



Standard Specification for Stainless Steel Bars and Shapes¹

This standard is issued under the fixed designation A276/A276M; 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 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 A314.

NOTE 2—For free-machining stainless bars designed especially for optimum machinability, see Specification A582/A582M.

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 either SI units or inch-pound units are to be regarded separately as standard. Within the text, 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 non-conformance with the standard. The inch-pound units shall apply unless the “M” designation of this specification is specified in the order.

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

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.

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

A1058 Test Methods for Mechanical Testing of Steel Products—Metric

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, and so forth),

3.1.4 Condition (Section 4.1),

3.1.5 Finish (Section 8 of Specification A484/A484M),

3.1.6 Surface preparation of shapes (Section 8 of Specification A484/A484M),

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

3.1.8 Cross section (round, square, and so forth),

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.

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

3.1.13 Choice of testing track from the options listed in Test Methods A1058 when material is ordered to an M suffix (SI units) product standard. If the choice of test track is not specified in the order, then the default ASTM track shall be used as noted in Test Methods A1058

3.1.14 Supplementary requirements, and

3.1.15 Additional requirements.

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 ^K |
| Austenitic Grades | | | | | | | | | | | |
| N08020 | Alloy 20 | 0.07 | 2.00 | 0.045 | 0.035 | 1.00 | 19.0–21.0 | 32.0–38.0 | 2.00–3.00 | ... | Cu 3.0–4.0 Nb 8 × C min.; 1.00 max |
| 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 |
| N08800 | 800 | 0.10 | 1.50 | 0.045 | 0.015 | 1.00 | 19.0–23.0 | 30.0–35.0 | ... | ... | Fe ^l 39.5 min. Cu 0.75 Al 0.15–0.60 Ti 0.15–0.60 |
| N08810 | 800H | 0.05–0.10 | 1.50 | 0.045 | 0.015 | 1.00 | 19.0–23.0 | 30.0–35.0 | ... | ... | Fe ^l 39.5 min. Cu 0.75 Al 0.15–0.60 Ti 0.15–0.60 |
| N08811 | ... | 0.06–0.10 | 1.50 | 0.045 | 0.015 | 1.00 | 19.0–23.0 | 30.0–35.0 | ... | ... | Fe ^l 39.5 min. Cu 0.75 Al ^l 0.25–0.60 Ti ^l 0.25–0.60 |
| N08904 | 904L | 0.020 | 2.00 | 0.045 | 0.035 | 1.00 | 19.0–23.0 | 23.0–28.0 | 4.0–5.0 | 0.10 | Cu 1.0–2.0 |
| N08925 | ... | 0.020 | 1.00 | 0.045 | 0.030 | 0.50 | 19.0–21.0 | 24.0–26.0 | 6.0–7.0 | 0.10–0.20 | Cu 0.80–1.50 |
| N08926 | ... | 0.020 | 2.00 | 0.030 | 0.015 | 0.50 | 19.0–21.0 | 24.0–26.0 | 6.0–7.0 | 0.15–0.25 | Cu 0.50–1.50 |
| 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 | 0.18–0.25 | Cu 0.50–1.00 |
| S31266 | ... | 0.030 | 2.00–4.00 | 0.035 | 0.020 | 1.00 | 23.0–25.0 | 21.0–24.0 | 5.2–6.2 | 0.35–0.60 | Cu 1.00–2.50 W 1.50–2.50 |
| 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 | ... |

TABLE 1 *Continued*

| UNS Designation ^B | Type | Composition, % | | | | | | | | | |
|------------------------------|--------------------|--------------------|-----------|------------|--------|---------|-----------|-----------|------------|--------------------|-------------------------------------|
| | | Carbon | Manganese | Phosphorus | Sulfur | Silicon | Chromium | Nickel | Molybdenum | Nitrogen | Other Elements ^K |
| 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 |
| S31730 | ... | 0.030 | 2.00 | 0.040 | 0.010 | 1.00 | 17.0–19.0 | 15.0–16.5 | 3.0–4.0 | 0.045 | Cu 4.0–5.0 |
| 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 5x(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 10xC–1.10 |
| S34800 | 348 | 0.08 | 2.00 | 0.045 | 0.030 | 1.00 | 17.0–19.0 | 9.0–12.0 | ... | ... | Cb 10xC–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 |
| S32750 ^L | ... | 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 ^E | ... | 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 |
| S82441 | ... | 0.030 | 2.5–4.0 | 0.035 | 0.005 | 0.070 | 23.0–25.0 | 3.0–4.5 | 1.00–2.00 | 0.20–0.30 | Cu 0.10–0.80 |
| 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 10x(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 x (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. Where ellipses (. . .) appear in this table, there is no requirement and the element need not be determined or reported.

