



~~Designation: A 276-08~~ **Designation: A276 – 08a**

Standard Specification for Stainless Steel Bars and Shapes¹

This standard is issued under the fixed designation A276; 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 reforging (Note 1). It includes rounds, squares, and hexagons, and hot-rolled or extruded shapes, such as angles, tees, and channels in the more commonly used types of stainless steels. The free-machining types (Note 2) for general corrosion resistance and high-temperature service are covered in a separate specification.

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

NOTE 2—For free-machining stainless bars designed especially for optimum machinability, see Specification A 582/A 582M/A 582MA582/A 582M.

NOTE 3—There are standards covering high nickel, chromium, austenitic corrosion, and heat resisting alloy materials. These standards are under the jurisdiction of ASTM Subcommittee B02.07 and may be found in *Annual Book of ASTM Standards*, Vol. 02.04.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 ASTM Standards:²

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

A582/A582M Specification for Free-Machining Stainless Steel Bars

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

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. 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 Name of material: stainless steel,

3.1.3 Form (bars, angles, etc.),

3.1.4 Condition (Section 4.1),

3.1.5 Finish (Section 8 of Specification A 484/A 484M/A 484MA484/A 484M),

3.1.6 Surface preparation of shapes (Section 8 of Specification A 484/A 484MA484/A 484M),

3.1.7 Applicable dimensions including size, thickness, width, and length, l.

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

3.1.9 Type or UNS designation (Table 1),

3.1.10 ASTM designation and date of issue, and

3.1.11 Whether bars are to be rolled as bars or cut from strip or plate.

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, http://www.sae.org.

