

بررسی استاندارد فروکروم ASTM A101

ترکیب شیمیایی:

Type Ferrochromium	Composition, %						
	Grade	Chromium	Carbon	Silicon	Sulfur, max	Phosphorus, max	Nitrogen
High carbon	A	51.0–56.0	6.0–8.0	6.0 max	0.040	0.030	...
	B	56.0–62.0	6.0–8.0	8.0–14.0	0.050	0.030	...
	C	62.0 min	6.0–8.0	3.0 max	0.050	0.030	...
Low carbon	A	60.0–67.0	0.025 max	1.0–8.0	0.025	0.030	...
	B	67.0–75.0	0.025 max	1.0 max	0.025	0.030	...
	C	67.0–75.0	0.050 max	1.0 max	0.025	0.030	...
	D	67.0–75.0	0.75 max	1.0 max	0.025	0.030	...
Vacuum low carbon	E	66.0–70.0	0.015 max	2.0 max	0.030	0.030	...
	G	63.0–68.0	0.050 max	2.0 max	0.030	0.030	5.0–6.5
Nitrogen bearing		62.0–70.0	0.10 max	1.0 max	0.025	0.030	1.0–5.0

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Type	Composition, max, %						
	High Carbon		Low Carbon	Vacuum Low Carbon ^A		Nitrogen Bearing	
	Grade	A, B	C	All Grades	E	G	—
Nitrogen		0.050	0.050	0.12	0.050		
Manganese		0.75	0.75	0.75	0.75	0.75	0.75
Nickel		0.50	0.50	0.50	0.50	0.50	0.50
Vanadium		0.50	0.50	0.50	0.50	0.50	0.50
Copper		0.050	0.050	0.050	0.050	0.050	0.050
Molybdenum		0.050	0.050	0.050	0.050	0.050	0.050
Columbium		0.050	0.050	0.050	0.050	0.050	0.050
Tantalum		0.050	0.050	0.050	0.050	0.050	0.050
Cobalt		0.10	0.10	0.10	0.10	0.10	0.10
Aluminum		0.25	0.25	0.10	0.10	0.10	0.10
Titanium		0.50	0.30	0.050	0.050	0.050	0.050
Zirconium		0.050	0.050	0.01	0.01	0.01	0.01
Antimony		0.01	0.01	0.01	0.01	0.01	0.01
Arsenic		0.005	0.005	0.005	0.005	0.005	0.005
Lead		0.005	0.005	0.005	0.005	0.005	0.005
Tin		0.005	0.005	0.005	0.005	0.005	0.005
Zinc		0.005	0.005	0.005	0.005	0.005	0.005
Boron		0.005	0.005	0.005	0.005	0.005	0.005
Silver		0.005	0.005	0.005	0.005	0.005	0.005
Bismuth		0.005	0.005	0.005	0.005	0.005	0.005

^AThe inert oxide (SiO₂ + CaO + MgO + Al₂O₃) content of vacuum low-carbon ferrochromium shall be specified as 3.50 % max.

سایز و دانه بندی:

Product	Standard Sizes	Tolerances	Friability Ratings		
Ferrochromium: High-carbon	8 in. (200 mm) by 4 in. (100 mm)	10 in. (250 mm), max	4		
	6 in. (150 mm) by down	10 %, max, retained on 6-in. (150-mm) sieve			
	5 in. (125 mm) by 2 in. (50 mm)	10 %, max, retained on 5-in. (125-mm) sieve			
	4 in. (100 mm) by 1 in. (25 mm)	10 %, max, retained on 4-in. (100-mm) sieve			
	3 in. (75 mm) by 1 in. (25 mm)	10 %, max, retained on 3-in. (75-mm) sieve			
	3 in. (75 mm) by ¼ in. (6.3 mm)	10 %, max, retained on 3-in. (75-mm) sieve			
	¼ in. (6.3 mm) by down	5 %, max, retained on ¼-in. (6.3-mm) sieve			
	8 mesh (2.36 mm) by down	5 %, max, retained on U.S. No. 8 (2.36-mm) sieve			
	Low-carbon	8 in. (200 mm) by down		10 in. (250 mm), max	1
		8 in. (200 mm) by 4 in. (100 mm)		10 %, max, retained on 8-in. (200-mm) sieve	
4 in. (100 mm) by down		10 %, max, retained on 4-in. (100-mm) sieve			
3 in. (75 mm) by 1 in. (25 mm)		10 %, max, retained on 3-in. (75-mm) sieve			
8 mesh (2.36 mm) by down		5 %, max, retained on U.S. No. 8 (2.36-mm) sieve			
Vacuum low carbon	brick or pellet	designated by manufacturer			



