



Standard Specification for Free-Machining Stainless Steel Bars¹

This standard is issued under the fixed designation A 582/A 582M; 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.

^{e1} NOTE—Table X1.1 was editorially corrected in May 2003.

1. Scope

1.1 This specification covers hot-finished or cold-finished bars, except bars for forging (Note 1). 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 (Note 2) than the free-machining types are covered in a separate specification.

1.2 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 are not exact equivalents: therefore, each system must be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 Unless the order specifies the applicable “M” specification designation, the material shall be furnished to the inch-pound units.

NOTE 1—For bars for reforging, see Specification A 314.

NOTE 2—For non-free machining stainless bars, see Specification A 276.

2. Referenced Documents

2.1 ASTM Standards:

A 276 Specification for Stainless Steel Bars and Shapes²

A 314 Specification for Stainless Steel Billets and Bars for Forging²

A 484/A 484M Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings²

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products³

E 527 Practice for Numbering Metals and Alloys (UNS)⁴

2.2 Other Document:

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 Stainless Steel Products.

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² Annual Book of ASTM Standards, Vol 01.05.

³ Annual Book of ASTM Standards, Vol 01.03.

⁴ Annual Book of ASTM Standards, Vol 01.01.

SAE J 1086 Recommended Practice for Numbering Metals and Alloys⁵

3. Ordering Information

3.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements may 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 A 582/A 582M) and date of issue,

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 A 582/A 582M dated .

4. General Requirements for Delivery

4.1 In addition to the requirements of this specification, all requirements of the current edition of Specification A 484/A 484M shall apply. Failure to comply with the general requirements of Specification A 484/A 484M constitutes nonconformance with this specification.

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.

6. Chemical Requirements

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

⁵ Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

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 | 5.00–6.50 | 0.04 | 0.18–0.35 | 1.00 | 16.00–18.00 | 5.00–6.50 | ... | ... | Cu 1.75–2.25 |
| S30300 | 303 | 0.15 | 2.00 | 0.20 | 0.15 min | 1.00 | 17.00–19.00 | 8.00–10.00 | ... | ... | ... |
| S30310 | XM-5 | 0.15 | 2.50–4.50 | 0.20 | 0.25 min | 1.00 | 17.00–19.00 | 7.00–10.00 | ... | ... | ... |
| S30323 | 303Se | 0.15 | 2.00 | 0.20 | 0.06 | 1.00 | 17.00–19.00 | 8.00–10.00 | ... | 0.15 min | ... |
| S30345 | XM-2 | 0.15 | 2.00 | 0.05 | 0.11–0.16 | 1.00 | 17.00–19.00 | 8.00–10.00 | 0.40–0.60 | ... | Al 0.60–1.00 |
| Martensitic | | | | | | | | | | | |
| S41600 | 416 | 0.15 | 1.25 | 0.06 | 0.15 min | 1.00 | 12.00–14.00 | ... | ... | ... | ... |
| S41610 | XM-6 | 0.15 | 1.50–2.50 | 0.06 | 0.15 min | 1.00 | 12.00–14.00 | ... | ... | ... | ... |
| S41623 | 416Se | 0.15 | 1.25 | 0.06 | 0.06 | 1.00 | 12.00–14.00 | ... | ... | 0.15 min | ... |
| S42020 | 420F | 0.30–0.40 | 1.25 | 0.06 | 0.15 min | 1.00 | 12.00–14.00 | 0.50 ^C | ... | ... | Cu 0.60 max ^C |
| S42023 | 420FSe | 0.20–0.40 | 1.25 | 0.06 | 0.06 | 1.00 | 12.00–14.00 | 0.50 ^C | ... | 0.15 min | Cu 0.60 max ^C |
| S44020 | 440F | 0.95–1.20 | 1.25 | 0.06 | 0.15 min | 1.00 | 16.00–18.00 | 0.50 ^C | ... | ... | Cu 0.60 max ^C |
| S44023 | 440FSe | 0.95–1.20 | 1.25 | 0.06 | 0.06 | 1.00 | 16.00–18.00 | 0.50 ^C | ... | 0.15 min | Cu 0.60 max ^C |
| Ferritic | | | | | | | | | | | |
| S18200 | XM-34 | 0.08 | 2.50 | 0.04 | 0.15 min | 1.00 | 17.50–19.50 | ... | 1.50–2.50 | ... | ... |
| S18235 | ... | 0.025 | 0.50 | 0.030 | 0.15–0.35 | 1.00 | 17.50–18.50 | 1.00 | 2.00–2.50 | ... | Ti 0.30–1.00 N 0.025 max C+N 0.035 max |
| S41603 | ... | 0.08 | 1.25 | 0.06 | 0.15 min | 1.00 | 12.00–14.00 | ... | ... | ... | ... |
| S43020 | 430F | 0.12 | 1.25 | 0.06 | 0.15 min | 1.00 | 16.00–18.00 | ... | ... | ... | ... |
| S43023 | 430FSe | 0.12 | 1.25 | 0.06 | 0.06 | 1.00 | 16.00–18.00 | ... | ... | 0.15 min | ... |

^A Designation established in accordance with Practice E 527 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 | ... | ... |

6.2 Methods and practices relating to chemical analysis required by this specification shall be in accordance with Test Methods, Practices and Terminology A 751.

7. Hardness Requirement

7.1 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.

8. Certification

8.1 Upon request of the purchaser in the contract or order, the manufacturer's certification that the material was manufactured and tested in accordance with this specification, together with a certified report of the test results, shall be furnished at the time of the shipment.

9. Keywords

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

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.

APPENDIX
(Nonmandatory Information)
X1. CROSS REFERENCE

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

TABLE X1.1 Cross Reference

| UNS Designation ^A | QQ-S-764B | Specification A 582, 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 E 527 and SAE J 1086, Recommended Practice for Numbering Metals and Alloys (UNS).

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