

ASTM A276

Stainless Steel Bars & Shapes

Hot-finished and cold-finished bars — rounds, squares, hexagons — plus hot-rolled or extruded shapes (angles, tees, channels) in the most widely used stainless steels. This guide condenses the standard into what matters for material selection and ordering.

Designation

A276 – 06

Product Forms

Bars · Angles · Tees · Channels

Families

Austenitic · Duplex · Ferritic · Martensitic

Grades

90+ UNS designations

Scope & Application

What A276 covers — and where to look when it doesn't.

● Covered Products

Hot-finished or cold-finished stainless bars: **rounds, squares, hexagons**, and hot-rolled or extruded **shapes** — angles, tees, channels.

● Four Alloy Families

Austenitic, austenitic-ferritic (duplex), ferritic, and martensitic stainless steels — general corrosion resistance and high-temperature service.

● Excluded: Reforging Bars

Bars for reforging are covered by **ASTM A314**, not A276.

● Excluded: Free-Machining

Free-machining stainless bars designed for optimum machinability are covered by **ASTM A582/A582M**.

● Excluded: High-Ni Alloys

High nickel, chromium, austenitic corrosion and heat-resisting alloy bars are covered by separate standards (Vol. 02.04).

● Units

Values stated in **inch-pound units** are regarded as the standard.

i General requirements: All bars must also comply with **ASTM A484/A484M** (General Requirements for Stainless Steel Bars, Billets, and Forgings). Failure to meet A484/A484M constitutes nonconformance to A276.

2 Grade Families at a Glance

A276 organizes 90+ grades into four metallurgical families. These are the workhorse grades in each.

Austenitic — workhorse corrosion resistance

~60 grades

304 / 304L	MOST USED	18Cr–8Ni · general purpose, weldable L-grade
316 / 316L / 316Ti		+2–3% Mo · chemical & marine service
321 / 347		Ti / Nb stabilized · intergranular-corrosion resistant
309S / 310S	HIGH TEMP	22–26Cr, 12–22Ni · elevated temperature
201 / 202		Mn-substituted · economical 300-series alternative
XM-19 (Nitronic 50)	HIGH STRENGTH	22Cr–13Ni–2Mo–N · 100 ksi min tensile
S31254 / N08367 / S32654	SUPER AUSTENITIC	6–8% Mo · severe chloride service

Austenitic-Ferritic (Duplex)

~9 grades

S32205 / S31803	MOST USED	22Cr–5Ni–3Mo · 65+ ksi yield, chloride SCC resistant
S32760	SUPER DUPLEX	25Cr–7Ni–3.5Mo–W · high strength + PREN ≥ 40
S32101 (Lean Duplex)		21Cr–1.5Ni · economical, high strength

Ferritic — magnetic, economical

~11 grades

430	MOST USED	17Cr · decorative, appliances, general use
409 / S40976		11Cr · automotive exhaust
444		18Cr–2Mo · better corrosion than 430
XM-27 / S44700	SUPER FERRITIC	26–30Cr, high Mo · maximum chloride resistance

Martensitic — hardenable

~13 grades

410 / 403

MOST USED

12Cr · general purpose hardenable

420

CUTLERY

13Cr, $\geq 0.15\text{C}$ · blades, surgical instruments

440A / B / C

HIGH HARDNESS

17Cr, 0.6–1.2C · HRC up to 58

431

16Cr–2Ni · corrosion + strength combination

3 Supply Conditions

Every A276 bar is furnished in one of five conditions — the letter appears directly in the mechanical requirements table.

A

Annealed

Soft, ductile, maximum corrosion resistance. The default for most austenitic and ferritic grades.

H

Hardened + Tempered (Low Temp.)

Martensitic grades. Higher strength; tempered at relatively low temperature.

T

Hardened + Tempered (High Temp.)

Martensitic grades. Tougher, lower hardness than Condition H.

S

Strain Hardened — Light

Relatively light cold work on austenitic grades. Moderate strength increase.

B

Strain Hardened — Severe

Relatively severe cold work. Highest strength — properties are size-dependent.



Size matters for Conditions B & S: minimum tensile and yield strengths **decrease as bar diameter/thickness increases** — always match the ordered size to the correct row of the mechanical table.

4 Chemical Composition — Key Grades

Composition limits, % (maximum unless a range is shown). Full list: Table 1 of the standard. Commonly ordered grades are highlighted.

