Designation: A 837/A 837M – 06

Standard Specification for Steel Forgings, Alloy, for Carburizing Applications[1]

This standard is issued under the fixed designation A 837/A 837M; 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 alloy steel forgings for carburizing applications.

1.2 Forgings are considered weldable under proper conditions. Welding technique is of fundamental importance and it is presupposed that welding procedure and inspection shall be in accordance with approved methods for the class of material used.

1.3 This specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable *M* specification designation (SI units), the material shall be furnished to inch-pound units.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 275/A 275M Test Method for Magnetic Particle Examination of Steel Forgings

A 388/A 388M Practice for Ultrasonic Examination of Heavy Steel Forgings

A 788/A 788M Specification for Steel Forgings, General Requirements

E 527 Practice for Numbering Metals and Alloys (UNS)

3. Ordering Information

3.1 Instructions for purchasing forgings to this specification are to be in accordance with Specification A 788/A 788M.

3.2 In addition to the basic requirements of this specification, certain supplementary requirements are listed at the end of this specification. These supplementary requirements may be applicable when additional control, testing, or examination is required to meet end use requirements.

4. Heat Treatment

4.1 The forgings shall be given a normalize or normalize and temper heat treatment.

5. Machining

5.1 Rough machining before heat treatment may be performed at the option of the manufacturer.

6. Chemical Composition

6.1 The steel shall conform to the requirements for chemical composition prescribed in Table 1 unless otherwise modified in accordance with Supplementary Requirement S4.

7. Mechanical Properties

7.1 *Hardness*:

7.1.1 Maximum hardness of the forgings shall be 229 BHN.

7.1.2 Hardness tests shall be taken on prepared surfaces of the forging after machining to the purchaser's ordering requirements.

7.1.3 *Number and Location of Tests*:

7.1.3.1 For forgings not intended for gear applications, the number and location of hardness tests shall be by agreement between the purchaser and forger.

7.1.3.2 For gear applications on each forging 8 in. [200 mm] and over in diameter, four Brinell hardness tests shall be made on the outside surface of that portion of the forging on which teeth will be cut two tests being made on each helix 180° apart, and the tests on the two helices shall be 90° apart. On each forging under 8 in. [200 mm] in diameter two Brinell hardness tests shall be made, one on each helix 180° apart. On hollow, cylindrical forgings, one hardness test on each end shall be taken 180° apart. Hardness tests shall be performed at the quarter-face width of the tooth-portion diameter.

[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 A01.06 on Steel Forgings and Billets.

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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.

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Grade Designations and Chemical Compositions

UNS Designation[A]	Grade Designation[B]	Chemical Composition, Ranges and Limits, %								
		Carbon	Manganese	Phosphorus, max	Sulfur, max	Silicon[C]	Nickel	Chromium	Molybdenum	Copper, max
G33106	E3310	0.08–0.13	0.45–0.60	0.025	0.025	0.15–0.35	3.25–3.75	1.40–1.75	0.10 max	0.35
G43200	4320	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.35	1.65–2.00	0.40–0.60	0.20–0.30	0.35
G46200	4620	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.35	1.65–2.00	0.25 max	0.20–0.30	0.35
G48150	4815	0.13–0.18	0.40–0.60	0.035	0.040	0.15–0.35	3.25–3.75	0.25 max	0.20–0.30	0.35
G86200	8620	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	0.35
G93106	9310	0.07–0.13	0.40–0.70	0.035	0.040	0.15–0.35	2.95–3.55	1.00–1.45	0.08–0.15	0.35
S41000	410	0.15 max	1.00 max	0.040	0.030	1.00 max	0.50 max	11.50–13.50	0.10 max	0.35

[A] New designation established in accordance with Practice E 527.
[B] Grade designations correspond to the respective Practice E 527.
[C] When vacuum carbon deoxidation is used, silicon maximum shall be 0.10 %.

8. Other Requirements

8.1 Forgings supplied to this material specification shall conform to the latest issue of Specification A 788/A 788M.

8.2 Specification A 788/A 788M covers forging terminology, melting processes, chemical analysis test methods, product analysis tolerances, mechanical testing methods, repair welding restrictions, marking, and certification requirements.

9. Keywords

9.1 alloy steel forgings; carburizing

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser on the order and agreed to by the manufacturer.

S1. Rough Turning and Boring

S1.1 The position of rough turning and boring in the sequence of manufacturing operations is specified.

S2. Magnetic Particle Examination

S2.1 Magnetic particle examination shall be specified in accordance with Test Method A 275/A 275M. Reporting and acceptance standards shall be a matter of agreement.

S3. Ultrasonic Examination

S3.1 Ultrasonic examination shall be specified in accordance with Practice A 388/A 388M. Reporting and acceptance standards shall be a matter of agreement.

S4. Phosphorous and Sulfur Restriction

S4.1 Phosphorus shall not exceed 0.015 %, and the sulfur shall not exceed 0.018 % for all classes when determined in accordance with the heat analysis requirements of Specification A 788/A 788M.

S5. Vacuum Degassing

S5.1 Vacuum treatment of the molten steel prior to or during the pouring of the ingot is required.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue, A 837/A 837M – 03, that may impact the use of this standard. (Approved May 1, 2006.)

(*1*) In Table 1, corrected UNS number for Grade 9310.

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