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

TABLE 1 Chemical Requirements^A

| UNS Designation ^B | Type | Composition, % | | | | | | | | | |
|------------------------------|-------------------|----------------|-----------|------------|--------|-----------|-----------|-----------|------------|-----------|-------------------------------------|
| | | Carbon | Manganese | Phosphorus | Sulfur | Silicon | Chromium | Nickel | Molybdenum | Nitrogen | Other Elements |
| Austenitic Grades | | | | | | | | | | | |
| N08367 | ... | 0.030 | 2.00 | 0.040 | 0.030 | 1.00 | 20.0–22.0 | 23.5–25.5 | 6.0–7.0 | 0.18–0.25 | Cu 0.75 |
| N08700 | ... | 0.04 | 2.00 | 0.040 | 0.030 | 1.00 | 19.0–23.0 | 24.0–26.0 | 4.3–5.0 | ... | Cu 0.50 Cb 8 × C min 0.40 max |
| S20100 | 201 | 0.15 | 5.5–7.5 | 0.060 | 0.030 | 1.00 | 16.0–18.0 | 3.5–5.5 | ... | 0.25 | ... |
| S20161 | ... | 0.15 | 4.0–6.0 | 0.045 | 0.030 | 3.0–4.0 | 15.0–18.0 | 4.0–6.0 | ... | 0.08–0.20 | ... |
| S20162 | ... | 0.15 | 4.0–8.0 | 0.040 | 0.040 | 2.5–4.5 | 16.5–21.0 | 6.0–10.0 | 0.50–2.50 | 0.05–0.25 | ... |
| S20200 | 202 | 0.15 | 7.5–10.0 | 0.060 | 0.030 | 1.00 | 17.0–19.0 | 4.0–6.0 | ... | 0.25 | ... |
| S20500 | 205 | 0.12–0.25 | 14.0–15.5 | 0.060 | 0.030 | 1.00 | 16.5–18.0 | 1.0–1.7 | ... | 0.32–0.40 | ... |
| S20910 | XM-19 | 0.06 | 4.0–6.0 | 0.045 | 0.030 | 1.00 | 20.5–23.5 | 11.5–13.5 | 1.50–3.00 | 0.20–0.40 | Cb 0.10–0.30, V 0.10–0.30 |
| S21800 | ... | 0.10 | 7.0–9.0 | 0.060 | 0.030 | 3.5–4.5 | 16.0–18.0 | 8.0–9.0 | ... | 0.08–0.18 | ... |
| S21900 | XM-10 | 0.08 | 8.0–10.0 | 0.045 | 0.030 | 1.00 | 19.0–21.5 | 5.5–7.5 | ... | 0.15–0.40 | ... |
| S21904 | XM-11 | 0.04 | 8.0–10.0 | 0.045 | 0.030 | 1.00 | 19.0–21.5 | 5.5–7.5 | ... | 0.15–0.40 | ... |
| S24000 | XM-29 | 0.08 | 11.5–14.5 | 0.060 | 0.030 | 1.00 | 17.0–19.0 | 2.3–3.7 | ... | 0.20–0.40 | ... |
| S24100 | XM-28 | 0.15 | 11.0–14.0 | 0.045 | 0.030 | 1.00 | 16.5–19.0 | 0.50–2.50 | ... | 0.20–0.45 | ... |
| S28200 | ... | 0.15 | 17.0–19.0 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | ... | 0.75–1.25 | 0.40–0.60 | Cu 0.75–1.25 |
| S30200 | 302 | 0.15 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 8.0–10.0 | ... | 0.10 | ... |
| S30215 | 302B | 0.15 | 2.00 | 0.045 | 0.030 | 2.00–3.00 | 17.0–19.0 | 8.0–10.0 | ... | 0.10 | ... |
| S30400 | 304 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–11.0 | ... | ... | ... |
| S30403 | 304L ^C | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–12.0 | ... | ... | ... |
| S30451 | 304N | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–11.0 | ... | 0.10–0.16 | ... |
| S30452 | XM-21 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–10.0 | ... | 0.16–0.30 | ... |
| S30453 | 304LN | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–11.0 | ... | 0.10–0.16 | ... |
| S30454 | ... | 0.03 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 8.0–11.0 | ... | 0.16–0.30 | ... |
| S30500 | 305 | 0.12 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 11.0–13.0 | ... | ... | ... |
| S30800 | 308 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 19.0–21.0 | 10.0–12.0 | ... | ... | ... |
| S30815 | ... | 0.05–0.10 | 0.80 | 0.040 | 0.030 | 1.40–2.00 | 20.0–22.0 | 10.0–12.0 | ... | 0.14–0.20 | Ce 0.03–0.08 |
| S30900 | 309 | 0.20 | 2.00 | 0.045 | 0.030 | 1.00 | 22.0–24.0 | 12.0–15.0 | ... | ... | ... |
| S30908 | 309S | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 22.0–24.0 | 12.0–15.0 | ... | ... | ... |
| S30940 | 309Cb | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 22.0–24.0 | 12.0–16.0 | ... | ... | Cb 10×C-1.10 |
| S31000 | 310 | 0.25 | 2.00 | 0.045 | 0.030 | 1.50 | 24.0–26.0 | 19.0–22.0 | ... | ... | ... |