Austenitic Grades

UNS	Type	C	Mn	P	S	Si	Cr	Ni	Mo	N
S30400	304	0.08	2.00	0.045	0.030	1.00	18.0–20.0	8.0–11.0	—	—
S30403	304L	0.030	2.00	0.045	0.030	1.00	18.0–20.0	8.0–12.0	—	—
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	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
S32100	321	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–12.0	—	—
S34700	347	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–12.0	—	—
S30908	309S	0.08	2.00	0.045	0.030	1.00	22.0–24.0	12.0–15.0	—	—
S31008	310S	0.08	2.00	0.045	0.030	1.50	24.0–26.0	19.0–22.0	—	—
S20100	201	0.15	5.5–7.5	0.060	0.030	1.00	16.0–18.0	3.5–5.5	—	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
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
S21800	Nitronic 60	0.10	7.0–9.0	0.060	0.030	3.5–4.5	16.0–18.0	8.0–9.0	—	0.08–0.11
S31254	254 SMO	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
N08367	AL-6XN	0.030	2.00	0.040	0.030	1.00	20.0–22.0	23.5–25.5	6.0–7.0	0.18–0.21
S32654	654 SMO	0.020	2.0–4.0	0.030	0.005	0.50	24.0–25.0	21.0–23.0	7.0–8.0	0.45–0.51

Duplex (Austenitic-Ferritic) Grades

UNS	Type	C	Mn	P	S	Si	Cr	Ni	Mo	N
S32205	2205	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
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	Lean Duplex	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
S32304	2304	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
S32550	Ferralium	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

S32760	Super Duplex	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
S31100	XM-26	0.06	1.00	0.045	0.030	1.00	25.0–27.0	6.0–7.0	—	—

Ferritic & Martensitic Grades

UNS	Type	Family	C	Mn	Cr	Ni	Mo	Other
S43000	430	Ferritic	0.12	1.00	16.0–18.0	—	—	—
S40500	405	Ferritic	0.08	1.00	11.5–14.5	0.50	—	Al 0.10–0.30
S40976	—	Ferritic	0.030	1.00	10.5–11.7	0.75–1.00	—	Cb-stabilized
S44400	444	Ferritic	0.025	1.00	17.5–19.5	1.00	1.75–2.50	Ti+Cb stabilized
S44600	446	Ferritic	0.20	1.50	23.0–27.0	0.75	—	—
S44627	XM-27	Ferritic	0.010	0.40	25.0–27.5	0.50	0.75–1.50	Very low C, N
S44700	29-4	Ferritic	0.010	0.30	28.0–30.0	0.15	3.5–4.2	C+N ≤ 0.025
S41000	410	Martensitic	0.08–0.15	1.00	11.5–13.5	—	—	—
S42000	420	Martensitic	0.15 min	1.00	12.0–14.0	—	—	—
S43100	431	Martensitic	0.20	1.00	15.0–17.0	1.25–2.50	—	—
S41400	414	Martensitic	0.15	1.00	11.5–13.5	1.25–2.50	—	—
S44004	440C	Martensitic	0.95–1.20	1.00	16.0–18.0	—	0.75	—
S44002	440A	Martensitic	0.60–0.75	1.00	16.0–18.0	—	0.75	—
S44003	440B	Martensitic	0.75–0.95	1.00	16.0–18.0	—	0.75	—
S41500	F6NM	Martensitic	0.05	0.50–1.00	11.5–14.0	3.5–5.5	0.50–1.00	Wrought CA6NM

★ **L-grade substitution note:** For some applications, substituting **304L for 304**, or **316L for 316**, may be undesirable because of design, fabrication, or service requirements (lower strength). If so, indicate this on the order.

Mechanical Properties — Minimums

Tensile & yield minimums by condition (ksi / MPa). Size-dependent values are split by diameter or thickness range.

Austenitic Grades — Condition A (Annealed)

Type	Finish	Size, in. (mm)	Tensile, min	Yield, min	Elong. %
304, 316, 321, 347, 302, 309S, 310S, 317	Hot-finished	All	75 ksi / 515 MPa	30 ksi / 205 MPa	4
304, 316, 321, 347, 302, 309S, 310S, 317	Cold-finished	≤ ½ (12.7)	90 ksi / 620 MPa	45 ksi / 310 MPa	3
304, 316, 321, 347, 302, 309S, 310S, 317	Cold-finished	> ½ (12.7)	75 ksi / 515 MPa	30 ksi / 205 MPa	3
304L, 316L	Hot-finished	All	70 ksi / 485 MPa	25 ksi / 170 MPa	4
304L, 316L	Cold-finished	≤ ½ (12.7)	90 ksi / 620 MPa	45 ksi / 310 MPa	3
201, 202	Hot / Cold	All	75 ksi / 515 MPa	40 ksi / 275 MPa	4
205	Hot / Cold	All	100 ksi / 690 MPa	60 ksi / 414 MPa	4
XM-19 (Nitronic 50)	Hot / Cold	All	100 ksi / 690 MPa	55 ksi / 380 MPa	3
S21800 (Nitronic 60)	Hot / Cold	All	95 ksi / 655 MPa	50 ksi / 345 MPa	3
304N, 316N	Hot / Cold	All	80 ksi / 550 MPa	35 ksi / 240 MPa	3
S31254 (254 SMO)	Hot / Cold	All	95 ksi / 650 MPa	44 ksi / 300 MPa	3
N08367 (AL-6XN)	Hot / Cold	All	95 ksi / 655 MPa	45 ksi / 310 MPa	3
S32654 (654 SMO)	Hot / Cold	All	109 ksi / 750 MPa	62 ksi / 430 MPa	4
S30815	Hot / Cold	All	87 ksi / 600 MPa	45 ksi / 310 MPa	4

