

ASTM A480 / A480M — General Requirements for Flat-Rolled Stainless Steel

The companion specification to A240 and others — covering tolerances, finish, testing, marking, and packaging for plate, sheet, and strip

Plate · Sheet · Strip

Dimensional Tolerances

Inch-Pound & SI Units

ASME SA-480 Equivalent

1 Scope & Application

A480/A480M is a "general requirements" specification. It does not define any grade or chemistry by itself — it provides tolerances, finish, testing, marking, and packaging rules that apply automatically unless the purchase order says otherwise.

WHAT IT COVERS

General Requirements

Dimensional tolerances, surface finishes, heat-treatment, testing, repair, marking, and packaging for flat-rolled stainless steel.

LINKED SPECS

Product Specifications

Applies to A167, A176, A240/A240M, A263, A264, A265, A666, A693, A793, and A895 unless overridden by the order.

PRIORITY RULE

Order of Precedence

Purchase order → Product specification (e.g., A240) → A480/A480M. The order cannot waive mandatory test requirements.

DUAL UNITS

A480 vs A480M

A480 = inch-pound (Annex A2 tolerances).
A480M = SI (Annex A3 tolerances). Unless "M" is specified, inch-pound units apply.

ASME

Pressure Vessel Use

For ASME Boiler & Pressure Vessel Code, see SA-480 in Section II.

GAGE NUMBERS

Discouraged

Thickness should be ordered to decimal or fractional size. Gage numbers are archaic and not a basis for rejection.

2

Product Forms & Production Methods

A480 organizes tolerances by production method (hot-rolled or cold-rolled, coiled or not) and by width (narrow < 24 in. / 600 mm vs. wide $\geq$ 24 in. / 600 mm). Knowing your product category is essential to finding the right tolerance table.

PLATE

Thickness $\geq$ 3/16 in. (4.76 mm)

Flat-rolled, typically hot-rolled. Supplied as mill plate (quarto) or coil-processed plate. Tolerance tables: A2.17–A2.20 / A3.17–A3.20.

SHEET

Thickness < 3/16 in., Width $\geq$ 24 in.

Available hot-rolled or cold-rolled, in coil or cut lengths. Surface finishes from No. 1 (HR pickled) to 2B/BA.

STRIP

Thickness < 3/16 in., Width < 24 in.

Cold-rolled, in coil or cut lengths. Edge types: No. 1 (rolled), No. 3 (slit), No. 5 (square, rolled/filed after slitting).

PRODUCTION CATEGORIES

4 Method Groups

- 1) Cold-rolled narrow coil-processed
 - 2) Cold-rolled wide coil-processed
 - 3) Hot-rolled narrow coil-processed
 - 4) Hot-rolled wide coil-processed
- Plus: product processed without coiling (plate mill).

Key distinction: "Quarto plate" (mill plate, processed without coiling) uses the heaviest tolerance tables. Coil-processed plate/sheet/strip uses tighter tolerances. Always confirm the production method when requesting a quote.

3 Ordering Information

To avoid ambiguity and delays, ASTM recommends the following items be included in every purchase order for flat-rolled stainless steel.

Required Information

- Quantity (weight or number of pieces)
- Form: plate, sheet, or strip
- Specification designation and date of issue
- Type or UNS designation
- Thickness (decimal or fractional, not gage no.)
- Width and length (in same units as thickness)
- Edge type (strip only: No. 1, No. 3, or No. 5)
- Finish designation (No. 1, 2B, BA, No. 4, etc.)

Optional / Special Requirements

- Heat or product analysis report
- Intergranular corrosion test (A262 / A763)
- Detrimental intermetallic phases test (A923, duplex)
- Charpy impact testing
- Permeability test (A342)
- Stretcher-leveled flatness standard
- Resquared (squared edges) product
- Restrictions on yield-strength determination method

Example order line: "10,000 kg ASTM A240M Type 316L (UNS S31603) stainless steel plate, 6.0 mm × 1500 mm × 6000 mm, No. 1 finish, annealed and pickled, with mill test certificate per EN 10204 3.1, conforming to A480M tolerances."