| S31008 | 310S | 0.08 | 2.00 | 0.045 | 0.030 | 1.50 | 24.0–26.0 | 19.0–22.0 | ... | ... | ... |
| S31040 | 310Cb | 0.08 | 2.00 | 0.045 | 0.030 | 1.50 | 24.0–26.0 | 19.0–22.0 | ... | ... | Cb 10×C-1.10 |
| S31254 | ... | 0.020 | 1.00 | 0.030 | 0.010 | 0.80 | 19.5–20.5 | 17.5–18.5 | 6.0–6.5 | 0.18–0.22 | Cu 0.50–1.00 |
| S31400 | 314 | 0.25 | 2.00 | 0.045 | 0.030 | 1.50–3.00 | 23.0–26.0 | 19.0–22.0 | ... | ... | ... |
| S31600 | 316 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–14.0 | 2.00–3.00 | ... | ... |
| S31603 | 316L ^C | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–14.0 | 2.00–3.00 | ... | ... |
| S31635 | 316Ti | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–14.0 | 2.00–3.00 | 0.10 | Ti 5×(C+N)-0.70 |
| S31640 | 316Cb | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–14.0 | 2.00–3.00 | 0.10 | Cb 10×C-1.10 |
| S31651 | 316N | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–14.0 | 2.00–3.00 | 0.10–0.16 | ... |
| S31653 | 316LN | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–13.0 | 2.00–3.00 | 0.10–0.16 | ... |
| S31654 | ... | 0.03 | 2.00 | 0.045 | 0.030 | 1.00 | 16.0–18.0 | 10.0–13.0 | 2.00–3.00 | 0.16–0.30 | ... |
| S31700 | 317 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 11.0–15.0 | 3.0–4.0 | 0.10 | ... |
| S31725 | ... | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 18.0–20.0 | 13.5–17.5 | 4.0–5.0 | 0.20 | ... |
| S31726 | ... | 0.030 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–20.0 | 14.5–17.5 | 4.0–5.0 | 0.10–0.20 | ... |
| S31727 | ... | 0.030 | 1.00 | 0.030 | 0.030 | 1.00 | 17.5–19.0 | 14.5–16.5 | 3.8–4.5 | 0.15–0.21 | Cu 2.8–4.0 |
| S32053 | ... | 0.030 | 1.00 | 0.030 | 0.010 | 1.00 | 22.0–24.0 | 24.0–26.0 | 5.0–6.0 | 0.17–0.22 | ... |
| S32100 | 321 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 9.0–12.0 | ... | ... | Ti 5×(C+N)-0.70 ^D |
| S32654 | ... | 0.020 | 2.0–4.0 | 0.030 | 0.005 | 0.50 | 24.0–25.0 | 21.0–23.0 | 7.0–8.0 | 0.45–0.55 | Cu 0.30–0.60 |
| S34565 | ... | 0.030 | 5.0–7.0 | 0.030 | 0.010 | 1.00 | 23.0–25.0 | 16.0–18.0 | 4.0–5.0 | 0.40–0.60 | Cb 0.10 |
| S34700 | 347 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 9.0–12.0 | ... | ... | Cb 10×C-1.10 |
| S34800 | 348 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 9.0–12.0 | ... | ... | Cb 10×C-1.10, Ta 0.10 Co 0.20 |
| Austenitic-Ferritic Grades | | | | | | | | | | | |
| S31100 | XM-26 | 0.06 | 1.00 | 0.045 | 0.030 | 1.00 | 25.0–27.0 | 6.0–7.0 | ... | ... | Ti 0.25 |
| S31803 | ... | 0.030 | 2.00 | 0.030 | 0.020 | 1.00 | 21.0–23.0 | 4.5–6.5 | 2.5–3.5 | 0.08–0.20 | ... |
| S32101 | ... | 0.040 | 4.0–6.0 | 0.040 | 0.030 | 1.00 | 21.0–22.0 | 1.35–1.70 | 0.10–0.80 | 0.20–0.25 | Cu 0.10–0.80 |
| S32202 | ... | 0.030 | 2.00 | 0.040 | 0.010 | 1.00 | 21.5–24.0 | 1.00–2.80 | 0.45 | 0.18–0.26 | ... |
| S32205 | ... | 0.030 | 2.00 | 0.030 | 0.020 | 1.00 | 22.0–23.0 | 4.5–6.5 | 3.0–3.5 | 0.14–0.20 | ... |
| S32304 | ... | 0.030 | 2.50 | 0.040 | 0.030 | 1.00 | 21.5–24.5 | 3.0–5.5 | 0.05–0.60 | 0.05–0.20 | Cu 0.05–0.60 |
| S32506 | ... | 0.030 | 1.00 | 0.040 | 0.015 | 0.90 | 24.0–26.0 | 5.5–7.2 | 3.0–3.5 | 0.08–0.20 | W 0.05–0.30 |
| S32550 | ... | 0.04 | 1.50 | 0.040 | 0.030 | 1.0 | 24.0–27.0 | 4.5–6.5 | 2.9–3.9 | 0.10–0.25 | Cu 1.50–2.50 |
| S32550 | ... | 0.04 | 1.50 | 0.040 | 0.030 | 1.0 | 24.0–27.0 | 4.5–6.5 | 2.9–3.9 | 0.10–0.25 | Cu 1.50–2.50 |
| S32750 | ... | 0.030 | 1.20 | 0.035 | 0.020 | 0.80 | 24.0–26.0 | 6.0–8.0 | 3.0–5.0 | 0.24–0.32 | Cu 0.50 |
| S32760 ^F | ... | 0.030 | 1.00 | 0.030 | 0.010 | 1.00 | 24.0–26.0 | 6.0–8.0 | 3.0–4.0 | 0.20–0.30 | Cu 0.50–1.00 W 0.50–1.00 |