^B Designations established in accordance with Practice 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 x % Mo + 16 x % 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.

^I Iron shall be determined arithmetically by difference of 100 minus the sum of specified elements.

^J (Al + Ti) = 0.85 - 1.20.

^KThe terms Columbium (Cb) and Niobium (Nb) both relate to the same element.

^L $\% \text{Cr} + 3.3 \times \% \text{Mo} + 16 \times \% \text{N} \geq 41$.

NOTE 4—A typical ordering description is as follows: 5000 lb [2270 kg] Stainless Steel Bars, Annealed and Centerless Ground, 1½ in. [40 mm] Round, 10 to 12 ft [3 to 3.7 m] in length, Type 304, ASTM Specification A276/A276M 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.

4.1.1.6 *Condition SA*—Stabilized annealed.

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 [A751](#).

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](#).

6.3 Hardness measurements, when required, shall be made at a location midway between the surface and the center of the cross section.

7. Magnetic Permeability

7.1 When required by the purchase order, the magnetic permeability of Types 201 and 205 in the annealed condition shall not exceed 1.2 as tested by a Severn-type indicator.

8. General Requirements

8.1 In addition to the requirements of this specification, all requirements of the current edition of Specification [A484/A484M](#) shall apply. Failure to comply with the general requirements of Specification [A484/A484M](#) constitutes non-conformance to this specification.

9. Certification

9.1 Upon request of the purchaser in the contract or order, the producer'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.

10. Keywords

10.1 austenitic stainless steel; austenitic-ferritic duplex stainless steel; ferritic stainless steel; martensitic stainless steel; stainless steel bars; stainless steel shapes



