Designation: A 240/A 240M – 04a$^{\epsilon 1}$

Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications[1]

This standard is issued under the fixed designation A 240/A 240M; 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.

ε[1] NOTE—Tables 1 and 2 were editorially corrected in March 2004.

1. Scope*

1.1 This specification[2] covers chromium, chromium-nickel, and chromium-manganese-nickel stainless steel plate, sheet, and strip for pressure vessels and for general applications.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 This specification is expressed in both inch-pound and SI units. However, unless the order specifies the applicable "M" specification designation (SI units), the material shall be furnished in inch-pound units.

2. Referenced Documents

2.1 *ASTM Standards:* [3]

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

A 480/A 480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A 923 Test Methods for Detecting Detrimental Intermetallic Phase in Wrought Duplex Austenitic/Ferritic Stainless Steels

E 112 Test Methods for Determining Average Grain Size

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *SAE Standard:*

J 1086 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 A 480/A 480M.

3.1.1 Definitions;
3.1.2 General requirements for delivery;
3.1.3 Ordering information;
3.1.4 Process;
3.1.5 Special tests;
3.1.6 Heat treatment;
3.1.7 Dimensions and permissible variations;
3.1.8 Workmanship, finish and appearance;
3.1.9 Number of tests/test methods;
3.1.10 Specimen preparation;
3.1.11 Retreatment;
3.1.12 Inspection;
3.1.13 Rejection and rehearing;
3.1.14 Material test report;
3.1.15 Certification; and
3.1.16 Packaging, marking, and loading.

4. Chemical Composition

4.1 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.

5. Mechanical Properties

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

5.2 When specified by the purchaser, Charpy impact tests shall be performed in accordance with Supplementary Requirement S1.

[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.

Current edition approved March 1, 2004. Published March 2004. Originally approved in 1940. Last previous edition approved in 2004 as A 240/A 240M – 04.

[2] For ASME Boiler and Pressure Vessel Code applications see related Specification SA-240 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.

[4] Available from Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096.

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

6. Materials for High-Temperature Service

6.1 The austenitic *H* Types shall conform to an average grain size of ASTM No. 7 or coarser as measured by Test Methods E 112.

6.2 Supplementary Requirement S2 shall be invoked when non-H grade austenitic stainless steels are ordered for ASME Code applications for service above 1000°F [540°C].

6.3 Grade S31060, unless otherwise specified in the purchase order, shall conform to an average grain size of ASTM No. 7 or coarser, as measured by Test Methods E 112.

TABLE 1 Chemical Composition Requirements, %[A]

