Designation: A582/A582M – 21

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 U.S. 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.

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:*[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

A484/A484M Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings

A751 Test Methods and Practices 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 (alloy) or UNS designation (Table 1),

3.1.3 Form (bars, angles, and so forth),

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, and so forth),

3.1.8 ASTM designation (Specification A582/A582M) and approval 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

4.1 Product furnished to this specification shall conform to the requirements of Specification A484/A484M, including any

[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[B]	Chemical Composition, %									
		Carbon[C]	Manganese[C]	Phosphorus,[C]	Sulfur[C]	Silicon, max	Chromium	Nickel	Molybdenum	Selenium	Other Elements
					Austenitic						
S20300	XM-1[D]	0.08	5.0–6.5	0.04	0.18–0.35	1.00	16.00–18.0	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[D]	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[D]	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[D]	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[E]	. . .	. . .	Cu 0.60[E]
S42023	420FSe	0.20–0.40	1.25	0.06	0.06	1.00	12.0–14.0	0.50[E]	. . .	0.15 min	Cu 0.60[E]
S44020	440F	0.95–1.20	1.25	0.06	0.15 min	1.00	16.0–18.0	0.50[E]	. . .	. . .	Cu 0.60[E]
S44023	440FSe	0.95–1.20	1.25	0.06	0.06	1.00	16.0–18.0	0.50[E]	. . .	0.15 min	Cu 0.60[E]
					Ferritic						
S18200	XM-34[D]	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] Unless otherwise indicated, a grade designation originally assigned by the American Iron and Steel Institute (AISI).
[C] Maximum unless otherwise noted.
[D] Naming system originated by ASTM.
[E] At manufacturer's option, reported only when intentionally added.

supplementary requirements indicated in the purchase order or contract. Failure to comply with the general requirements of Specification A484/A484M constitutes nonconformance with this specification.

5. Materials and Manufacture

5.1 Bars may be furnished either hot finished or cold finished, suitable for machining processes, in one of the conditions listed in Table 2.

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 A751.

7. Hardness Requirement

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

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.

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	. . .	. . .

TABLE 3 Mechanical Test Requirements

Types	Condition	Brinell Hardness [A] (HBW)
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 per Test Methods and Definitions A370.

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

8. Certification

8.1 *Certificate of Compliance*—The producer or supplier shall furnish a certificate of compliance stating that the product was manufactured, sampled, tested, and inspected in accordance with this specification (including year date) and any other requirements designated in the purchase order or contract, and has been found to meet such requirements.

8.2 *Test Reports*—A report of all test results required by this specification shall be furnished at time of shipment. The report shall include the ASTM specification designation, year date, and revision, if any.

9. Keywords

9.1 austenitic stainless steel; ferritic stainless steel; free-machining stainless steel; martensitic stainless steel; stainless steel bars

APPENDIX

(Nonmandatory Information)

X1. CROSS REFERENCE

X1.1 This table is intended to assist the user when Specification A582/A 582M is referenced in a government procurement. It shows the types of steels in Specification A582/A 582M replacing the steels formerly specified in QQ-S-764B.

X1.1 Cross Reference

UNS Designation[A]	QQ-S-764B	Specification A582, Type
S20300	203EZ	XM-1
S30300	303	303
S30310	303 Plus X	XM-5
S30323	303Se	303Se
S30345	303Ma	XM-2
S41600	416	416
S41610	416 Plus X	XM-6
S41623	416Se	416Se
S42020	420F	420F
S42023	420FSe	420FSe
S43020	430F	430F
S43023	430FSe	430FSe

[A] Designation established in accordance with Practice E527 and SAE J 1086, Recommended Practice for Numbering Metals and Alloys (UNS).