TABLE 2 Mechanical Requirements

| Type | Condition | Finish | Diameter or Thickness, in. [mm] | Tensile Strength, min | | Yield Strength, ^A min | | Elonga- tion in 2 in. [50 mm] ^B or 4D min % | Reduc- tion of Area, ^{C, D} min, % | Brinell Hard- ness, HBW unless otherwise indicated, ^E max | |
|--|-----------|-------------------------------|-------------------------------------|----------------------------------|-----------------|-------------------------------------|-----------------|--|--|---|-----|
| | | | | ksi | MPa | ksi | MPa | | | | |
| Austenitic Grades | | | | | | | | | | | |
| N08020 | SA | hot-finished or cold-finished | all | 80 | [550] | 35 | [240] | 30 | 50 | ... | |
| N08367 | A | hot-finished or cold-finished | all | 95 | 655 | 45 | 310 | 30 | 50 | ... | |
| N08700 | A | hot-finished or cold-finished | all | 80 | 550 | 35 | 240 | 30 | 50 | ... | |
| N08800 800 | A | hot-finished or cold-finished | all | 75 | 515 | 30 | 205 | 30 | ... | 192 | |
| N08810 800H | A | hot-finished or cold-finished | all | 65 | 450 | 25 | 170 | 30 | ... | 192 | |
| N08811 | A | hot-finished or cold-finished | all | 65 | 450 | 25 | 170 | 30 | ... | 192 | |
| N08904 904L | A | hot-finished or cold-finished | all | 71 | 490 | 31 | 220 | 35 | ... | ... | |
| N08925 | A | hot-finished or cold-finished | all | 87 | 600 | 43 | 295 | 40 | ... | 217 | |
| N08926 | A | hot-finished or cold-finished | all | 94 | 650 | 43 | 295 | 35 | ... | 256 | |
| 201, 202 | A | hot-finished or cold-finished | all | 75 | 515 | 40 | 275 | 40 | 45 | ... | |
| S20161 | A | hot-finished | all | 125 | 860 | 50 | 345 | 40 | 40 | 255 | |
| | | cold-finished | all | 125 | 860 | 50 | 345 | 40 | 40 | 311 | |
| S20162 | A | hot-finished or cold finished | all | 100 | 690 | 50 | 345 | 50 | 60 | ... | |
| 205 | A | hot-finished or cold-finished | all | 100 | 690 | 60 | 414 | 40 | 50 | ... | |
| XM-19 | A | hot-finished or cold-finished | all | 100 | 690 | 55 | 380 | 35 | 55 | ... | |
| | | | As hot-rolled | up to 2 [50.8], incl | 135 | 930 | 105 | 725 | 20 | 50 | ... |
| | | | | over 2 to 3 [50.8 to 76.2], incl | 115 | 795 | 75 | 515 | 25 | 50 | ... |
| | | | over 3 to 8 [76.2 to 203.2], incl | 100 | 690 | 60 | 415 | 30 | 50 | ... | |
| S21800 | A | hot-finished or cold-finished | all | 95 | 655 | 50 | 345 | 35 | 55 | 241 | |
| XM-10, XM-11 | A | hot-finished or cold-finished | all | 90 | 620 | 50 | 345 | 45 | 60 | ... | |
| XM-29 | A | hot-finished or cold-finished | all | 100 | 690 | 55 | 380 | 30 | 50 | ... | |
| XM-28 | A | hot-finished or cold-finished | all | 100 | 690 | 55 | 380 | 30 | 50 | ... | |
| S24565 | A | hot-finished or cold-finished | all | 115 | 795 | 60 | 415 | 35 | 40 | ... | |
| S28200 | A | hot-finished or cold finished | all | 110 | 760 | 60 | 410 | 35 | 55 | ... | |
| 302, 302B, 304, 304LN, 305, 308, 309, 309S, 309Cb, 310, 310S, 310Cb, 314, 316, 316LN, 316Cb, 316TI, 317, 321, 347, 348 | A | hot-finished | all | 75 ^F | 515 | 30 ^F | 205 | 40 ^G | 50 | ... | |
| | | | cold-finished | up to 1/2 [12.70] incl | 90 | 620 | 45 | 310 | 30 | 40 | ... |
| | | | | over 1/2 [12.70] | 75 ^F | 515 | 30 ^F | 205 | 30 | 40 | ... |
| 304L, 316L | A | hot-finished | all | 70 | 485 | 25 | 170 | 40 ^G | 50 | ... | |
| | | | cold-finished | up to 1/2 [12.70] incl. | 90 | 620 | 45 | 310 | 30 | 40 | ... |
| | | | over 1/2 [12.70] | 70 | 485 | 25 | 170 | 30 | 40 | ... | |
| 304N, 316N | A | hot-finished or cold-finished | all | 80 | 550 | 35 | 240 | 30 | ... | ... | |
| 202, 302, 304, 304N, 316, 316N | B | cold-finished | up to 3/4 [19.05] incl | 125 | 860 | 100 | 690 | 12 | 35 | ... | |
| | | | over 3/4 [19.05] to 1 [25.40] | 115 | 795 | 80 | 550 | 15 | 35 | ... | |
| | | | over 1 [25.40] to 1 1/4 [31.75] | 105 | 725 | 65 | 450 | 20 | 35 | ... | |
| 304L, 316L | | | over 1 1/4 [31.75] to 1 1/2 [38.10] | 100 | 690 | 50 | 345 | 24 | 45 | ... | |