4 Edges for Cold-Rolled Strip

Three edge types are available on cold-rolled strip. The choice affects width tolerances and downstream processing.

NO. 1

Rolled Edge

A rolled edge, either round or square as specified. Produced by the rolling mill — smoothest and most uniform edge.

NO. 3

Slit Edge

Produced by slitting a wider coil. Most economical, but the edge may have slight burr. Width tolerances per Tables A2.2 / A3.2.

NO. 5

Square Edge

Approximately square edge produced by rolling or filing after slitting. For applications requiring a clean, square edge for welding or fitting.

5 Heat Treatment Requirements

Heat treatment cycles must be performed separately from other thermal processing. Below is a summary of solution-annealing temperatures from Table A1.2. Cooling codes: B = water quench or rapid cool to prevent carbide reprecipitation; C = water quench or rapid cool; D = water quench (coil in continuous line: water quench or rapid cool).

Alloy Family	Representative Grades	Min. Temperature	Cooling Code
Austenitic (standard)	304, 316, 321, 347, 317L, 309S, 310S	1900 °F [1040 °C]	B (water/rapid)
Austenitic H grades	304H, 316H, 321H, 347H, 348H	1900 °F [1040 °C]	C
Austenitic H (cold-worked)	304H, 309H, 310H, 316H	2000 °F [1095 °C]	C
Austenitic H (hot-finished)	Same H grades	1925 °F [1050 °C]	C
Super-austenitic (6% Mo)	S31254, S31266, S32050, S32654	2100 °F [1150 °C]	C
904L	N08904	2000 °F [1095 °C]	C
Duplex (standard)	S32205 (2205)	1900 °F [1040 °C]	D (water quench)
Duplex (lean)	S32304 (2304)	1800 °F [980 °C]	C
Duplex (super)	S32750 (2507)	1880–2060 °F [1025–1125 °C]	C
Ferritic / Martensitic	410, 410S, 430, 439, 444, XM-27	Per applicable spec	—
S41500	F6NM	1750 °F [955 °C] min, air cool; temper 1050–1150 °F	—

Caution for stabilized grades: Solution-annealing above 1950 °F [1066 °C] can impair intergranular corrosion resistance in Types 321, 321H, 347, 347H, 316Ti, 309Cb, 310Cb, etc. If IGC is a concern, specify the corrosion test of §18.2 on sensitized specimens. The manufacturer may use a lower-temperature solution anneal or a stabilization anneal (below 1800 °F / 982 °C) — but effectiveness varies by media.

6 Testing & Inspection

The number and type of tests depend on whether the material is supplied in coil form or as cut lengths. Below is a summary.

Coil-Form Material

- ≥ 2 hardness tests (one from each coil end)
- 1 bend test (when required)
- 1 permeability test (when required)
- ≥ 1 tension test per coil
- If hardness difference between ends exceeds 5 HRB, or material is temper-rolled: tensile on both ends

Cut-Length Material

- 1 tension test per 100 pieces (or fewer) of same heat & nominal thickness
- 2 tension tests if temper-rolled (1 if single-piece lot)
- 1 bend test (when required)
- ≥ 1 hardness test
- 1 intergranular corrosion test per heat & thickness (when specified)

Test Methods Reference

Test	ASTM Method	Notes
Tension	A370	Strain rate 1/8 to 1/2 in./in./min between yield and fracture
Brinell hardness	A370	May be done on grip ends of tension specimens
Rockwell hardness	A370	If too thin for Rockwell superficial, hardness is waived
Hardness conversion	E140	For converting between scales
Bend test	A370	Transverse, full thickness up to 1/2 in. [12.7 mm]
Intergranular corrosion	A262 (Practice E)	Not required unless specified on order; austenitic 300 series expected to pass
Ferritic IGC	A763 (Practice X, Y, or Z)	For S44400, S44635, XM-27, XM-33, etc.
Duplex intermetallic phases	A923 (Methods A, B, C)	Not required unless specified; all duplex expected to pass
Permeability	A342/A342M	When required
Charpy impact	A370	When required

Bend radius rules: Material up to 3/8 in. [9.5 mm] bends over 1× thickness (1T). Material over 3/8 in. to 1 in. bends over 2× thickness (2T). For plates over 1 in. [25.4 mm], bend tests must be agreed between seller and purchaser.

