



Designation: A693 – 22

Standard Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip¹

This standard is issued under the fixed designation A693; 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 specification² covers precipitation-hardening stainless steel plate, sheet, and strip. The mechanical properties of these steels are developed by suitable low-temperature heat treatments generally referred to as precipitation hardening.

1.2 These steels are used for parts requiring corrosion resistance and high strength at room temperature or at temperatures up to 600 °F (315 °C). Some of these steels are particularly suitable for moderate to severe drawing and forming in the solution-treated condition. Others are capable of mild forming only. They are suitable for machining in the solution-annealed condition, after which they may be hardened to the mechanical properties specified in this standard without danger of cracking or distortion.

1.3 The values stated in inch-pound units are to be regarded as the standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*³

A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

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 ASME Boiler and Pressure Vessel Code applications see related Specification SA-693 in Section II of that Code.

³ 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.

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 *SAE Standard:*

SAE J 1086 Recommended Practice for Numbering Metals and Alloys (UNS)⁴

3. General Requirements

3.1 The following requirements for orders for material furnished under this specification shall conform to the applicable requirements of the current edition of Specification **A480/A480M** or as specified in the following:

3.1.1 *Ordering Information:*

3.1.1.1 In addition to the requirements of Specification **A480/A480M**, the heat treatment (see Section 6) shall be specified on the purchase order if other than the solution-annealed condition is being ordered.

4. Materials and Manufacture

4.1 The steel shall be melted by one of the following processes:

4.1.1 Electric furnace (with separate degassing and refining optional),

4.1.2 Vacuum furnace, and

4.1.3 One of the former followed by:

4.1.3.1 Consumable remelting in vacuum, inert gas, or electroslag, or

4.1.3.2 Electron beam refining.

4.1.4 Other commercial melting methods as agreed upon between purchaser and seller are acceptable.

5. Chemical Composition

5.1 The steel shall conform to the requirements as to chemical composition specified in **Table 1**, and shall conform to applicable requirements specified in the current edition of Specification **A480/A480M**.

⁴ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

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

TABLE 1 Chemical Requirements^A

UNS Designation ^B	Type	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Composition, %					Titanium	Copper	Other Elements ^C
							Chromium	Nickel	Aluminum	Molybdenum				
S17400	630	0.07	1.00	0.040	0.030	1.00	15.0–17.5	3.0–5.0	...	...	...	3.0–5.0	D	
S17700	631	0.09	1.00	0.040	0.030	1.00	16.0–18.0	6.5–7.7	0.75–1.50	...	...	...	...	
S15700	632	0.09	1.00	0.040	0.030	1.00	14.0–16.0	6.5–7.7	0.75–1.50	2.00–3.00	...	...	...	
S35000	633	0.07–0.11	0.50–1.25	0.040	0.030	0.50	16.0–17.0	4.0–5.0	...	2.5–3.2	...	...	E	
S35500	634	0.10–0.15	0.50–1.25	0.040	0.030	0.50	15.0–16.0	4.0–5.0	...	2.5–3.2	...	...	E	
S17600	635	0.08	1.00	0.040	0.030	1.00	16.0–17.5	6.0–7.5	0.40	...	0.40–1.20	...	...	
S36200	XM-9	0.05	0.50	0.030	0.030	0.30	14.0–14.5	6.5–7.0	0.10	0.30	0.60–0.90	...	...	
S15500	XM-12	0.07	1.00	0.040	0.030	1.00	14.0–15.5	3.5–5.5	0.90–1.35	...	...	2.5–4.5	D	
S13800	XM-13	0.05	0.20	0.010	0.008	0.10	12.3–13.2	7.5–8.5	...	2.00–2.50	...	...	G	
S45500	XM-16	0.05	0.50	0.040	0.030	0.50	11.0–12.5	7.5–9.5	...	0.50	0.80–1.40	1.50–2.50	F	
S45000	XM-25	0.05	1.00	0.030	0.030	1.00	14.0–16.0	5.0–7.0	...	0.50–1.00	...	1.25–1.75	H	
S46500	...	0.02	0.25	0.015	0.010	0.25	11.0–12.5	10.8–11.2	...	0.75–1.25	1.50–1.80	...	G	
S46910	...	0.030	1.00	0.030	0.015	0.70	11.0–13.0	8.0–10.0	0.15–0.50	3.0–5.0	0.50–1.20	1.5–3.5	...	

^A Limits are in percent maximum unless shown as a range or stated otherwise.^B Designation established in accordance with Practice E527 and SAE J 1086.^C The terms Columbium (Cb) and Niobium (Nb) both refer to the same element.^D Niobium 0.15–0.45.^E Nitrogen 0.07–0.13.^F Niobium 0.10–0.50.^G Nitrogen 0.01.^H Niobium 8 times carbon minimum.