Austenitic — High-Strength Conditions (Size-Dependent)

Type	Cond.	Diameter, in. (mm)	Tensile, min	Yield, min	Elong. %
304, 316 (and N-grades)	B	≤ ¾ (19.05)	125 ksi / 860 MPa	100 ksi / 690 MPa	12
304, 316 (and N-grades)	B	> ¾ to 1 (19.05–25.4)	115 ksi / 795 MPa	80 ksi / 550 MPa	15
304, 316 (and N-grades)	B	> 1 to 1¼ (25.4–31.75)	105 ksi / 725 MPa	65 ksi / 450 MPa	20
304, 316 (and N-grades)	B	> 1¼ to 1½ (31.75–38.1)	100 ksi / 690 MPa	50 ksi / 345 MPa	24
304, 316 (and N-grades)	B	> 1½ to 1¾ (38.1–44.45)	95 ksi / 655 MPa	45 ksi / 310 MPa	28
304, 316	S	≤ 2 (50.8)	95 ksi / 650 MPa	75 ksi / 515 MPa	25
304, 316	S	> 2 to 2½ (50.8–63.5)	90 ksi / 620 MPa	65 ksi / 450 MPa	30

304, 316	S	> 2½ to 3 (63.5–76.2)	80 ksi / 550 MPa	55 ksi / 380 MPa	30
XM-21, S30454, S31654	B	≤ 1 (25.4)	145 ksi / 1000 MPa	125 ksi / 860 MPa	15
XM-21, S30454, S31654	B	> 1 to 1¾ (25.4–44.45)	125–135 ksi	100–115 ksi	16–18

Duplex Grades — Condition A

Type	Tensile, min	Yield, min	Elong. %	Brinell, max
S32205 (2205)	95 ksi / 655 MPa	65 ksi / 450 MPa	25	290
S31803	90 ksi / 620 MPa	65 ksi / 448 MPa	25	290
S32101 (Lean)	94 ksi / 650 MPa	65 ksi / 450 MPa	30	290
S32304 (2304)	87 ksi / 600 MPa	58 ksi / 400 MPa	25	290
S32550	109 ksi / 750 MPa	80 ksi / 550 MPa	25	290
S32760 (Super)	109 ksi / 750 MPa	80 ksi / 550 MPa	25	290
S32760 — Cond. S	125 ksi / 860 MPa	105 ksi / 720 MPa	16	335

Ferritic Grades — Condition A

Type	Finish	Tensile, min	Yield, min	Elong. %	Brinell, max
430	Hot / Cold	60 ksi / 415 MPa	30 ksi / 207 MPa	20 (hot) / 16 (cold)	—
429	Hot / Cold	70 ksi / 480 MPa	40 ksi / 275 MPa	20 (hot) / 16 (cold)	—
444	Hot / Cold	60 ksi / 415 MPa	45 ksi / 310 MPa	20 (hot) / 16 (cold)	217
446, XM-27	Hot / Cold	65 ksi / 450 MPa	40 ksi / 275 MPa	20 (hot) / 16 (cold)	219
S44700, S44800	Hot	70 ksi / 480 MPa	55 ksi / 380 MPa	20	—
S44700, S44800	Cold	75 ksi / 520 MPa	60 ksi / 415 MPa	15	—
S40976	Hot / Cold	60 ksi / 415 MPa	20 ksi / 140 MPa	20	244

Martensitic Grades

Type	Cond.	Tensile, min	Yield, min	Elong. %	Brinell
410, 403	A	70 ksi / 480 MPa	40 ksi / 275 MPa	20 (hot) / 16 (cold)	—
410, 403	T	100 ksi / 690 MPa	80 ksi / 550 MPa	15 (hot) / 12 (cold)	—
410, 403	H	120 ksi / 830 MPa	90 ksi / 620 MPa	12	—
414	T	115 ksi / 790 MPa	90 ksi / 620 MPa	15	—
S41500 (F6NM)	T	115 ksi / 795 MPa	90 ksi / 620 MPa	15	295

S41425	T	120 ksi / 825 MPa	95 ksi / 655 MPa	15	321
XM-30	T	125 ksi / 860 MPa	100 ksi / 690 MPa	13 (hot) / 12 (cold)	302
420, S42010	A	Hardness-only requirements		—	241–255
431	A	Hardness-only requirement		—	285
440A / B / C	A	Hardness-only requirement		—	269 (hot) / 285 (cold)

i Notes: Yield strength is determined by the 0.2% offset method (A370). Extruded shapes of Cr-Ni grades in Condition A: 25 ksi yield / 70 ksi tensile minimum. Shapes $\leq \frac{1}{2}$ in. (12.5 mm) section thickness: 30% elongation acceptable.

