



Designation: A550 – 16 (Reapproved 2021)

## Standard Specification for Ferrocolumbium (Ferroniobium)<sup>1</sup>

This standard is issued under the fixed designation A550; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers three grades of Ferrocolumbium (ferroniobium), designated Low-Alloy Steel Grade, Alloy and Stainless Steel Grade, and High-Purity Grade.

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.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[A1025/A1025M Specification for Ferroalloys and Other Alloying Materials, General Requirements](#)

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves](#)

### 3. General Conditions for Delivery

3.1 Materials furnished to this specification shall conform to the requirements of Specification [A1025/A1025M](#), including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification [A1025/A1025M](#) constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification [A1025/A1025M](#), this specification shall prevail.

### 4. Chemical Composition

4.1 The material shall conform to the requirements as to chemical composition specified in [Tables 1 and 2](#). The manufacturer shall furnish an analysis of each shipment showing the percentage of each element specified in [Table 1](#).

4.2 For elements specified in [Table 2](#) an analysis of each lot is not required. Upon request of the purchaser, the manufacturer shall supply the results of an analysis for the elements specified in [Table 2](#) on a cumulative basis over a period mutually agreed upon by the manufacturer and the purchaser.

### 5. Sizing

5.1 Ferrocolumbium (ferroniobium) is available in sizes and to tolerances shown in [Table 3](#).

### 6. Keywords

6.1 columbium (niobium); ferrocolumbium (ferroniobium); tantalum

**TABLE 1 Chemical Requirements**

Element	Composition, %		
	Low-Alloy Steel Grade	Alloy and Stainless Steel Grade	High-Purity Grade
Columbium (Niobium) <sup>A,E</sup>	60.0–70.0	60.0–70.0	60.0–70.0
Tantalum, max	5.0	2.0	0.50 <sup>B</sup>
Carbon, max	0.5	0.3	0.10
Manganese, max	3.0	2.0	0.50
Silicon, max	4.0	2.5	0.40
Aluminum, max	3.0 <sup>C</sup>	2.0 <sup>C</sup>	2.0 <sup>D</sup>
Tin, max	0.25	0.15	0.02
Phosphorus, max	0.10	0.05	0.02
Sulfur, max	0.10	0.05	0.02

<sup>A</sup> The columbium (niobium) content of any shipment shall be reported to the nearest 0.1 %.

<sup>B</sup> Or 0.25 % maximum as agreed between purchaser and seller.

<sup>C</sup> Or 1.50 % maximum as agreed between purchaser and seller.

<sup>D</sup> Or 1.0 % maximum as agreed between purchaser and seller.

<sup>E</sup> Columbium (Cb) and niobium (Nb) refer to the same Element 41.

**TABLE 2 Supplemental Chemical Requirements**

NOTE 1—These are maximum limits allowable unless otherwise stated.<sup>A</sup>

Element	Composition, % <sup>A</sup>		
	Low-Alloy Steel Grade	Alloy and Stainless Steel Grade	High-Purity Grade
Chromium	1.00	1.00	0.10
Tungsten	1.00	0.5	0.05
Titanium	1.00	1.0	0.10
Lead	0.25	0.01	0.01
Cobalt	0.25	0.05	0.05

<sup>A</sup> The composition of the ferrocolumbium (ferroniobium) shall be within these limits; however, an analysis of each lot is not required. Upon request, the manufacturer shall supply the results of an analysis for these elements on terms previously agreed upon by the manufacturer and purchaser.

**TABLE 3 Standard Sizes and Tolerances**

Standard Size	Tolerance <sup>A</sup>	Friability Rating
2 in. by down	10 % max retained on 2-in. (50-mm) sieve	4
	10 % max passing No. 8 (2.36-mm) sieve	
½ in. by down	10 % max retained on ½-in. (12.5-mm) sieve	4
¼ in. by down	10 % max retained on ¼-in. (6.3-mm) sieve	4
8 mesh by down	10 % max retained on No. 8 (2.36-mm) sieve	4
20 mesh by down	10 % max retained on No. 20 (0.85-mm) sieve	4

<sup>A</sup> Specifications of sieve sizes used to define tolerances herein are as listed in Specification E11.