Thickness Tolerances

Thickness tolerances are the most frequently referenced tables. Below are representative values for the most common product categories. Full tables in Annex A2 (inch-pound) / A3 (SI).

7a. Cold-Rolled, Narrow Coil (Strip) — Inch-Pound [Table A2.1]

Specified Thickness, in.	$w \leq 6$ in.	$6 < w \leq 12$ in.	$12 < w \leq 24$ in.
0.010–0.012	± 0.001	± 0.001	± 0.001
0.015–0.020	± 0.001	± 0.0015	± 0.0015
0.029–0.035	± 0.0015	± 0.002	± 0.002
0.035–0.050	± 0.0025	± 0.003	± 0.003
0.050–0.069	± 0.003	± 0.003	± 0.003
0.069–0.100	± 0.003	± 0.003	± 0.004
0.100–0.125	± 0.004	± 0.004	± 0.005

Measurement point: Thickness measured at least 3/8 in. [9.5 mm] from the edge (1/8 in. [3.2 mm] for widths under 1 in. [25.4 mm]). Tolerances include crown.

7b. Cold-Rolled, Wide Coil (Sheet) — SI [Table A3.5]

Specified Thickness, mm	$w \leq 1000$	$1000 < w \leq 1300$	$1300 < w \leq 2100$
0.50	± 0.045	± 0.05	—
1.00	± 0.055	± 0.06	± 0.07
1.50	± 0.08	± 0.08	± 0.10
2.00	± 0.10	± 0.10	± 0.11
3.00	± 0.13	± 0.13	± 0.15
5.00	± 0.17	± 0.17	± 0.19
8.00	± 0.17	± 0.22	± 0.25

7c. Hot-Rolled Mill Plate (Quarto Plate) — SI [Table A3.17]

Thickness, mm	$w \leq 2100$	$2100 < w \leq 3000$	$3000 < w \leq 3600$	$w > 3600$
5	+1.35 / -0	+1.75 / -0	—	—
8	+1.15 / -0	+1.30 / -0	+2.15 / -0	—
10	+1.15 / -0	+1.30 / -0	+2.15 / -0	—
20	+1.40 / -0	+1.55 / -0	+2.15 / -0	+2.30 / -0
50	+1.80 / -0	+1.90 / -0	+2.40 / -0	+2.95 / -0
100	+3.75 / -0	+4.00 / -0	+5.00 / -0	+5.70 / -0
200	+6.00 / -0	+6.50 / -0	+9.00 / -0	+11.0 / -0

Under-tolerance: For quarto plate up to 250 mm thick, the under-tolerance is 0.30 mm. Thickness is measured along the longitudinal edges, 10–75 mm from the edge. For high-strength plate (min. yield $\geq$ 35 ksi / 240 MPa), flatness tolerances are increased by 1.5 $\times$.

8 Width & Length Tolerances

8a. Width — Hot-Rolled Wide Coil (trimmed edges) [Table A3.14]

Thickness, mm	$w < 1200$	$w \geq 1200$
< 5.00	+2 / -0	+6 / -0
5.00–10.00	+4 / -0	+9 / -0
> 10.00	+6 / -0	+12 / -0

8b. Width — Quarto Plate (sheared) [Table A3.18]

Specified Width	Tolerance (over)
$w < 2000$ mm	+15 / -0 mm
$2000 \leq w < 3000$	+20 / -0 mm
$w \geq 3000$ mm	+25 / -0 mm

Under-tolerance for sheared quarto plate width: 6.35 mm [0.25 in.].

