeCr…C90LSLP						0.05
XVII)	FeCr…C90Si2LP			1.5	3		0.10
XVIII	FeCr…C90Si2LSLP						0.05
XIX)	FeCr…C90Si4LP			3	5		0.10
XX)	FeCr…C90Si4LSLP						0.05

NOTES–

1. The designations shall be completed by the figure for the required standard chromium range selected from table 1.

Examples: Quality FeCr…C20

a) In the case of a required standard chromium range from 45.0 to 55.0 %, the designation would read FeCr50C20.
b) In the case of a required standard chromium range from 65.0 to 75.0 %, the designation would read FeCr70C20.

2. For the deviation, within a lot, of the chromium content from the mean value, see clause **8**

Table 3 Chemical Composition of Medium Carbon Ferrochromium

(*Clauses* 5 *and* 8.2.2)

a) Medium Carbon Ferrochromium(FeCr), Normal Phosphorus Content.

Grade No.	Grade Designation	*Constituent , percent*					
		Cr	C, *Max*		Si, *Max*	P, *Max*	S, *Max*
			Over	Upto and including			
I)	FeCr…C10	Within the range from 45 up to and including 75. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated acco rdingly.	0.5	1.0	1.5	0.050	0.050
II)	FeCr…C20		1.0	2.0			
III)	FeCr…C40		2.0	4.0			
b) Medium Carbon Ferrochromium(FeCr), Low Phosphorus Content.							
I)	FeCr…C10LP	Within the range from 45 up to and including 75. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	0.5	1	1.5	0.030	0.050
II)	FeCr…C20LP		1	2			
III)	FeCr…C40LP		2	4			

NOTES–

1. The designations shall be completed by the figure for the required standard chromium range selected from table 1.

Examples: Quality FeCr…C20

a) In the case of a required standard chromium range from 45.0 to 55.0 %, the designation would read FeCr50C20.

b) In the case of a required standard chromium range from 65.0 to 75.0 %, the designation would read FeCr70C20.

2. For the deviation, within a lot, of the chromium content from the mean value, see clause **8**

Table 4 Chemical Composition of Low Carbon Ferrochromium

(*Clauses* 5 *and* 8.2.2)

Grade No.	Grade Designation		Constituent , *percent*					
		Cr	C		Si, *Max*	P, *Max*	S, *Max*	N, *Max*
			Over	Upto and including				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
a) Low carbon FeCr, normal phosphorus content								
I)	FeCr…C01	Within the range from 45 up to and including 75. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	-	0.015	1.5	0.050	0.030	0.15
II)	FeCr…C03		0.015	0.030				
III)	FeCr…C05		0.030	0.050				
IV)	FeCr…C1		0. 50	0.10				
V)	FeCr…C2		0.10	0.25				
VI)	FeCr…C5		0.25	0.50				
b) Low carbon FeCr, low phosphorus content								
I)	FeCr…C01LP	Within the range from 45 up to and including 75. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	0	0.015	1.5	0.050	0.030	0.15
II)	FeCr…C03LP		0.015	0.030				
III)	FeCr…C05LP		0.030	0.050				
IV)	FeCr…C1LP		0. 50	0.10				
V)	FeCr…C2LP		0.10	0.25				
VI)	FeCr…C5LP		0.25	0.50				

NOTES–

1. The designations shall be completed by the figure for the required standard chromium range selected from table 1.

Examples: Quality FeCr…C20

a) In the case of a required standard chromium range from 45.0 to 55.0 %, the designation would read FeCr50C20.

b) In the case of a required standard chromium range from 65.0 to 75.0 %, the designation would read FeCr70C20.

2. For the deviation, within a lot, of the chromium content from the mean value, see clause **8**

Table 5 Chemical Composition of Low Carbon Ferrochromium, High Chromium Content

(Clauses 5 and 8.2.2)

Grade No.	Grade Designation	Constituent , *percent*								
		Cr	C		Si, *Max*	P, *Max*	S, *Max*	Ni, *Max*	Co, *Max*	N, *Max*
			Over	Upto and including						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10	(11)
	FeCr…C01	Within the range from 75 up to and including 95. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.	0	0.015	1.5	0.020	0.030	0.15	0.02	0.20
	FeCr…C03		0.015	0.030						
	FeCr…C05		0.030	0.050						

NOTES–

1. The designations shall be completed by the figure for the required standard chromium range selected from table 1.

Examples: Quality FeCr…C20

a) In the case of a required standard chromium range from 45.0 to 55.0 %, the designation would read FeCr50C20.
b) In the case of a required standard chromium range from 65.0 to 75.0 %, the designation would read FeCr70C20.

2. For the deviation, within a lot, of the chromium content from the mean value, see clause **8**

Table 6 Chemical Composition of Low Carbon Ferrochromium, Nitrogen containing

(Clauses 5 and 8.2.2)

Grade No.	Grade Designation	Constituent , *percent*						
		Cr	C	Si, *Max*	P, *Max*	S, *Max*	N, *Max*	
							Over	Upto and including
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Smelted FeCr…C1N3	Within the range from 45 up to and including	0.10	1.5	0.030	0.025	2.0	4.0

	Sintered FeCr…C1N7	75. One of the standard chromium ranges specified in table 1 shall be selected, as required, and designated accordingly.		1.5				
	Sintered FeCr…C1N7Si			Over 1.5			4.0	10.0

NOTES–

1. The designations shall be completed by the figure for the required standard chromium range selected from table 1.

Examples: Quality FeCr…C20

a) In the case of a required standard chromium range from 45.0 to 55.0 %, the designation would read FeCr50C20.
b) In the case of a required standard chromium range from 65.0 to 75.0 %, the designation would read FeCr70C20.

2. For the deviation, within a lot, of the chromium content from the mean value, see clause **8**

9 SIZE RANGE

9.1 If material is supplied in lumps or as crushed and screened particles, the size ranges shall be given in Table 2. If the purchaser requires particular size range and/or tolerance other than those given in Table 2, this shall be agreed upon between the manufacturer and the purchaser. However, the tolerance on such agreed size ranges shall be oversize 10 % maximum and undersize 10 % maximum.

9.2 Sieve clause

Table 7 Particle Size Range

(*Clause* 9.1)

Size Designation	Size Range up to and above Including (mm)	Undersize, Percent By Mass, *Max*	Oversize Percent by Mass, *Max*
(1)	(2)	(3)	(4)
i)	10 - 150	10	10
ii)	10 - 100	10	10
iii)	10 - 90	10	10
iv)	10 - 50	10	10
v)	5 - 10	10	10
vi)	0 - 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.

10 EXTRANEOUS CONTAMINATIONS

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

11 SAMPLING

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

12 PACKING

The material shall be packed in suitable containers, in quantities as mutually agreed to between the supplier and the purchaser. A quantity of slag and anti-burning materials shall be specified by mutual agreement between the supplier and the purchaser

13 MARKING

12.1 The material shall be marked with the following:

a. Indication of the source of manufacture;
b. Grade designation, cast or lot and size designation;
c. Quantity;
d. Date of manufacture; and
e. Shelf life, if required.

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.