



Designation: **A276/A276M—16 A276/A276M – 16a**

# Standard Specification for Stainless Steel Bars and Shapes<sup>1</sup>

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 ( $\epsilon$ ) 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*:<sup>2</sup>

**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

**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*:<sup>3</sup>

**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.

<sup>1</sup> 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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<sup>2</sup> 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.

<sup>3</sup> 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

- 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.

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**TABLE 1 Chemical Requirements<sup>A</sup>**

UNS Designation <sup>B</sup>	Type	Composition, %									
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Other Elements <sup>K</sup>
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 <sup>J</sup> 39.5 min. Cu 0.75
N08810	800H	0.05–0.10	1.50	0.045	0.015	1.00	19.0–23.0	30.0–35.0	...	...	Al 0.15–0.60 Ti 0.15–0.60 Fe <sup>J</sup> 39.5 min. Cu 0.75
N08811	...	0.06–0.10	1.50	0.045	0.015	1.00	19.0–23.0	30.0–35.0	...	...	Al 0.15–0.60 Ti 0.15–0.60 Fe <sup>J</sup> 39.5 min. Cu 0.75
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 <sup>C</sup>	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 <sup>C</sup>	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 <sup>E</sup>	Type	Composition, %									
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Other Elements <sup>K</sup>
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 <sup>D</sup>
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 <sup>L</sup>	...	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 <sup>E</sup>	...	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 <sup>F</sup>	0.010 <sup>G</sup>	0.40	0.020	0.020	0.40	25.0–27.5	0.50	0.75–1.50	0.015 <sup>G</sup>	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	<sup>H</sup>	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	...	...

<sup>A</sup> 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.

<sup>B</sup> Designations established in accordance with Practice E527 and SAE J 1086.

<sup>C</sup> 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.

<sup>D</sup> Nitrogen content is to be reported for this grade.

<sup>E</sup> % Cr + 3.3 x % Mo + 16 x % N ≥ 40.

<sup>F</sup> Nickel plus copper shall be 0.50 % max.

<sup>G</sup> Product analysis tolerance over the maximum limit for carbon and nitrogen shall be 0.002 %.

<sup>H</sup> Wrought version of CA 6NM.

<sup>I</sup> Iron shall be determined arithmetically by difference of 100 minus the sum of specified elements.

<sup>J</sup> (Al + Ti) = 0.85 - 1.20.