8c. Length — Hot-Rolled Wide Coil, cut lengths [Table A3.15]

Specified Length	Tolerance (over/under)
L < 3000 mm	+12 / -0
3000 ≤ L ≤ 6000 mm	+0.0053L / -0

8d. Length — Quarto Plate (sheared) [Table A3.19]

Nominal Length	Over / Under
L < 4000	+20 / -0
4000–6000	+30 / -0
6000–8000	+40 / -0
8000–10000	+50 / -0
10000–15000	+75 / -0
15000–20000	+100 / -0

Under-tolerance for sheared quarto plate length: 6.35 mm [0.25 in.].

8e. Resquared (Stretcher-Leveled) Product [Table A3.22]

Thickness	Dimension	Over	Under
Under 3.30 mm	Width ≤ 1200 / Length ≤ 3000	2 mm	0
Under 3.30 mm	Width ≥ 1200 / Length ≥ 3000	3 mm	0
3.30 mm and over	All widths and lengths	7 mm	0

Customer tip: If you need tighter width/length tolerances, specify "resquared" or "stretcher-leveled" on the order. Polished sheets with finishes No. 4 and higher are produced to resquared tolerances.

Flatness Tolerances

Flatness tolerance = maximum deviation from a horizontal flat surface. Two standards exist: regular (as-rolled) and stretcher-leveled (tighter).

9a. Hot-Rolled Wide Coil — Regular Standard [Table A3.16]

Thickness	Width	Flatness Tolerance
$t < 5 \text{ mm}$	$w < 900$	13 mm
$t < 5 \text{ mm}$	900–1500	19 mm
$t < 5 \text{ mm}$	$w \geq 1500$	26 mm
$t \geq 5 \text{ mm}$	$w < 1500$	23 mm
$t \geq 5 \text{ mm}$	1500–1800	30 mm
$t \geq 5 \text{ mm}$	$w \geq 1800$	38 mm

9b. Stretcher-Leveled Standard [Table A3.16, lower]

Thickness	Width	Length	Flatness Tol.
$t \leq 13 \text{ mm}$	$w < 1200$	$L < 2400$	4 mm
$t \leq 13 \text{ mm}$	$w < 1200$	$L \geq 2400$	7 mm
$t \leq 13 \text{ mm}$	$w \geq 1200$	$L \geq 2400$	7 mm

9c. Quarto Plate Flatness [Table A3.20]

Thickness, mm	Flatness Tolerance
5	10 mm
10	9.5 mm
15–25	7.9 mm
50–150	6.4 mm
≥ 150	6.4 mm

Measurement method: Tolerances apply to any 914 mm [36 in.] length in the plane of the plate, measured while resting on a flat surface with concavity upward. If the longer dimension is under 914 mm, tolerance is not greater than 6.4 mm [1/4 in.]. For plates with min. yield $\geq$ 35 ksi [240 MPa], permitted variations are increased by 1.5 $\times$.

10 Camber, Circle & Weight Tolerances

10a. Camber — Cold-Rolled Narrow Strip [Table A3.28]

Specified Width	Tolerance per 2400 mm
Up to 40 mm	13 mm
Over 40 to 600 mm	7 mm

10b. Camber — Wide Coil / Quarto Plate

Specified Width	Tolerance per 2400 mm
600–900 mm	4 mm
900 mm and over	3 mm

Quarto plate camber: 3.18 mm in any 1524 mm [1/8 in. in any 5 ft].

10c. Sheared Circle Diameter Tolerances [Table A3.24]

Thickness	$\varnothing < 600$ mm	$\varnothing 600\text{--}1200$	$\varnothing > 1200$
Under 1.50 mm	+2	+3	+5
1.50–2.50	+3	+4	+6
2.50 and thicker	+4	+5	+7

No tolerance under specified diameter for circles.