Standard Specification for Ferrochromium¹

This standard is issued under the fixed designation A101; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers two types of ferrochromium designated as high carbon and low carbon, the latter including nitrogen-bearing and vacuum grades.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

[A1025 Specification for Ferroalloys and Other Alloying Materials, General Requirements](#)

[E363 Test Methods for Chemical Analysis of Chromium and Ferrochromium](#)

3. General Conditions for Delivery

3.1 Materials furnished to this specification shall conform to the requirements of Specification [A1025](#), including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification [A1025](#) constitutes nonconformance with this specification.

¹ This specification is under the jurisdiction of ASTM Committee [A01](#) on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee [A01.18](#) on Castings.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

In case of conflict between the requirements of this specification and Specification [A1025](#), this specification shall prevail.

4. Chemical Composition

4.1 The grades shall conform to the requirements as to chemical composition specified in [Table 1](#). The manufacturer shall furnish an analysis of each shipment showing the elements specified in [Table 1](#).

5. Size

5.1 The various grades are available in sizes as listed in [Table 2](#).

5.2 The sizes listed in [Table 2](#) are typical, as shipped from the manufacturer's plant. These alloys exhibit varying degrees of friability; therefore, some attrition may be expected in transit, storage, and handling. A quantitative test is not available for rating relative friability of ferroalloys. A code system has been developed, therefore, for this purpose, and a number rating for each product type is shown in the last column of [Table 2](#). Definitions applicable to these code numbers are given in Specification [A1025](#).

6. Chemical Analysis

6.1 The chemical analysis method shall be agreed upon by the purchaser and supplier.

6.2 In cases of discrepancy, Test Methods [E363](#) shall be used for referee purposes.

7. Keywords

7.1 ferroalloys; ferrochromium; high carbon; low carbon; nitrogen-bearing; vacuum low carbon

TABLE 1 Chemical Requirements

Type Ferrochromium	Composition, %						
	Grade	Chromium	Carbon	Silicon	Sulfur, max	Phosphorus, max	Nitrogen
High carbon	A	51.0–56.0	6.0–8.0	6.0 max	0.040	0.030	...
	B	56.0–62.0	6.0–8.0	8.0–14.0	0.050	0.030	...
	C	62.0 min	6.0–8.0	3.0 max	0.050	0.030	...
Low carbon	A	60.0–67.0	0.025 max	1.0–8.0	0.025	0.030	...
	B	67.0–75.0	0.025 max	1.0 max	0.025	0.030	...
	C	67.0–75.0	0.050 max	1.0 max	0.025	0.030	...
	D	67.0–75.0	0.75 max	1.0 max	0.025	0.030	...
Vacuum low carbon	E	66.0–70.0	0.015 max	2.0 max	0.030	0.030	...
	G	63.0–68.0	0.050 max	2.0 max	0.030	0.030	5.0–6.5
Nitrogen bearing		62.0–70.0	0.10 max	1.0 max	0.025	0.030	1.0–5.0