TABLE 1 *Continued*

| UNS Designation ^B | Type | Composition, % | | | | | | | | | |
|------------------------------|--------------------|--------------------|-----------|------------|--------|---------|-----------|-----------|------------|--------------------|---------------------------|
| | | Carbon | Manganese | Phosphorus | Sulfur | Silicon | Chromium | Nickel | Molybdenum | Nitrogen | Other Elements |
| Ferritic Grades | | | | | | | | | | | |
| S40500 | 405 | 0.08 | 1.00 | 0.040 | 0.030 | 1.00 | 11.5–14.5 | 0.50 | ... | ... | Al 0.10–0.30 |
| S40976 | ... | 0.030 | 1.00 | 0.040 | 0.030 | 1.00 | 10.5–11.7 | 0.75–1.00 | ... | 0.040 | Cb 10×(C+N)-0.80 |
| S42900 | 429 | 0.12 | 1.00 | 0.040 | 0.030 | 1.00 | 14.0–16.0 | ... | ... | ... | ... |
| S43000 | 430 | 0.12 | 1.00 | 0.040 | 0.030 | 1.00 | 16.0–18.0 | ... | ... | ... | ... |
| S44400 | 444 | 0.025 | 1.00 | 0.040 | 0.030 | 1.00 | 17.5–19.5 | 1.00 | 1.75–2.50 | 0.035 | Ti+Cb 0.20+4 × (C+N)-0.80 |
| S44600 | 446 | 0.20 | 1.50 | 0.040 | 0.030 | 1.00 | 23.0–27.0 | 0.75 | ... | 0.25 | ... |
| S44627 | XM-27 ^F | 0.010 ^G | 0.40 | 0.020 | 0.020 | 0.40 | 25.0–27.5 | 0.50 | 0.75–1.50 | 0.015 ^G | Cu 0.20 Cb 0.05–0.20 |
| S44700 | ... | 0.010 | 0.30 | 0.025 | 0.020 | 0.20 | 28.0–30.0 | 0.15 | 3.5–4.2 | 0.020 | C+N 0.025 Cu 0.15 |
| S44800 | ... | 0.010 | 0.30 | 0.025 | 0.020 | 0.20 | 28.0–30.0 | 2.00–2.50 | 3.5–4.2 | 0.020 | C+N 0.025 Cu 0.15 |
| Martensitic Grades | | | | | | | | | | | |
| S40300 | 403 | 0.15 | 1.00 | 0.040 | 0.030 | 0.50 | 11.5–13.0 | ... | ... | ... | ... |
| S41000 | 410 | 0.08–0.15 | 1.00 | 0.040 | 0.030 | 1.00 | 11.5–13.5 | ... | ... | ... | ... |
| S41040 | XM-30 | 0.18 | 1.00 | 0.040 | 0.030 | 1.00 | 11.0–13.0 | ... | ... | ... | Cb 0.05–0.30 |
| S41400 | 414 | 0.15 | 1.00 | 0.040 | 0.030 | 1.00 | 11.5–13.5 | 1.25–2.50 | ... | ... | ... |
| S41425 | ... | 0.05 | 0.50–1.00 | 0.020 | 0.005 | 0.50 | 12.0–15.0 | 4.0–7.0 | 1.50–2.00 | 0.06–0.12 | Cu 0.30 |
| S41500 | ^H | 0.05 | 0.50–1.00 | 0.030 | 0.030 | 0.60 | 11.5–14.0 | 3.5–5.5 | 0.50–1.00 | ... | ... |
| S42000 | 420 | 0.15 min | 1.00 | 0.040 | 0.030 | 1.00 | 12.0–14.0 | ... | ... | ... | ... |
| S42010 | ... | 0.15–0.30 | 1.00 | 0.040 | 0.030 | 1.00 | 13.5–15.0 | 0.35–0.85 | 0.40–0.85 | ... | ... |
| S43100 | 431 | 0.20 | 1.00 | 0.040 | 0.030 | 1.00 | 15.0–17.0 | 1.25–2.50 | ... | ... | ... |
| S44002 | 440A | 0.60–0.75 | 1.00 | 0.040 | 0.030 | 1.00 | 16.0–18.0 | ... | 0.75 | ... | ... |
| S44003 | 440B | 0.75–0.95 | 1.00 | 0.040 | 0.030 | 1.00 | 16.0–18.0 | ... | 0.75 | ... | ... |
| S44004 | 440C | 0.95–1.20 | 1.00 | 0.040 | 0.030 | 1.00 | 16.0–18.0 | ... | 0.75 | ... | ... |

^A Maximum, unless range or minimum is indicated.

^B Designations established in accordance with Practice E 527 E527 and SAE J 1086.

^C For some applications, the substitution of Type 304L for Type 304, or Type 316L for Type 316 may be undesirable because of design, fabrication, or service requirements. In such cases, the purchaser should so indicate on the order.

^D Nitrogen content is to be reported for this grade.

^E % Cr + 3.3 × % Mo + 16 × % N ≥ 40.

^F Nickel plus copper shall be 0.50 % max.

^G Product analysis tolerance over the maximum limit for carbon and nitrogen shall be 0.002 %.

^H Wrought version of CA 6NM.

3.1.12 Test for magnetic permeability when specified by customer purchase order when ordering Types 201 and 205.

3.1.13 Special requirements.

NOTE 4—A typical ordering description is as follows: 5000 lb (2268 kg) Stainless Steel Bars, Annealed and Centerless Ground, 1½ in. (38.10 mm) Round, 10 to 12 ft (3.05 to 3.66 m) in length, Type 304, ASTM Specification A276 dated _____. End use: machined valve parts.

4. Manufacture

4.1 Condition:

4.1.1 Bars shall be furnished in one of the following conditions listed in the Mechanical Requirements table:

4.1.1.1 Condition A—Annealed

4.1.1.2 Condition H—Hardened and tempered at a relatively low temperature

4.1.1.3 Condition T—Hardened and tempered at a relatively high temperature

4.1.1.4 Condition S—Strain Hardened—Relatively light cold work

4.1.1.5 Condition B—Relatively severe cold work

5. Chemical Composition

5.1 The steel shall conform to the requirements for chemical composition specified in Table 1.

5.2 Methods and practices relating to chemical analysis required by this specification shall be in accordance with Test Methods, Practices, and Terminology A 751A751.

6. Mechanical Properties Requirements

6.1 The material shall conform to the mechanical test requirements specified in Table 2.

6.2 The martensitic grades shall be capable of meeting the hardness requirements after heat treating as specified in Table 3.