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phos-phorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E,F]
					Austenitic (Chromium-Nickel) (Chromium-Manganese-Nickel)							
N08020	. . .	0.07	2.00	0.045	0.035	1.00	19.0–21.0	32.0–38.0	2.00–3.00	. . .	3.0–4.0	Cb 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	0.75	. . .
N08800	800[G]	0.10	1.50	0.045	0.015	1.00	19.0–23.0	30.0–35.0	. . .	. . .	0.75	Fe[H] 39.5 min Al 0.15–0.60 Ti 0.15–0.60
N08810	800H[G]	0.05–0.10	1.50	0.045	0.015	1.00	19.0–23.0	30.0–35.0	. . .	. . .	0.75	Fe[H] 39.5 min Al 0.15–0.60 Ti 0.15–0.60
N08811	. . .	0.06–0.10	1.50	0.040	0.015	1.00	19.0–23.0	30.0–35.0	. . .	. . .	0.75	Fe[H] 39.5 min Ti[I] 0.15–0.60 Al[I] 0.15–0.60
N08904	904L[G]	0.020	2.00	0.045	0.035	1.00	19.0–23.0	23.0–28.0	4.0–5.0	0.10	1.0–2.0	. . .
N08926	. . .	0.020	2.00	0.030	0.010	0.50	19.0–21.0	24.0–26.0	6.0–7.0	0.15–0.25	0.5–1.5	. . .
S20100	201	0.15	5.5–7.5	0.060	0.030	1.00	16.0–18.0	3.5–5.5	. . .	0.25	. . .	. . .
S20103	. . .	0.03	5.5–7.5	0.045	0.030	0.75	16.0–18.0	3.5–5.5	. . .	0.25	. . .	. . .
S20153	. . .	0.03	6.4–7.5	0.045	0.015	0.75	16.0–17.5	4.0–5.0	. . .	0.10–0.25	1.00	. . .
S20161	. . .	0.15	4.0–6.0	0.040	0.040	3.0–4.0	15.0–18.0	4.0–6.0	. . .	0.08–0.20	. . .	. . .
S20200	202	0.15	7.5–10.0	0.060	0.030	1.00	17.0–19.0	4.0–6.0	. . .	0.25	. . .	. . .
S20400	. . .	0.030	7.0–9.0	0.040	0.030	1.00	15.0–17.0	1.50–3.00	. . .	0.15–0.30	. . .	. . .
S20910	XM-19[J]	0.06	4.0–6.0	0.040	0.030	0.75	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
S21400	XM-31[J]	0.12	14.0–16.0	0.045	0.030	0.30–1.00	17.0–18.5	1.00	. . .	0.35 min	. . .	. . .
S21600	XM-17[J]	0.08	7.5–9.0	0.045	0.030	0.75	17.5–22.0	5.0–7.0	2.00–3.00	0.25–0.50	. . .	. . .
S21603	XM-18[J]	0.03	7.5–9.0	0.045	0.030	0.75	17.5–22.0	5.0–7.0	2.00–3.00	0.25–0.50	. . .	. . .
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	. . .	. . .
S24000	XM-29[J]	0.08	11.5–14.5	0.060	0.030	0.75	17.0–19.0	2.3–3.7	. . .	0.20–0.40	. . .	. . .
S30100	301	0.15	2.00	0.045	0.030	1.00	16.0–18.0	6.0–8.0	. . .	0.10	. . .	. . .
S30103	301L[G]	0.03	2.00	0.045	0.030	1.00	16.0–18.0	6.0–8.0	. . .	0.20	. . .	. . .
S30153	301LN[G]	0.03	2.00	0.045	0.030	1.00	16.0–18.0	6.0–8.0	. . .	0.07–0.20	. . .	. . .
S30200	302	0.15	2.00	0.045	0.030	0.75	17.0–19.0	8.0–10.0	. . .	0.10	. . .	. . .
S30400	304	0.08	2.00	0.045	0.030	0.75	18.0–20.0	8.0–10.5	. . .	0.10	. . .	. . .
S30403	304L	0.030	2.00	0.045	0.030	0.75	18.0–20.0	8.0–12.0	. . .	0.10	. . .	. . .
S30409	304H	0.04–0.10	2.00	0.045	0.030	0.75	18.0–20.0	8.0–10.5	. . .	. . .	. . .	. . .
S30415	. . .	0.04–0.06	0.80	0.045	0.030	1.00–2.00	18.0–19.0	9.0–10.0	. . .	0.12–0.18	. . .	Ce 0.03–0.08
S30451	304N	0.08	2.00	0.045	0.030	0.75	18.0–20.0	8.0–10.5	. . .	0.10–0.16	. . .	. . .
S30452	XM-21[J]	0.08	2.00	0.045	0.030	0.75	18.0–20.0	8.0–10.5	. . .	0.16–0.30	. . .	. . .
S30453	304LN	0.030	2.00	0.045	0.030	0.75	18.0–20.0	8.0–12.0	. . .	0.10–0.16	. . .	. . .
S30500	305	0.12	2.00	0.045	0.030	0.75	17.0–19.0	10.5–13.0	. . .	. . .	. . .	. . .
S30600	. . .	0.018	2.00	0.020	0.020	3.7–4.3	17.0–18.5	14.0–15.5	0.20	. . .	0.50	. . .
S30601	. . .	0.015	0.50–0.80	0.030	0.013	5.0–5.6	17.0–18.0	17.0–18.0	0.20	0.05	0.35	. . .
S30615	. . .	0.16–0.24	2.00	0.030	0.030	3.2–4.0	17.0–19.5	13.5–16.0	. . .	. . .	. . .	Al 0.80–1.50
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
S30908	309S	0.08	2.00	0.045	0.030	0.75	22.0–24.0	12.0–15.0	. . .	. . .	. . .	. . .
S30909	309H[G]	0.04–0.10	2.00	0.045	0.030	0.75	22.0–24.0	12.0–15.0	. . .	. . .	. . .	. . .
S30940	309Cb[G]	0.08	2.00	0.045	0.030	0.75	22.0–24.0	12.0–16.0	. . .	. . .	. . .	Cb 10×C min, 1.10 max
S30941	309HCb[G]	0.04–0.10	2.00	0.045	0.030	0.75	22.0–24.0	12.0–16.0	. . .	. . .	. . .	Cb 10×C min, 1.10 max
S31008	310S	0.08	2.00	0.045	0.030	1.50	24.0–26.0	19.0–22.0	. . .	. . .	. . .	. . .
S31009	310H[G]	0.04–0.10	2.00	0.045	0.030	0.75	24.0–26.0	19.0–22.0	. . .	. . .	. . .	. . .
S31040	310Cb[G]	0.08	2.00	0.045	0.030	1.50	24.0–26.0	19.0–22.0	. . .	. . .	. . .	Cb 10×C min, 1.10 max

