Designation: A 99 – 82 (Reapproved 2000)

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:*

E 11 Specification for Wire-Cloth Sieves for Testing Purposes[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[2]

E 31 Methods for Chemical Analysis of Ferroalloys[3]

E 32 Practices for Sampling Ferroalloys and Steel Additives for Determination of Chemical Composition[3]

3. Basis of Purchase

3.1 Orders for material under this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Name of material,

3.1.3 ASTM Designation: A 99,

3.1.4 Grade,

3.1.5 Size, and

3.1.6 Requirements for packing, analysis reports, etc., as appropriate.

3.2 The customary basis of payment for standard ferromanganese is per pound of ferroalloy, rather than per pound of contained managanese. Although low- and medium-carbon ferromanganese are ordered by total net weight, the customary basis of payment is per pound of contained manganese.

NOTE 1—The term "weight" is temporarily used in this specification because of established trade usage. The word is used to mean both "force" and "mass," and care must be taken to determine which is meant in each case (SI unit for force = newton and for mass = kilogram).

4. Chemical Composition

4.1 The material shall conform to the requirements as to chemical composition specified in Table 1 and Table 2.

4.2 The manufacturer shall furnish an analysis of each shipment showing the manganese, carbon, and silicon content and, when required, such of the other elements specified in Table 1.

4.3 The values shown in Table 2 are expected maximums. Upon request by 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.

5. Size

5.1 The various grades are available in sizes as listed in Table 3.

5.2 The sizes and friability ratings listed in Table 3 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 3. Definitions applicable to these code numbers are given in Appendix X1.

6. Sampling

6.1 The material shall be sampled in accordance with Practices E 32.

---

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

Current edition approved July 30, 1982. Published September 1982. Originally published as A 99 – 25 T. Last previous edition A 99 – 76.

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

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

TABLE 1 Chemical Requirements[A]

	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,[B] %	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[C]	85.0 to 90.0	80.0 to 85.0
Carbon, max, %	7.5[D]	7.5[D]	7.5[D]	1.5	1.5	1.5	1.5	1.5[C]	As specified[E]	0.75
Silicon, max, %	1.2	1.2	1.2	1.5	1.0	0.70	0.35	1.5[C]	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] For purpose of determining conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E 29.
[B] For purposes of determining the manganese content of any shipment, manganese shall be reported to the nearest 0.01 %, applying the same rounding procedure as prescribed in Footnote *A*.
[C] Based on metallic content.
[D] Carbon values shown are maximum; with normal silicon content, carbon will typically be in the range 6.9 to 7.2 %.
[E] Grade A low carbon material may be obtained with the following maximum percentage of carbon 0.75, 0.50, and 0.10.

TABLE 2 Supplemental Chemical Requirements[A]

	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

[A] For purposes of determining conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E 29.

6.2 Other methods of sampling mutually agreed upon by the manufacturer and the purchaser may be used; however, in case of discrepancy, Practices E 32 shall be used for referee.

7. Chemical Analysis

7.1 The chemical analysis of the material shall be made in accordance with the procedure for ferromanganese as described in Methods E 31, or alternative methods which will yield equivalent results.

7.2 If alternative methods of analysis are used, in case of discrepancy, methods prescribed in Methods E 31 shall be used for referee.

7.3 Where no method is given in Methods E 31 for the analysis for a particular element, the analysis shall be made in accordance with a procedure agreed upon by the manufacturer and the purchaser.

8. Inspection

8.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification.

9. Rejection

9.1 Any claims or rejections shall be made to the manufacturer within 45 days from receipt of material by the purchaser.

10. Packaging

10.1 Ferromanganese shall be packaged in sound containers, or shipped in bulk, in such manner that none of the alloy is lost or contaminated in shipment.

TABLE 3 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) ⅜in. × 12 mesh (9.5 × 1.4 mm) ¼in. × 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 × ¼in. (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.

APPENDIX

(Nonmandatory Information)

X1. FRIABILITY RATINGS

Code No.	Definition
1	Very tough materials which are susceptible to little, if any, breakage during shipment or handling. (Example: low-carbon ferrochrome.)
2	Some breakage of large pieces probable in shipping and handling. No appreciable lines produced from either lump or crushed sizes. (Example: chrome metal.)
3	Appreciable reduction in size of large pieces possible in shipping and handling. No appreciable production of fines in handling of crushed sizes. (Example: ferrovanadium.)
4	Appreciable reduction in size of large pieces upon repeated handling. Some fines produced upon repeated handling of crushed sizes. (Example: standard ferromanganese.)
5	Appreciable reduction in size in repeated handling of large pieces. Appreciable fines may be produced in the handling of crushed sizes. (Example: 50 % ferrosilicon.)
6	This category represents the most friable alloys. (Example: calcium silicon.)