Designation: A 99 – 03

Standard Specification for Ferromanganese[1]

This standard is issued under the fixed designation A 99; 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.

This standard has been approved for use by agencies of the Department of Defense. This specification replaces Federal Specification QQ-F-145.

1. Scope

1.1 This specification covers ten grades of ferromanganese, designated as follows:

Standard ferromanganese	Grade A
	Grade B
	Grade C
Medium-carbon ferromanganese	Grades A,B,C, and D
	Nitrided
Low-carbon ferromanganese	Grade A
	Grade B

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 1025 Specification for Ferroalloys, General Requirements[2]

E 11 Specification for Wire Cloth and Sieves for Testing Purposes[3]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[3]

E 32 Practices for Sampling Ferroalloys and Steel Additives for Determination of Chemical Composition[4]

3. General Conditions for Delivery

3.1 Materials furnished to this specification shall conform to the requirements of Specification A 1025, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 1025 constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 1025, this specification shall prevail.

4. Chemical Composition

4.1 The material shall conform to the requirements as to chemical composition specified in Table 1.

4.2 The manufacturer shall furnish an analysis of each shipment showing the percentage of each element specified..

5. Size

5.1 The various grades are available in sizes as listed in Table 2.

5.2 The sizes and friability ratings 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 code system has been developed. Therefore, for this purpose, 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 A 1025.

6. Keywords

6.1 ferroalloy; ferromanganese

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[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] *Annual Book of ASTM Standards*, Vol 01.02.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 03.05.

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TABLE 1 Chemical Requirements

	Standard Ferromanganese			Medium Carbon Ferromanganese				Nitrided Medium Carbon Ferromanganese	Low Carbon Ferromanganese	
	Grade A	Grade B	Grade C	Grade A	Grade B	Grade C	Grade D		Grade A	Grade B
Manganese, %	78.0 to 82.0	76.0 to 78.0	74.0 to 76.0	80.0 to 85.0	80.0 to 85.0	80.0 to 85.0	80.0 to 85.0	75 to 80[A]	85.0 to 90.0	80.0 to 85.0
Carbon, max, %	7.5	7.5	7.5	1.5	1.5	1.5	1.5	1.5[A]	As specified	0.75
Silicon, max, %	1.2	1.2	1.2	1.5	1.0	0.70	0.35	1.5[A]	2.0	5.0 to 7.0
Phosphorus, max, %	0.35	0.35	0.35	0.30	0.30	0.30	0.30	0.3	0.20	0.30
Sulfur, max, %	0.050	0.050	0.050	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Nitrogen, %								4% min		

[A] Based on metallic content.

TABLE 2 Standard Sizes and Tolerances

Product	Standard Sizes	Tolerances[A]		Friability Rating
Standard ferromanganese Grades A, B, C	8 × 4 in. (200 × 100 mm) 5 x 2 in. (125 × 50 mm) 4 × 1 in. (100 × 25 mm) 2 × ¼ in. (50 × 6.3 mm) ⅜ in. × 12 mesh (9.5 × 1.4 mm) ¼ in. × down (6.3 mm × down) 8 mesh × down (2.36 mm × down) 20 mesh × down (0.85 mm × down)	90 lb (40.8-kg) lump, max 10 % max retained on 5-in. (125-mm) sieve 10 % max retained on 4-in. (100-mm) sieve 10 % max retained on 2-in. (50-mm) sieve 5 % max retained on ⅜-in. (9.5-mm) sieve 5 % max retained on ¼-in. (6.3-mm) sieve 5 % max retained on No. 8 (2.36-mm) sieve 5 % max retained on No. 20 (0.85 mm) sieve	10 % max passing 4-in. (100-mm) sieve 10 % max passing 2-in. (50-mm) sieve 10 % max passing 1-in. (25-mm) sieve 10 % max passing ¼-in. (6.3-mm) sieve 5 % max passing No. 14 (1.4-mm) sieve	4
Medium-carbon ferromanganese Grades A, B, C, and D	8 × 4 in. (200 × 100 mm) 5 × 2 in. (125 × 50 mm) 4 in. × down (100 mm × down) 2 in. × down (50 mm × down) 8 mesh × down (2.36 mm × down)	90-lb (40.8-kg) lump, max 10 % max retained on 5-in. (125-mm) sieve 10 % max retained on 4-in. (100-mm) sieve 10 % max retained on 2-in. (50-mm) sieve 5 % max retained on No. 8 (2.36-mm) sieve	10 % max passing 4-in. (100-mm) sieve 10 % max passing 2-in. (50-mm) sieve 12 % max passing ¼-in. (6.3-mm) sieve 15 % max passing No. 8 (2.36-mm) sieve	4½
Medium-carbon ferromanganese Nitrided grade	Briquetted only			4
Low-carbon ferromanganese Grades A and B	6 × 2 in. (150 × 50 mm) 4 × ¼ in. (100 × 6.3 mm) 8 mesh × down (2.36 mm × down) 20 mesh × down (0.85 mm × down)	10 % max retained on 6-in. (150-mm) sieve 10 % max retained on 4-in. (100-mm) sieve 5 % max retained on No. 8 (2.36-mm) sieve 5 % max retained on No. 20 (0.85-mm) sieve	10 % max passing 2-in. (50-mm) sieve 5 % max passing ¼-in. (6.3-mm) sieve	5

[A] Specifications of sieve sizes used to define tolerances herein are as listed in Specification E 11.

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the purchase order or contract.

S1. Chemical Requirements

The composition shall be further limited to the requirements of Table S1 in addition to those of Table 1. The manufacturer shall furnish an analysis of each shipment showing the percentage of the elements specified.

TABLE S1 Supplemental Chemical Requirements

	Composition, max, %		
	Standard Ferromanganese, All Grades	Medium-Carbon Ferromanganese, All Grades	Low-Carbon Ferromanganese, All Grades
Arsenic	0.30	0.15	0.10
Tin	0.020	0.010	0.010
Lead	0.050	0.050	0.020
Chromium	0.50	0.50	0.50
Carbon	0.10 or 0.50 or 0.70 for Grade A only		

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