TABLE 1 *Continued*

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phos-phorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E,F]
S31041	310HCb[G]	0.04–0.10	2.00	0.045	0.030	0.75	24.0–26.0	19.0–22.0	. . .	. . .	. . .	Cb 10×C min, 1.10 max
S31050	310 MoLN[G]	0.020	2.00	0.030	0.010	0.50	24.0–26.0	20.5–23.5	1.60–2.60	0.09–0.15	. . .	. . .
S31060	. . .	0.05–0.10	1.00	0.040	0.030	0.50	22.0–24.0	10.0–12.5	. . .	0.18–0.25	. . .	Ce + La 0.025–0.070 B 0.001–0.010
S31254	. . .	0.020	1.00	0.030	0.010	0.80	19.5–20.5	17.5–18.5	6.0–6.5	0.18–0.22	0.50–1.00	. . .
S31266	. . .	0.030	2.0–4.0	0.035	0.020	1.00	23.0–25.0	21.0–24.0	5.2–6.2	0.35–0.60	1.00–2.50	W 1.50–2.50
S31277	. . .	0.020	3.00	0.030	0.010	0.50	20.5–23.0	26.0–28.0	6.5–8.0	0.30–0.40	0.50–1.50	. . .
S31600	316	0.08	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10	. . .	. . .
S31603	316L	0.030	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10	. . .	. . .
S31609	316H	0.04–0.10	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	. . .	. . .	. . .
S31635	316Ti[G]	0.08	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10	. . .	Ti 5 × (C + N) min, 0.70 max
S31640	316Cb[G]	0.08	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10	. . .	Cb 10 × C min, 1.10 max
S31651	316N	0.08	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10–0.16	. . .	. . .
S31653	316LN	0.030	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10–0.16	. . .	. . .
S31700	317	0.08	2.00	0.045	0.030	0.75	18.0–20.0	11.0–15.0	3.0–4.0	0.10	. . .	. . .
S31703	317L	0.030	2.00	0.045	0.030	0.75	18.0–20.0	11.0–15.0	3.0–4.0	0.10	. . .	. . .
S31725	317LM[G]	0.030	2.00	0.045	0.030	0.75	18.0–20.0	13.5–17.5	4.0–5.0	0.20	. . .	. . .
S31726	317LMN[G]	0.030	2.00	0.045	0.030	0.75	17.0–20.0	13.5–17.5	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	2.8–4.0	. . .
S31753	317LN[G]	0.030	2.00	0.045	0.030	0.75	18.0–20.0	11.0–15.0	3.0–4.0	0.10–0.22	. . .	. . .
S32050	. . .	0.030	1.50	0.035	0.020	1.00	22.0–24.0	20.0–23.0	6.0–6.8	0.21–0.32	0.40	. . .
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	0.75	17.0–19.0	9.0–12.0	. . .	0.10	. . .	Ti 5 × (C + N) min, 0.70 max
S32109	321H	0.04–0.10	2.00	0.045	0.030	0.75	17.0–19.0	9.0–12.0	. . .	. . .	. . .	Ti 4 × (C + N) min, 0.70 max
S32615	. . .	0.07	2.00	0.045	0.030	4.8–6.0	16.5–19.5	19.0–22.0	0.30–1.50	. . .	1.50–2.50	. . .
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	0.30–0.60	. . .
S33228	. . .	0.04–0.08	1.00	0.020	0.015	0.30	26.0–28.0	31.0–33.0	. . .	. . .	. . .	Ce 0.05–0.10 Cb 0.6–1.0 Al 0.025
S33400	334[G]	0.08	1.00	0.030	0.015	1.00	18.0–20.0	19.0–21.0	. . .	. . .	. . .	Al 0.15–0.60 Ti 0.15–0.60
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	0.75	17.0–19.0	9.0–13.0	. . .	. . .	. . .	Cb 10 × C min, 1.00 max
S34709	347H	0.04–0.10	2.00	0.045	0.030	0.75	17.0–19.0	9.0–13.0	. . .	. . .	. . .	Cb 8 × C min, 1.00 max
S34800	348	0.08	2.00	0.045	0.030	0.75	17.0–19.0	9.0–13.0	. . .	. . .	. . .	(Cb + Ta) 10×C min, 1.00 max Ta 0.10 Co 0.20
S34809	348H	0.04–0.10	2.00	0.045	0.030	0.75	17.0–19.0	9.0–13.0	. . .	. . .	. . .	(Cb + Ta) 8×C min, 1.00 max Ta 0.10 Co 0.20
S35045	. . .	0.06–0.10	1.50	0.045	0.015	1.00	25.0–29.0	32.0–37.0	. . .	. . .	0.75	Al 0.15–0.60 Ti 0.15–0.60
S35135	. . .	0.08	1.00	0.045	0.015	0.60–1.00	20.0–25.0	30.0–38.0	4.0–4.8	. . .	0.75	Ti 0.40–1.00
S35315	. . .	0.04–0.08	2.00	0.040	0.030	1.20–2.00	24.0–26.0	34.0–36.0	. . .	0.12–0.18	. . .	Ce 0.03–0.10
S38100	XM-15[J]	0.08	2.00	0.030	0.030	1.50–2.50	17.0–19.0	17.5–18.5	. . .	. . .	. . .	. . .
S38815	. . .	0.030	2.00	0.040	0.020	5.5–6.5	13.0–15.0	13.0–17.0	0.75–1.50	. . .	0.75–1.50	Al 0.30

