Designation: A582/A582M – 05

Standard Specification for Free-Machining Stainless Steel Bars[1]

This standard is issued under the fixed designation A582/A582M; 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.

1. Scope*

1.1 This specification covers hot-finished or cold-finished bars, except bars for forging (Note 1), suitable for machining processes. It includes rounds, squares, and hexagons in the more commonly used types of stainless free-machining steels designed especially for optimum machinability and for general corrosion and high-temperature service. Stainless steel bars other than the free-machining types are covered in a separate specification (Note 2).

1.2 This specification is expressed in both inch-pound units and in SI units; however, unless the purchase order or contract specifies the applicable *M* specification designation (SI units), the inch-pound units shall apply. The values stated in either inch-pound units or SI (metric) units are to be regarded separately as standard: within the text and tables, the SI units are shown in [brackets]. 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 nonconformance with the specification.

NOTE 1—For bars for reforging, see Specification A314.

NOTE 2—For non-free machining stainless bars, see Specification A276.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A276 Specification for Stainless Steel Bars and Shapes

A314 Specification for Stainless Steel Billets and Bars for Forging

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

A959 Guide for Specifying Harmonized Standard Grade Compositions for Wrought Stainless Steels

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 *SAE Document:*[3]

SAE J 1086 Recommended Practice for Numbering Metals and Alloys[3]

3. Ordering Information

3.1 It is the responsibility of the purchaser to specify all requirements that are necessary for product ordered under this specification. Such requirements to be considered include, but are not limited to, the following:

3.1.1 Quantity (weight or number of pieces),

3.1.2 Type or UNS designation (Table 1),

3.1.3 Form (bars, angles, etc.),

3.1.4 Condition (Table 2),

3.1.5 Finish (5.1),

3.1.6 Applicable dimensions, including size, thickness, width, and length,

3.1.7 Cross section (round, square, etc.),

3.1.8 ASTM designation (Specification A582/A 582M) and publication date,

3.1.9 Preparation for delivery, and

3.1.10 Marking requirements.

NOTE 3—A typical ordering description is as follows: 5000 lb [2000 kg] Type 416 bars, annealed and centerless ground, 1½ in. [40 mm] round, 10 to 12 ft [3 to 4 m] in length, ASTM Specification A582/A582Mdated.

4. General Requirements for Delivery

4.1 Product furnished to this specification shall conform to the requirements of Specification A751, including any supplementary requirements indicated in the purchase order or contract. Failure to comply with the general requirements of Specification A751 constitutes nonconformance with this

[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 A01.17 on Flat-Rolled and Wrought Stainless Steel.

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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.

[3] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

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

TABLE 1 Chemical Requirements

UNS Designation[A]	Type	Chemical Composition, %									
		Carbon[B]	Manganese[B]	Phosphorus,[B]	Sulfur[B]	Silicon, max	Chromium	Nickel	Molybdenum	Selenium	Other Elements
					Austenitic						
S20300	XM-1	0.08	5.0–6.5	0.04	0.18–0.35	1.00	16.0–18.0	5.0–6.5	. . .	. . .	Cu 1.75–2.25
S30300	303	0.15	2.00	0.20	0.15 min	1.00	17.0–19.0	8.0–10.0	. . .	. . .	. . .
S30310	XM-5	0.15	2.5–4.5	0.20	0.25 min	1.00	17.0–19.0	7.0–10.0	. . .	. . .	. . .
S30323	303Se	0.15	2.00	0.20	0.06	1.00	17.0–19.0	8.0–10.0	. . .	0.15 min	. . .
S30345	XM-2	0.15	2.00	0.05	0.11–0.16	1.00	17.0–19.0	8.0–10.0	0.40–0.60	. . .	Al 0.60–1.00
					Martensitic						
S41600	416	0.15	1.25	0.06	0.15 min	1.00	12.0–14.0	. . .	. . .	. . .	. . .
S41610	XM-6	0.15	1.50–2.50	0.06	0.15 min	1.00	12.0–14.0	. . .	. . .	. . .	. . .
S41623	416Se	0.15	1.25	0.06	0.06	1.00	12.0–14.0	. . .	. . .	0.15 min	. . .
S42020	420F	0.30–0.40	1.25	0.06	0.15 min	1.00	12.0–14.0	0.50[C]	. . .	. . .	Cu 0.60[C]
S42023	420FSe	0.20–0.40	1.25	0.06	0.06	1.00	12.0–14.0	0.50[C]	. . .	0.15 min	Cu 0.60[C]
S44020	440F	0.95–1.20	1.25	0.06	0.15 min	1.00	16.0–18.0	0.50[C]	. . .	. . .	Cu 0.60[C]
S44023	440FSe	0.95–1.20	1.25	0.06	0.06	1.00	16.0–18.0	0.50[C]	. . .	0.15 min	Cu 0.60[C]
					Ferritic						
S18200	XM-34	0.08	2.50	0.04	0.15 min	1.00	17.5–19.5	. . .	1.50–2.50	. . .	. . .
S18235	. . .	0.025	0.50	0.030	0.15–0.35	1.00	17.5–18.5	1.00	2.00–2.50	. . .	Ti 0.30–1.00 N 0.025 C+N 0.035
S41603	. . .	0.08	1.25	0.06	0.15 min	1.00	12.0-14.0	. . .	. . .	. . .	. . .
S43020	430F	0.12	1.25	0.06	0.15 min	1.00	16.0–18.0	. . .	. . .	. . .	. . .
S43023	430FSe	0.12	1.25	0.06	0.06	1.00	16.0–18.0	. . .	. . .	0.15 min	. . .

