Designation: A 176 – 99

Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation A 176; 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 Department of Defense.

1. Scope

1.1 This specification covers stainless and heat-resisting chromium steel plate, sheet, and strip available in a wide variety of surface finishes.

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

NOTE 1—Grades that were previously covered in both Specifications A 176 and A 240/A 240M have been removed from this specification and may now be supplied and purchased in compliance with Specification A 240/A 240M. The chemical and mechanical property requirements of these grades were identical in Specifications A 176 and A 240/A 240M at the time of removal from Specification A 176.

2. Referenced Documents

2.1 *ASTM Standards:*

A 240/A240M Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels[2]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[2]

A 480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip[2]

E 527 Practice for Numbering Metals and Alloys (UNS)[3]

2.2 *SAE Standard:*

J1086 Practice for Unified Numbering for Metals and Alloys (UNS)[4]

3. Chemical Composition

3.1 The steel shall conform to the requirements as to chemical composition specified in Table 1, and shall conform to applicable requirements specified in Specification A 480/A 480M.

4. Mechanical Properties

4.1 The material shall conform to the mechanical properties specified in Table 2.

5. General Requirements

5.1 The following requirements for orders for material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A 480/A480M.

5.1.1 Definitions,
5.1.2 General requirements for delivery,
5.1.3 Ordering information,
5.1.4 Process,
5.1.5 Special tests,
5.1.6 Heat treatment,
5.1.7 Dimensions and permissible variations,
5.1.8 Workmanship, finish and appearance,
5.1.9 Number of tests/test methods,
5.1.10 Specimen preparation,
5.1.11 Retreatment,
5.1.12 Inspection,
5.1.13 Rejection and rehearing,
5.1.14 Material test report, and
5.1.15 Certification.

[1] This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloysand is the direct responsibility of Subcommittee A01.17 on Flat Stainless Steel Products.

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[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 01.01.

[4] Available from the Society for Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

TABLE 1 Chemical Requirements[A]

UNS Designation[B]	Type	Composition, %								
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Nitrogen	Other Elements[C]
S40300	403	0.15	1.00	0.040	0.030	0.50	11.5–13.0	0.60	. . .	. . .
S42000	420	0.15 min	1.00	0.040	0.030	1.00	12.0–14.0	0.75	. . .	Mo 0.50 max
S42200	422	0.20–0.25	0.50–1.00	0.025	0.025	0.50	11.0–12.5	0.50–1.00	. . .	Mo 0.90-1.25 V 0.20-0.30 W 0.90-1.25
S43100	431	0.20	1.00	0.040	0.030	1.00	15.0–17.0	1.25–2.50	. . .	. . .
S44200	442	0.20	1.00	0.040	0.040	1.00	18.0–23.0	0.60	. . .	. . .
S44600	446	0.20	1.50	0.040	0.030	1.00	23.0–27.0	0.75	0.25	. . .

[A] Maximum unless range or minimum is indicated.
[B] New designation established in accordance with Practice E 527 and SAE J1086.
[C] The terms Columbium (Cb) and Niobium (Nb) both relate to the same element.

TABLE 2 Mechanical Test Requirements

UNS Designation	Type	Tensile Strength, min		Yield Strength, min[A]		Elongation in 2 in. or 50 mm, min, %	Hardness, max[B]		Cold Bend, deg[C]
		ksi	MPa	ksi	MPa		Brinell	Rockwell B	
S40300	403	70	485	30	205	25.0[D]	217	96	180
S42000	420	100[E]	690	. . .	. . .	15.0	217	96	. . .
S42200	422	. . .	. . .	. . .	. . .	. . .	248	24[F]	not required
S43100	431	. . .	. . .	. . .	. . .	. . .	285	29[F]	not required
S44200	442	65	515	40	275	20.0	217	96	180
S44600	446	65	515	40	275	20.0	217	96	135

[A] Yield strength shall be determined by the offset method at 0.2 % in accordance with Test Methods and Definitions A 370. Unless otherwise specified (see 5.1.10), an alternative method of determining yield strength may be based on a total extension under load of 0.5 %.
[B] Either Brinell or Rockwell B hardness is permissible.
[C] Bend test not required for steels thicker than 1 in. (25.4 mm) unless specified by the purchaser.
[D] Material 0.050 in. (1.27 mm) and under in thickness shall have a minimum elongation of 20.0 %.
[E] Maximum. Type 420 is usually used in the heat treated condition (quenched and tempered to a specified range of hardness or tensile strength).
[F] Rockwell C scale.