TABLE 1 *Continued*

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phos-phorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E,F]
						Duplex (Austenitic-Ferritic)						
S31200	. . .	0.030	2.00	0.045	0.030	1.00	24.0–26.0	5.5–6.5	1.20–2.00	0.14–0.20	. . .	. . .
S31260	. . .	0.03	1.00	0.030	0.030	0.75	24.0–26.0	5.5–7.5	2.5–3.5	0.10–0.30	0.20–0.80	W 0.10–0.50
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	. . .	. . .
S32001	. . .	0.030	4.0–6.0	0.040	0.030	1.00	19.5–21.5	1.00–3.00	0.60	0.05–0.17	1.00	. . .
S32003	. . .	0.030	2.00	0.030	0.020	1.00	19.5–22.5	3.0–4.0	1.50–2.00	0.14–0.20	. . .	. . .
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	0.10–0.80	. . .
S32205	2205[G]	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	2304[G]	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	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
S32520	. . .	0.030	1.50	0.035	0.020	0.80	24.0–26.0	5.5–8.0	3.0–4.0	0.20–0.35	0.50–2.00	. . .
S32550	255[G]	0.04	1.50	0.040	0.030	1.00	24.0–27.0	4.5–6.5	2.9–3.9	0.10–0.25	1.50–2.50	. . .
S32750	2507[G]	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	0.50	. . .
S32760[K]	. . .	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	0.50–1.00	W 0.50–1.00
S32900	329	0.08	1.00	0.040	0.030	0.75	23.0–28.0	2.0–5.00	1.00–2.00	. . .	. . .	. . .
S32906	. . .	0.030	0.80–1.50	0.030	0.030	0.50	28.0–30.0	5.8–7.5	1.50–2.60	0.30–0.40	0.80	. . .
S32950	. . .	0.030	2.00	0.035	0.010	0.60	26.0–29.0	3.5–5.2	1.00–2.50	0.15–0.35	. . .	. . .
S39274†	. . .	0.030	1.00	0.030	0.020	0.80	24.0–26.0	6.0–8.0	2.5–3.5	0.24–0.32	0.20–0.80	W 1.50–2.50
						Ferritic or Martensitic (Chromium)						
S32803	. . .	0.015	0.50	0.020	0.0035	0.55	28.0–29.0	3.0–4.0	1.80–2.50	0.020 (C+N) 0.030	. . .	Cb 12×(C+N) min, 0.15–0.50
S40500	405	0.08	1.00	0.040	0.030	1.00	11.5–14.5	0.60	. . .	. . .	. . .	Al 0.10–0.30
S40900[L]	409[L]											
S40910	. . .	0.030	1.00	0.040	0.020	1.00	10.5–11.7	0.50	. . .	0.030	. . .	Ti 6×(C+N) min, 0.50 max; Cb 0.17
S40920	. . .	0.030	1.00	0.040	0.020	1.00	10.5–11.7	0.50	. . .	0.030	. . .	Ti 8×(C+N) min, Ti 0.15–0.50; Cb 0.10
S40930	. . .	0.030	1.00	0.040	0.020	1.00	10.5–11.7	0.50	. . .	0.030	. . .	(Ti+Cb) [0.08+8 ×(C+N)] min, 0.75 max; Ti 0.05 min
S40945	. . .	0.030	1.00	0.040	0.030	1.00	10.5–11.7	0.50	. . .	0.030	. . .	Cb 0.18–0.40 Ti 0.05–0.20
S40975	. . .	0.030	1.00	0.040	0.030	1.00	10.5–11.7	0.50–1.00	. . .	0.030	. . .	Ti 6×(C+N) min, 0.75 max
S40977	. . .	0.030	1.50	0.040	0.015	1.00	10.5–12.5	0.30–1.00	. . .	0.030	. . .	. . .
S41000	410	0.08–0.15	1.00	0.040	0.030	1.00	11.5–13.5	0.75	. . .	. . .	. . .	. . .
S41003	. . .	0.030	1.50	0.040	0.030	1.00	10.5–12.5	1.50	. . .	0.030	. . .	. . .
S41008	410S	0.08	1.00	0.040	0.030	1.00	11.5–13.5	0.60	. . .	. . .	. . .	. . .
S41045	. . .	0.030	1.00	0.040	0.030	1.00	12.0–13.0	0.50	. . .	0.030	. . .	Cb 9×(C+N) min, 0.60 max
S41050	. . .	0.04	1.00	0.045	0.030	1.00	10.5–12.5	0.60–1.10	. . .	0.10	. . .	. . .
S41500[M]	. . .	0.05	0.50–1.00	0.030	0.030	0.60	11.5–14.0	3.5–5.5	0.50–1.00	. . .	. . .	. . .
S42035	. . .	0.08	1.00	0.045	0.030	1.00	13.5–15.5	1.0–2.5	0.2–1.2	. . .	. . .	Ti 0.30–0.50
S42900	429[G]	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	0.75	. . .	. . .	. . .	. . .
S43035	439	0.030	1.00	0.040	0.030	1.00	17.0–19.0	0.50	. . .	0.030	. . .	Ti [0.20+4(C+N)] min, 1.10 max; Al 0.15
S43400	434	0.12	1.00	0.040	0.030	1.00	16.0–18.0	. . .	0.75–1.25	. . .	. . .	. . .
S43600	436	0.12	1.00	0.040	0.030	1.00	16.0–18.0	. . .	0.75–1.25	. . .	. . .	Cb 5×C min, 0.80 max