**A276/A276M – 16a****TABLE 2** *Continued*

| Type | Condition | Finish | Diameter or Thickness, in. [mm] | Tensile Strength, min | | Yield Strength, ^A min | | Elonga- tion in 2 in. [50 mm] ^B or 4D min % | Reduc- tion of Area, ^{C, D} min, % | Brinell Hard- ness, HBW unless otherwise indicated, ^E max |
|------------------------------------|-----------|----------------------------------|-------------------------------------|--------------------------|------|-------------------------------------|-----|--|--|---|
| | | | | ksi | MPa | ksi | MPa | | | |
| 304, 304N, 316, 316N 304L, 316L | S | cold-finished | over 1½ [38.10] to 1¾ [44.45] | 95 | 655 | 45 | 310 | 28 | 45 | ... |
| | | | up to 2 [50.8] incl | 95 | 650 | 75 | 515 | 25 | 40 | ... |
| | | | over 2 to 2½ [50.8 to 63.5] incl | 90 | 620 | 65 | 450 | 30 | 40 | ... |
| XM-21, S30454, S31654 | A | hot-finished or cold-finished | over 2½ to 3 [63.5 to 76.2] incl | 80 | 550 | 55 | 380 | 30 | 40 | ... |
| | | | all | 90 | 620 | 50 | 345 | 30 | 50 | ... |
| XM-21, S30454 S31654 | B | cold-finished | up to 1 [25.40] incl | 145 | 1000 | 125 | 860 | 15 | 45 | ... |
| | | | over 1 [25.40] to 1¼ [31.75] | 135 | 930 | 115 | 795 | 16 | 45 | ... |
| | | | over 1¼ [31.75] to 1½ [38.10] | 135 | 895 | 105 | 725 | 17 | 45 | ... |
| S30815 | A | hot-finished or cold-finished | over 1½ [38.10] to 1¾ [44.45] | 125 | 860 | 100 | 690 | 18 | 45 | ... |
| | | | all | 87 | 600 | 45 | 310 | 40 | 50 | ... |
| S31254 | A | hot-finished or cold-finished | all | 87 | 600 | 45 | 310 | 40 | 50 | ... |
| | | | all | 95 | 650 | 44 | 300 | 35 | 50 | ... |
| S31266 | A | hot-finished or cold-finished | all | 109 | 750 | 61 | 420 | 35 | ... | ... |
| S31725 | A | hot-finished or cold-finished | all | 75 | 515 | 30 | 205 | 40 | ... | ... |
| S31726 | A | hot-finished or cold-finished | all | 80 | 550 | 35 | 240 | 40 | ... | ... |
| S31727 | A | hot-finished or cold-finished | all | 80 | 550 | 36 | 245 | 35 | ... | 217 |
| S31730 | A | hot-finished or cold-finished | all | 70 | 480 | 25 | 175 | 35 | ... | 90 HRB |
| S32053 | A | hot-finished or cold-finished | all | 93 | 640 | 43 | 295 | 40 | ... | 217 |
| S32654 | A | hot-finished or cold-finished | all | 109 | 750 | 62 | 430 | 40 | 40 | 250 |
| Austenitic-Ferritic Grades | | | | | | | | | | |
| XM-26 | A | hot-finished or cold-finished | all | 90 | 620 | 65 | 450 | 20 | 55 | ... |
| S31803 | A | hot-finished or cold-finished | all | 90 | 620 | 65 | 448 | 25 | ... | 290 |
| S32056 | A | hot-finished or cold-finished | all | 90 | 620 | 65 | 450 | 18 | ... | 302 |
| S32101 | A | hot-finished or cold-finished | all | 94 | 650 | 65 | 450 | 30 | ... | 290 |
| S32202 | A | hot-finished or cold-finished | all | 94 | 650 | 65 | 450 | 30 | ... | 290 |
| S32205 | A | hot-finished or cold-finished | all | 95 | 655 | 65 | 450 | 25 | ... | 290 |
| S32304 | A | hot-finished or cold-finished | all | 87 | 600 | 58 | 400 | 25 | ... | 290 |
| S32550 | A | hot-finished or cold-finished | all | 109 | 750 | 80 | 550 | 25 | ... | 290 |
| S32550 | S | cold-finished | all | 125 | 860 | 105 | 720 | 16 | ... | 335 |
| S32750 | A | hot-finished or cold-finished | up to 2 [50.8] incl | 116 | 800 | 80 | 550 | 15 | ... | 310 |
| | | | over 2 [50.8] | 110 | 760 | 75 | 515 | 15 | ... | 310 |
| S32760 | A | hot-finished or cold-finished | all | 109 | 750 | 80 | 550 | 25 | ... | 310 |
| | | | all | 125 | 860 | 105 | 720 | 16 | ... | 335 |
| S32760 S82441 | A | hot-finished or cold-finished | Under 7/16 [11 mm] | 107 | 740 | 78 | 540 | 25 | ... | 290 |
| | | | 7/16 and over [11 mm] | 99 | 680 | 70 | 480 | 25 | ... | 290 |
| Ferritic Grades | | | | | | | | | | |
| 405 ^H | A | hot-finished | all | ... | ... | ... | ... | ... | ... | 207 |
| | | cold-finished | all | ... | ... | ... | ... | ... | ... | 217 |
| 429 | A | hot-finished | all | 70 | 480 | 40 | 275 | 20 | 45 | ... |
| | | cold-finished | all | 70 | 480 | 40 | 275 | 16 | 45 | ... |
| 430 | A | hot-finished or cold-finished | all | 60 | 415 | 30 | 207 | 20 | 45 | ... |