6 Response to Heat Treatment (Martensitic)

Capability requirement — martensitic samples ($\leq \frac{3}{8}$ in. section) must reach the minimum hardness below when treated as specified. Temperature tolerance: $\pm 25^\circ\text{F}$ ($\pm 14^\circ\text{C}$).

Type	Austenitizing Temp., min	Quenchant	Hardness, HRC min
440C	1875°F (1020°C)	Air	58
440B	1875°F (1020°C)	Oil	56
440A	1875°F (1020°C)	Air	55
S42010	1850°F (1010°C)	Oil	48
420	1825°F (995°C)	Air	50
431	1875°F (1020°C)	Oil	40
414	1750°F (955°C)	Oil	42
410, 403	1750°F (955°C)	Air	35

★ **Practical meaning:** these are **capability** values — the steel must be able to harden to this level, verified on a small test section. Your actual part hardness after your own heat treatment will depend on section size and tempering.

Testing & Certification

What the standard requires before material ships.

Chemical Analysis

Heat analysis per **ASTM A751** methods and practices. Steel must conform to Table 1 composition limits.

Tensile Testing

Per **ASTM A370** — test methods and definitions for mechanical testing of steel products. Yield by 0.2% offset.

Hardness

Brinell (or equivalent Rockwell). When required, measured **midway between surface and center** of the cross section.

Heat-Treat Capability

Martensitic grades must meet Table 3 hardness after the specified austenitize + quench cycle.

Magnetic Permeability

When specified on the purchase order for **Types 201 and 205** (annealed): max **1.2** by Severn-type indicator.

Certification

On request in the contract/order: producer's certification of manufacture and testing per A276, with a **certified report of test results** at time of shipment.

Ordering Checklist

The purchaser is responsible for specifying all necessary requirements. Use this checklist to build a complete order.

Required Information

- Quantity (weight or number of pieces)
- Name of material: stainless steel
- Form (bars, angles, tees, channels...)
- Condition (A, H, T, S, or B)
- Finish (per A484/A484M, Section 8)
- Surface preparation of shapes
- Dimensions: size, thickness, width, length
- Cross section (round, square, hexagon...)
- Type or UNS designation
- ASTM designation and date of issue
- Rolled as bars, or cut from strip / plate
- Magnetic permeability test (Types 201/205 only)
- Any special requirements

Good to Specify

- End use (helps the producer flag issues)
- Product analysis verification, if required
- Certified test report with shipment
- For 304/316 vs 304L/316L: state if L-substitution is **not acceptable**
- Permeability limit when ordering 201/205
- Hardness reporting, where Brinell max applies
- Bar-to-bar straightness / surface requirements via A484/A484M

TYPICAL ORDER DESCRIPTION (from the standard):

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.

Key Takeaways

01

One standard, four families

A276 is the single-source spec for stainless bar — austenitic, duplex, ferritic, and martensitic — but it excludes reforcing bars (A314) and free-machining bars (A582).

02

Condition letter drives properties

A (annealed) is the default; B and S raise strength substantially but minimums fall with size; H and T apply only to hardenable martensitic grades.

03

Don't silently swap L-grades

304L/316L have lower minimum strength than 304/316. If your design depends on full-strength properties, say so on the order.

04

Duplex delivers 2× yield

2205 bar gives ≥65 ksi yield vs ~30 ksi for annealed 304/316 — plus chloride SCC resistance. Consider it before up-sizing austenitic bar.

05

440C tops the hardness chart

Up to HRC 58 capability for wear parts and cutlery; 410/420 cover the mid-range of hardenable applications.

06

Complete orders avoid surprises

Form, condition, finish, cross-section, dimensions, and grade must all be stated — the standard puts that responsibility on the purchaser.

Disclaimer: This guide is a customer-oriented summary of ASTM A276 – 06 (Standard Specification for Stainless Steel Bars and Shapes) prepared for convenience of reference only. It does not replace the full standard. For purchasing, inspection, and compliance decisions, always refer to the current official edition of ASTM A276 and ASTM A484/A484M. ASTM designations are trademarks of ASTM International.