TABLE 1 *Continued*

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phos-phorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E,F]
S43932	. . .	0.030	1.00	0.040	0.030	1.00	17.0–19.0	0.50	. . .	0.030	. . .	(Ti+Cb) [0.20+4(C+N)] min, 0.75 max; Al 0.15
S43940	. . .	0.030	1.00	0.040	0.015	1.00	17.5–18.5	. . .	. . .	. . .	. . .	Ti 0.10–0.60 Cb [0.30+(3×C)] min
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(C+N)] min, 0.80 max
S44500	. . .	0.020	1.00	0.040	0.012	1.00	19.0–21.0	0.60	. . .	0.03	0.30–0.60	Cb 10×(C+N) min, 0.80 max
S44626	XM-33[J]	0.06	0.75	0.040	0.020	0.75	25.0–27.0	0.50	0.75–1.50	0.04	0.20	Ti 0.20–1.00; Ti 7(C+N) min
S44627	XM-27[J]	0.010[N]	0.40	0.020	0.020	0.40	25.0–27.5	0.50	0.75–1.50	0.015[N]	0.20	Cb 0.05–0.20 (Ni + Cu) 0.50
S44635	. . .	0.025	1.00	0.040	0.030	0.75	24.5–26.0	3.5–4.5	3.5–4.5	0.035	. . .	(Ti+Cb) [0.20+4 (C+N)] min, 0.80 max
S44660	. . .	0.030	1.00	0.040	0.030	1.00	25.0–28.0	1.0–3.5	3.0–4.0	0.040	. . .	(Ti+Cb) 0.20 – 1.00, Ti + Cb 6×(C+N) min
S44700	. . .	0.010	0.30	0.025	0.020	0.20	28.0–30.0	0.15	3.5–4.2	0.020	0.15	(C+N) 0.025
S44735	. . .	0.030	1.00	0.040	0.030	1.00	28.0–30.0	1.00	3.6–4.2	0.045	. . .	(Ti+Cb) 0.20–1.00, (Ti+Cb) 6× (C+N) min
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	0.15	(C+N) 0.025
S46800	. . .	0.030	1.00	0.040	0.030	1.00	18.0–20.0	0.50	. . .	0.030	. . .	Ti 0.07–0.30 Cb 0.10–0.60 (Ti+Cb) [0.20+4 (C+N)] min, 0.80 max

[A] Maximum, unless range or minimum is indicated.
[B] Designation established in accordance with Practice E 527 and SAE J 1086.
[C] Unless otherwise indicated, a grade designation originally assigned by the American Iron and Steel Institute (AISI).
[D] Carbon analysis shall be reported to nearest 0.01 % except for the low-carbon types, which shall be reported to nearest 0.001 %.
[E] The terms Columbium (Cb) and Niobium (Nb) both relate to the same element.
[F] When two minimums or two maximums are listed for a single type, as in the case of both a value from a formula and an absolute value, the higher minimum or lower maximum shall apply.
[G] Common name, not a trademark, widely used, not associated with any one producer.
[H] Iron shall be determined arithmetically by difference of 100 minus the sum of the other specified elements.
[I] (Al + Ti) 0.85–1.20.
[J] Naming system developed and applied by ASTM.
[K] Cr + 3.3 Mo + 16 N = 40 min.
[L] S40900 (Type 409) has been replaced by S40910, S40920, and S40930. Unless otherwise specified in the ordering information, an order specifying S40900 or Type 409 shall be satisfied by any one of S40910, S40920, or S40930 at the option of the seller. Material meeting the requirements of S40910, S40920, or S40930, may at the option of the manufacturer be certified as S40900.
[M] Plate version of CA-6NM.
[N] Product (check or verification) analysis tolerance over the maximum limit for C and N in XM-27 shall be 0.002 %.
† UNS number was editorially corrected.