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TABLE 2 Continued

| Type | Condition | Finish | Diameter or Thickness, in. [mm] | Tensile Strength, min | | Yield Strength, ^A min | | Elongation in 2 in. [50 mm] ^B or 4D min % | Reduction of Area, ^{C, D} % | Brinell Hardness, HBW unless otherwise indicated, ^E max |
|---------------------------|-----------|----------------------------------|------------------------------------|--------------------------|-----|-------------------------------------|-----|---|---|--|
| | | | | ksi | MPa | ksi | MPa | | | |
| S40976 | A | hot-finished or cold-finished | all | 60 | 415 | 20 | 140 | 20 | 45 | 244 |
| S44400 | A | hot-finished | all | 60 | 415 | 45 | 310 | 20 | 45 | 217 |
| 446, XM-27 | A | hot-finished | all | 65 | 450 | 40 | 275 | 20 | 45 | 219 |
| | | cold-finished | all | 65 | 450 | 40 | 275 | 16 | 45 | 219 |
| S44700 | A | hot-finished | all | 70 | 480 | 55 | 380 | 20 | 40 | ... |
| | | cold-finished | all | 75 | 520 | 60 | 415 | 15 | 30 | ... |
| S44800 | A | hot-finished | all | 70 | 480 | 55 | 380 | 20 | 40 | ... |
| | | cold-finished | all | 75 | 520 | 60 | 415 | 15 | 30 | ... |
| Martensitic Grades | | | | | | | | | | |
| 403, 410 | A | hot-finished | all | 70 | 480 | 40 | 275 | 20 | 45 | ... |
| | | cold-finished | all | 70 | 480 | 40 | 275 | 16 | 45 | ... |
| 403, 410 | T | hot-finished | all | 100 | 690 | 80 | 550 | 15 | 45 | ... |
| | | cold-finished | all | 100 | 690 | 80 | 550 | 12 | 40 | ... |
| XM-30 | T | hot-finished | all | 125 | 860 | 100 | 690 | 13 | 45 | 302 |
| | | cold-finished | all | 125 | 860 | 100 | 690 | 12 | 35 | ... |
| 403, 410 | H | hot-finished | all | 120 | 830 | 90 | 620 | 12 | 40 | ... |
| | | cold-finished | all (rounds only) | 120 | 830 | 90 | 620 | 12 | 40 | ... |
| XM-30 | A | hot-finished | all | 70 | 480 | 40 | 275 | 13 | 45 | 235 |
| | | cold-finished | all | 70 | 480 | 40 | 275 | 12 | 35 | ... |
| 414 | A | hot-finished or cold-finished | all | ... | ... | ... | ... | ... | ... | 298 |
| 414 | T | hot-finished or cold-finished | all | 115 | 790 | 90 | 620 | 15 | 45 | ... |
| S41425 | T | hot-finished | all | 120 | 825 | 95 | 655 | 15 | 45 | 321 |
| S41500 | T | hot-finished or cold-finished | all | 115 | 795 | 90 | 620 | 15 | 45 | 295 |
| 420 | A | hot-finished | all | ... | ... | ... | ... | ... | ... | 241 |
| | | cold-finished | all | ... | ... | ... | ... | ... | ... | 255 |
| S42010 | A | hot-finished | all | ... | ... | ... | ... | ... | ... | 235 |
| | | cold-finished | all | ... | ... | ... | ... | ... | ... | 255 |
| 431 | A | hot-finished or cold-finished | all | ... | ... | ... | ... | ... | ... | 285 |
| 440A, 440B, and 440C | A | hot-finished | all | ... | ... | ... | ... | ... | ... | 269 |
| | | cold-finished | all | ... | ... | ... | ... | ... | ... | 285 |