TABLE 2 Standard Sizes and Tolerances

Product	Standard Sizes	Tolerances	Friability Ratings	
Ferrochromium: High-carbon	8 in. (200 mm) by 4 in. (100 mm)	10 in. (250 mm), max	10 %, max, passing 4-in. (100-mm) sieve	4
	6 in. (150 mm) by down	10 %, max, retained on 6-in. (150-mm) sieve	10 %, max, passing 2-in. (50-mm) sieve	
	5 in. (125 mm) by 2 in. (50 mm)	10 %, max, retained on 5-in. (125-mm) sieve	10 %, max, passing 1/2-in. (12.5-mm) sieve	
	4 in. (100 mm) by in. (12.5 mm)	10 %, max, retained on 4-in. (100-mm) sieve	10 %, max, passing 1-in. (25-mm) sieve	
	3 in. (75 mm) by 1 in. (25 mm)	10 %, max, retained on 3-in. (75-mm) sieve	10 %, max, passing 1/4-in. (6.3-mm) sieve	
	3 in. (75 mm) by 1/4 in. (6.3 mm)	10 %, max, retained on 3-in. (75-mm) sieve	5 %, max, retained on 1/4-in. (6.3-mm) sieve	
	1/4 in. (6.3 mm) by down	5 %, max, retained on 1/4-in. (6.3-mm) sieve	5 %, max, retained on U.S. No. 8 (2.36-mm) sieve	
	8 mesh (2.36 mm) by down	10 in. (250 mm), max		
Low-carbon	8 in. (200 mm) by down	10 in. (250 mm), max		1
	8 in. (200 mm) by 4 in. (100 mm)	10 %, max, retained on 8-in. (200-mm) sieve	5 %, max, passing 4-in. (100-mm) sieve	
	4 in. (100 mm) by down	10 %, max, retained on 4-in. (100-mm) sieve	10 %, max, passing 1-in. (25-mm) sieve	
	3 in. (75 mm) by 1 in. (25 mm)	10 %, max, retained on 3-in. (75-mm) sieve	5 %, max, retained on U.S. No. 8 (2.36-mm) sieve	
Vacuum low carbon	brick or pellet	designated by manufacturer		

SUPPLEMENTARY REQUIREMENTS

The composition shall be limited to the requirements of **Table S1.1** in addition to those in **Table 1**. Upon request of the purchaser, the manufacturer shall furnish an analysis for any of these elements on a cumulative basis over a period mutually agreed upon by the manufacturer and the purchaser.

TABLE S1.1 Supplementary Chemical Requirements

Type	Composition, max, %					
	High Carbon		Low Carbon	Vacuum Low Carbon ^A		Nitrogen Bearing
Grade	A, B	C	All Grades	E	G	—
Nitrogen	0.050	0.050	0.12	0.050		
Manganese	0.75	0.75	0.75	0.75	0.75	0.75
Nickel	0.50	0.50	0.50	0.50	0.50	0.50
Vanadium	0.50	0.50	0.50	0.50	0.50	0.50
Copper	0.050	0.050	0.050	0.050	0.050	0.050
Molybdenum	0.050	0.050	0.050	0.050	0.050	0.050
Columbium	0.050	0.050	0.050	0.050	0.050	0.050
Tantalum	0.050	0.050	0.050	0.050	0.050	0.050
Cobalt	0.10	0.10	0.10	0.10	0.10	0.10
Aluminum	0.25	0.25	0.10	0.10	0.10	0.10
Titanium	0.50	0.30	0.050	0.050	0.050	0.050
Zirconium	0.050	0.050	0.01	0.01	0.01	0.01
Antimony	0.01	0.01	0.01	0.01	0.01	0.01
Arsenic	0.005	0.005	0.005	0.005	0.005	0.005
Lead	0.005	0.005	0.005	0.005	0.005	0.005
Tin	0.005	0.005	0.005	0.005	0.005	0.005
Zinc	0.005	0.005	0.005	0.005	0.005	0.005
Boron	0.005	0.005	0.005	0.005	0.005	0.005
Silver	0.005	0.005	0.005	0.005	0.005	0.005
Bismuth	0.005	0.005	0.005	0.005	0.005	0.005

^AThe inert oxide ($\text{SiO}_2 + \text{CaO} + \text{MgO} + \text{Al}_2\text{O}_3$) content of vacuum low-carbon ferrochromium shall be specified as 3.50 % max.

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