TABLE 2 Mechanical Test Requirements

UNS Designation	Type[A]	Tensile Strength, min		Yield Strength,[B] min		Elongation in 2 in. or 50 mm, min, %	Hardness, max[C]		Cold Bend°[D]
		ksi	MPa	ksi	MPa		Brinell	Rockwell B	
Austenitic (Chromium-Nickel) (Chromium-Manganese-Nickel)									
N08020	. . .	80	550	35	240	30[E]	217	95	not required
N08367									
Sheet and Strip		100	690	45	310	30	. . .	100	not required
Plate		95	655	45	310	30	241	. . .	not required
N08800	800[F]	75	520	30[G]	205[G]	30[H]	. . .	. . .	not required
N08810	800H[F]	65	450	25[G]	170[G]	30	. . .	. . .	not required
N08811	. . .	65	450	25	170	30	. . .	. . .	not required
N08904	904L[F]	71	490	31	220	35	. . .	90	not required
N08926	. . .	94	650	43	295	35	. . .	. . .	not required
S20100	201-1[I]	75	515	38	260	40	217	95	. . .
S20100	201-2[I]	95	655	45	310	40	241	100	. . .
S20103	201L[F]	95	655	38	260	40	217	95	not required
S20153	201LN[F]	95	655	45	310	45	241	100	not required
S20161	. . .	125	860	50	345	40	255	25[J]	not required
S20200	202	90	620	38	260	40	241	. . .	. . .
S20400	. . .	95	655	48	330	35	241	100	not required
S20910	XM-19[K]								
Sheet and Strip		105	725	60	415	30	241	100	not required
Plate		100	690	55	380	35	241	100	not required
S21600	XM-17[J]								
Sheet and Strip		100	690	60	415	40	241	100	not required
Plate		90	620	50	345	40	241	100	not required
S21603	XM-18[K]								
Sheet and Strip		100	690	60	415	40	241	100	not required
Plate		90	620	50	345	40	241	100	not required
S21800	. . .	95	655	50	345	35	241	100	not required
S24000	XM-29[K]								
Sheet and Strip		100	690	60	415	40	241	100	not required
Plate		100	690	55	380	40	241	100	not required
S30100	301	75	515	30	205	40	217	95	not required
S30103	301L[F]	80	550	32	220	45	241	100	not required
S30153	301LN[F]	80	550	35	240	45	241	100	not required
S30200	302	75	515	30	205	40	201	92	not required
S30400	304	75	515	30	205	40	201	92	not required
S30403	304L	70	485	25	170	40	201	92	not required
S30409	304H	75	515	30	205	40	201	92	not required
S30415	. . .	87	600	42	290	40	217	95	not required
S30451	304N	80	550	35	240	30	217	95	not required
S30452	XM-21[K]								
Sheet and Strip		90	620	50	345	30	241	100	not required
Plate		85	585	40	275	30	241	100	not required
S30453	304LN	75	515	30	205	40	217	95	not required
S30500	305	70	485	25	170	40	183	88	not required
S30600	. . .	78	540	35	240	40	. . .	. . .	. . .
S30601	. . .	78	540	37	255	30	. . .	. . .	not required
S30615	. . .	90	620	40	275	35	217	95	not required
S30815	. . .	87	600	45	310	40	217	95	. . .
S30908	309S	75	515	30	205	40	217	95	not required
S30909	309H[F]	75	515	30	205	40	217	95	not required
S30940	309Cb[F]	75	515	30	205	40	217	95	not required
S30941	309HCb[F]	75	515	30	205	40	217	95	not required

TABLE 2 *Continued*

UNS Designation	Type[A]	Tensile Strength, min		Yield Strength,[B] min		Elongation in 2 in. or 50 mm, min, %	Hardness, max[C]		Cold Bend[c D]
		ksi	MPa	ksi	MPa		Brinell	Rockwell B	
S31008	310S	75	515	30	205	40	217	95	not required
S31009	310H[F]	75	515	30	205	40	217	95	not required
S31040	310Cb[F]	75	515	30	205	40	217	95	not required
S31041	310HCb[F]	75	515	30	205	40	217	95	not required
S31050	310 MoLN[F]								
	t ≤ 0.25 in.	84	580	39	270	25	217	95	not required
	t > 0.25 in.	78	540	37	255	25	217	95	not required
S31060	. . .	87	600	41	280	40	217	95	not required
S31254									
Sheet and Strip		100	690	45	310	35	223	96	not required
Plate		95	655	45	310	35	223	96	not required
S31266	. . .	109	750	61	420	35	. . .	. . .	not required
S31277	. . .	112	770	52	360	40	. . .	. . .	not required
S31600	316	75	515	30	205	40	217	95	not required
S31603	316L	70	485	25	170	40	217	95	not required
S31609	316H	75	515	30	205	40	217	95	not required
S31635	316Ti[F]	75	515	30	205	40	217	95	not required
S31640	316Cb[F]	75	515	30	205	30	217	95	not required
S31651	316N	80	550	35	240	35	217	95	not required
S31653	316LN	75	515	30	205	40	217	95	not required
S31700	317	75	515	30	205	35	217	95	not required
S31703	317L	75	515	30	205	40	217	95	not required
S31725	317LM[F]	75	515	30	205	40	217	95	not required
S31726	317LMN[F]	80	550	35	240	40	223	96	not required
S31727	. . .	80	550	36	245	35	217	96	not required
S31753	317LN	80	550	35	240	40	217	95	not required
S32050	. . .	98	675	48	330	40	250	. . .	not required
S32053	. . .	93	640	43	295	40	217	96	not required
S32100	321	75	515	30	205	40	217	95	not required
S32109	321H	75	515	30	205	40	217	95	not required
S32615[L]	. . .	80	550	32	220	25	. . .	. . .	not required
S32654	. . .	109	750	62	430	40	250	. . .	not required
S33228	. . .	73	500	27	185	30	217	95	not required
S33400	334[F]	70	485	25	170	30	. . .	92	not required
S34565	. . .	115	795	60	415	35	241	100	not required
S34700	347	75	515	30	205	40	201	92	not required
S34709	347H	75	515	30	205	40	201	92	not required
S34800	348	75	515	30	205	40	201	92	not required
S34809	348H	75	515	30	205	40	201	92	not required
S35045	. . .	70	485	25	170	35	. . .	. . .	not required
S35135									
Sheet and Strip	. . .	80	550	30	205	30	. . .	. . .	not required
Plate	. . .	75	515	30	205	30	. . .	. . .	not required
S35315	. . .	94	650	39	270	40	217	95	not required
S38100	XM-15[K]	75	515	30	205	40	217	95	not required
S38815	. . .	78	540	37	255	30	. . .	. . .	not required
				Duplex (Austenitic-Ferritic)					
S31200	. . .	100	690	65	450	25	293	31[J]	not required
S31260	. . .	100	690	70	485	20	290	. . .	. . .
S31803	. . .	90	620	65	450	25	293	31[J]	not required
S32001	. . .	90	620	65	450	25	. . .	25[J]	not required
S32003	. . .	90	620	65	450	25	293	31[J]	not required
S32101	. . .								