10d. Weight Tolerances [Table A3.27]

Item	Permitted Over-weight
≤ 5 sheets, estimated ≤ 100 kg	10% over theoretical
> 5 sheets, estimated > 100 kg	7.5% over theoretical

10e. Theoretical Weight Density Factors

Alloy Type	Density (SI)
Cr-Mn-Ni (200 series)	7.82 kg/m ² per mm thick
Cr-Ni (300 series)	8.07 kg/m ² per mm thick
Cr (400 series, ferritic/martensitic)	7.92 kg/m ² per mm thick

11 Marking, Packaging & Loading

Proper marking ensures traceability from the mill to the final fabrication.

MARKING CONTENT

What Goes on Each Piece

Specification designation, type/UNS, material ID number, and manufacturer name/mark.

MARKING LOCATION

Where & How Many

Flat sheet/strip/plate: two places near ends, or continuously along one edge. Pieces under 24 in. [610 mm] in both dimensions: one mark.

MARKING METHODS

Permitted Methods

(a) Marking fluid, (b) low-stress die stamp, (c) vibratory tool (min. tip radius 0.005 in.), (d) electrochemical etching.

THIN MATERIAL

No Die Stamps

Material under 1/4 in. [6.4 mm] thick shall not be marked with die stamps — use marking fluid or etching instead.

COIL MARKING

Coil Form

Marked near the outside end; inside of coil also marked or tagged with full identification.

PACKAGING

A700 / MIL-STD

Commercial: Practices A700. Government: MIL-STD-163 for preservation/packaging; Fed. Std. 123 / MIL-STD-129 for marking.

Dual-type marking: Material conforming to two types within the ordering specification may be marked as both, provided the manufacturer certifies to each type.

12 Repair of Plate by Welding

PERMITTED

Surface Defect Repair

Welding repair of surface defects is permitted unless prohibited by other specs or the purchase order.

LIMITS

Depth & Area

Defect depth $\leq 1/3$ of nominal thickness. Total repair area $\leq 1\%$ of plate surface, unless purchaser approves.

PROCEDURE

ASME Section IX

Welding procedure and welders must be qualified per ASME BPVC Section IX. Consumables must be compatible with the plate.

FINISH

Ground Smooth

After repair, the welded area is ground smooth and blended uniformly to the surrounding surface.

13 Key Takeaways

#1

A480 = Tolerances, A240 = Material

A240 defines chemistry & mechanicals; A480 defines tolerances, finish, testing, marking & packaging. Always reference both.

#2

Know Your Product Category

Hot-rolled vs. cold-rolled, coil vs. quarto, narrow vs. wide — these determine which tolerance table applies. Confirm before quoting.

#3

Stretcher-Leveled = Tighter Flatness

If flatness is critical, specify "stretcher-leveled" on the order. Regular (as-rolled) tolerances are 2–5× looser.

#4

Order Decimal, Not Gage

Gage numbers are archaic and not a basis for rejection. Order thickness in decimal or fractional units, in one consistent system.

#5

IGC & Duplex Tests Are Optional

Intergranular corrosion (A262) and duplex intermetallic phase (A923) tests are not run unless specified on the order.

#6

Mind the Stabilized Grades

Solution-annealing above 1950 °F [1066 °C] can impair IGC resistance in Ti/Nb-stabilized grades. Specify the corrosion test if concerned.

#7

A480M for SI Orders

If ordering in millimeters, specify "A480M" to invoke Annex A3 (SI tolerances). Otherwise, Annex A2 (inch-pound) applies.

#8

Weight & Density

Theoretical weight is calculated by density:
300 series = 8.07, 400 series = 7.92, 200 series = 7.82 kg/m² per mm thick.

Disclaimer: This guide is a simplified summary for customer convenience. For procurement, inspection, and code compliance, always refer to the latest official ASTM A480 / A480M standard and any applicable project or regulatory specifications.

ASTM A480 / A480M Customer Guide · Simplified summary based on ASTM A480/A480M-08b

For official requirements, consult the current ASTM standard and your project specifications.