^A Yield strength shall be determined by the 0.2 % offset method in accordance with Test Methods and Definitions A370 or Test Methods A1058. An alternative method of determining yield strength may be used based on a total extension under load of 0.5 %.

^B For some specific products, it may not be practicable to use a 2-in. or 50-mm gage length. The use of sub-size test specimens, when necessary, is permissible in accordance with Test Methods and Definitions A370 or Test Methods A1058.

^C Reduction of area does not apply on flat bars 3/16 in. [4.76 mm] and under in thickness as this determination is not generally made in this product size.

^D The material shall be capable of meeting the required reduction of area where listed, but actual measurement and reporting of the reduction of area are not required unless specified in the purchase order.

^E Or equivalent Rockwell hardness (HRB or HRC).

^F For extruded shapes of all Cr-Ni grades of Condition A, the yield strength shall be 25 ksi [170 MPa] min and tensile strength shall be 70 ksi [480 MPa] min.

^G For shapes having section thickness of 1/2 in. [12.5 mm] or less, 30% min. elongation is acceptable.

^H Material shall be capable of being heat treated to a maximum Brinell hardness of 250 HBW when oil quenched from 1750°F [950°C].

TABLE 3 Response to Heat Treatment

| Type ^A | Heat Treatment Temperature ^B °F [°C], min | Quenchant | Hardness HRC, min |
|-------------------|--|-----------|----------------------|
| 403 | 1750 [955] | Air | 35 |
| 410 | 1750 [955] | Air | 35 |
| 414 | 1750 [955] | Oil | 42 |
| 420 | 1825 [995] | Air | 50 |
| S42010 | 1850 [1010] | Oil | 48 |
| 431 | 1875 [1020] | Oil | 40 |
| 440A | 1875 [1020] | Air | 55 |
| 440B | 1875 [1020] | Oil | 56 |
| 440C | 1875 [1020] | Air | 58 |

^A Samples for testing shall be in the form of a section not exceeding 3/8 in. [9.50 mm] in thickness.

^B Temperature tolerance is ±25°F [14°C].

SUMMARY OF CHANGES

Committee **A01** has identified the location of selected changes to this standard since the last issue (A276/A276M – 16) that may impact the use of this standard. (Approved May 1, 2016.)

(1) Increased the maximum permitted hardness in **Table 2** for UNS S32760 to 310 HBW.

Committee **A01** has identified the location of selected changes to this standard since the last issue (A276/A276M – 15) that may impact the use of this standard. (Approved Jan. 1, 2016.)

(1) Added UNS N08020 to **Tables 1 and 2** and stabilized annealed as a condition to **4.1.1.6**.

(2) Added new footnote K to **Table 1**.

(3) Revised **Table 1** to include a minimum % Cr + 3.3 × % Mo + 16 × % N value for Grade S32750 by adding footnote L.

Committee **A01** has identified the location of selected changes to this standard since the last issue (A276 – 13a) that may impact the use of this standard. (Approved Jan. 1, 2015.)

(1) Converted this specification to a combined standard by revising the designation, subsections **1.2**, **2.1**, and **3.1.13 – 3.1.15**, **Note 4**, **Table 1**, and **Table 2** (column headings and footnotes **A**, **B**, **F**, and **H**).

(2) Added S31730 and S31266 to **Tables 1 and 2**.

(3) Revised footnote **A** of **Table 1** to explain ellipses.

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