TABLE 2 *Continued*

UNS Designation	Type[A]	Tensile Strength, min		Yield Strength,[B] min		Elongation in 2 in. or 50 mm, min, %	Hardness, max[C]		Cold Bend°[D]
		ksi	MPa	ksi	MPa		Brinell	Rockwell B	
	t ≤ 0.25 in. [6.4 mm]	101	700	77	530	30	290	. . .	not required
	t > 0.25 in. [6.4 mm]	94	650	65	450	30	290	. . .	not required
S32205	2205[F]	95	655	65	450	25	293	31[J]	not required
S32304	2304[F]	87	600	58	400	25	290	32[J]	not required
S32506	. . .	90	620	65	450	18	302	32[J]	not required
S32520	. . .	112	770	80	550	25	310	. . .	not required
S32550	255[F]	110	760	80	550	15	302	32[J]	not required
S32750	2507[F]	116	795	80	550	15	310	32[J]	not required
S32760	. . .	108	750	80	550	25	270	. . .	not required
S32900	329	90	620	70	485	15	269	28[J]	not required
S32906	. . .								
	t < 0.4 in. [1.0 mm]	116	800	94	650	25.0	310	32[J]	not required
	t ≥ 0.4 in. [1.0 mm]	109	750	80	550	25.0	310	32[J]	not required
S32950[M]	. . .	100	690	70	485	15	293	32[J]	not required
S39274†	. . .	116	800	80	550	15	310	32[J]	not required
				Ferritic or Martensitic (Chromium)					
S32803	. . .	87	600	72	500	16	241	100	not required
S40500	405	60	415	25	170	20	179	88	180
S40900[N]	409[N]								
S40910	. . .	55	380	25	170	20	179	88	180
S40920	. . .	55	380	25	170	20	179	88	180
S40930	. . .	55	380	25	170	20	179	88	180
S40945	. . .	55	380	30	205	22	. . .	80	180
S40975	. . .	60	415	40	275	20	197	92	180
S40977	. . .	65	450	41	280	18	180	88	not required
S41000	410	65	450	30	205	20	217	96	180
S41003	. . .	66	455	40	275	18	223	20[J]	not required
S41008	410S	60	415	30	205	22[O]	183	89	180
S41045	. . .	55	380	30	205	22	. . .	80	180
S41050	. . .	60	415	30	205	22	183	89	180
S41500	. . .	115	795	90	620	15	302	32[J]	not required
S42035	. . .	80	550	55	380	16	180	88	not required
S42900	429[F]	65	450	30	205	22[O]	183	89	180
S43000	430	65	450	30	205	22[O]	183	89	180
S43035	439	60	415	30	205	22	183	89	180
S43400	434	65	450	35	240	22	. . .	89	180
S43600	436	65	450	35	240	22	. . .	89	180
S43932	. . .	60	415	30	205	22	183	89	180
S43940	. . .	62	430	36	250	18	180	88	not required

TABLE 2 *Continued*

UNS Designation	Type[A]	Tensile Strength, min		Yield Strength,[B] min		Elongation in 2 in. or 50 mm, min, %	Hardness, max[C]		Cold Bend°[D]
		ksi	MPa	ksi	MPa		Brinell	Rockwell B	
S44400	. . .	60	415	40	275	20	217	96	180
S44500	. . .	62	427	30	205	22	. . .	83	180
S44626	XM-33[K]	68	470	45	310	20	217	96	180
S44627	XM-27[K]	65	450	40	275	22	187	90	180
S44635	. . .	90	620	75	515	20	269	28[J]	180
S44660	. . .	85	585	65	450	18	241	100	180
S44700	. . .	80	550	60	415	20	223	20[J]	180
S44735	. . .	80	550	60	415	18	255	25[J]	180
S44800	. . .	80	550	60	415	20	223	20[J]	180
S46800	. . .	60	415	30	205	22	. . .	90	180

[A] Unless otherwise indicated, a grade designation originally assigned by the American Iron and Steel Institute (AISI).