[A] Designation established in accordance with Practice E527 and SAE J 1086, Recommended Practice for Numbering Metals and Alloys (UNS).
[B] Maximum unless otherwise noted.
[C] At manufacturer's option, reported only when intentionally added.

TABLE 2 Condition

Type	Condition A (Annealed)	Condition T (Intermediate Temper)	Condition H (Hard Temper)
XM-1	A	. . .	. . .
303	A	. . .	. . .
XM-5	A	. . .	. . .
303Se	A	. . .	. . .
XM-2	A	. . .	. . .
416	A	T	H
XM-6	A	T	H
416Se	A	T	H
420F	A	. . .	. . .
420FSe	A	. . .	. . .
440F	A	. . .	. . .
440FSe	A	. . .	. . .
XM-34	A	. . .	. . .
S18235	A	. . .	. . .
S41603	A	. . .	. . .
430F	A	. . .	. . .
430FSe	A	. . .	. . .

specification. In case of conflict between the requirements of this specification and Specification A751, this specification shall prevail.

5. Materials and Manufacture

5.1 Bars may be furnished either hot finished or cold finished in one of the conditions listed in Table 2.

5.2 Surface finishing shall be performed in accordance with finishing methods as defined in Specification A751.

6. Chemical Requirements

6.1 The chemical composition shall conform to the requirements specified in Table 1.

6.2 Methods and practices relating to chemical analysis required by this specification shall be in accordance with Test Methods, Practices, and Terminology .

7. Hardness Requirement

7.1 The product shall conform with the hardness requirements listed in Table 3 for Brinell Hardness Number (HB).

7.2 At least one hardness test shall be made midway between surface and center on each lot to determine that the material conforms to Table 3.

7.2.1 Hardness testing shall be performed in accordance with Test Methods and Definitions A370.

7.2.2 For sizes below 1 in. [25 mm] cross section, it is permitted to determine the hardness value by tensile test with conversion to hardness in accordance with Test Methods and Definitions A370.

8. Certification

8.1 *Certificate of Compliance*—When specified in the purchase order or contract, the producer or supplier shall furnish a certificate of compliance stating that the product was manufactured, sampled, tested, and inspected in accordance with this

TABLE 3 Mechanical Test Requirements

Types	Condition	Hardness[A] (HB)
All (except 440F, 440FSe and S18235)	A	262 max
416, 416Se, 420FSe, and XM-6	T	248 to 302
416, 416Se, and XM-6	H	293 to 352
440 F and 440FSe	A	285 max
S18235	A	207 max

[A] Sizes below approximately 1 in. [25 mm] cross section may be tensile tested and converted to hardness in accordance with Test Methods and Definitions A370.