[B] 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 Specification A 480/A 480M, paragraph 4.1.11, Ordering Information), an alternative method of determining yield strength may be based on total extension under load of 0.5 %.

[C] Either Brinell or Rockwell B Hardness is permissible.

[D] Bend tests are not required for chromium steels (ferritic or martensitic) thicker than 1 in. [25 mm] or for any austenitic or duplex (austenitic-ferritic) stainless steels regardless of thickness.

[E] Elongation for thickness, less than 0.015 in. (0.38 mm) shall be 20 % minimum, in 1 in. (25.4 mm).

† UNS number was editorially corrected.

[F] Common name, not a trademark, widely used, not associated with any one producer.

[G] Yield strength requirements shall not apply to material under 0.020 in [0.50 mm] in thickness.

[H] Not applicable for thicknesses under 0.010 in. [0.25 mm].

[I] Type 201 is generally produced with a chemical composition balanced for rich side (Type 201-1) or lean side (Type 201-2) austenite stability depending on the properties required for specific applications.

[J] Rockwell C scale.

[K] Naming system developed and applied by ASTM.

[L] For S32615, the grain size as determined in accordance with the Test Methods E 112, Comparison Method, Plate II, shall be No. 3 or finer.

[M] Prior to Specification A 240 – 89b, the tensile value for S32950 was 90 ksi.

[N] S40900 (Type 409) has been replaced by S40910, S40920, and S40930. Unless otherwise specified in the ordering information, an order specifying S40900 or Type 409 shall be satisfied by any one of S40910, S40920, or S40930 at the option of the seller. Material meeting the requirements of S40910, S40920, or S40930, may at the option of the manufacturer be certified as S40900.

[O] Material 0.050 in (1.27 mm) and under in thickness shall have a minimum elongation of 20 %.

SUPPLEMENTARY REQUIREMENTS

A supplementary requirement shall apply only when specified in the purchase order.

S1. Charpy Impact Testing of Plate

S1.1 Charpy impact tests shall be conducted in accordance with Test Methods and Definitions A 370.

S1.2 *Number of Tests*—One impact test (3 specimens) shall be made from one plate per heat treatment lot in the final heat treated condition.

S1.3 *Orientation of Test Specimens*—Unless specified as transverse specimens (long axis of the specimen transverse to the final rolling direction, root of the notch perpendicular to the rolling face) on the purchase order, the orientation of the specimens shall be longitudinal (long axis of the specimen parallel to the final rolling direction, root of the notch perpendicular to the rolling face). The manufacturer is permitted to test transverse specimens provided that such tests meet the acceptance criteria applicable to longitudinal specimens. Unless otherwise specified on the purchase order, the specimens shall be taken so as to include the mid-thickness of the product.

S1.4 *Test Temperature*—The purchaser shall specify the test temperature. The manufacturer is permitted to test specimens at a temperature lower than that specified by the purchaser, provided that such tests shall meet the acceptance criteria applicable to specimens tested at the specified temperature (see Note).

NOTE —Test Methods A 923, Method B, applicable to some duplex (austenitic-ferritic) stainless steels as listed in Test Methods A 923, uses a Charpy impact test for the purpose of determining the absence of detrimental intermetallic phases. Method B specifies a test temperature and acceptance criterion, expressed as impact energy, for each type of steel covered. It may be economical for the Charpy impact tests performed on duplex stainless steels covered in both Specification A 240 and Test Methods A 923 to be performed at the lower of the temperatures specified by this supplementary requirement and Test Methods A 923 Method B, with measurement of both lateral expansion and impact energy.

S1.5 *Acceptance Limit* —Unless otherwise specified on the purchase order, each of the three specimens tested shall show a lateral expansion opposite the notch of not less than 0.015 in. [0.38 mm].

S1.6 *Records*—The recorded results shall include the specimen orientation, specimen size, test temperature, absorbed energy values (if required), and lateral expansion opposite the notch.

S2. Materials for High-Temperature Service

S2.1 Unless an H grade has been ordered, this supplementary requirement shall be specified for ASME Code applications for service above 1000°F [540°C].

S2.2 The user is permitted to use an austenitic stainless steel as the corresponding H grade when the material meets all requirements of the H grade including chemistry, annealing temperature, and grain size (see Section 6).

S2.3 The user is permitted to use an L grade austenitic stainless steel for service above 1000°F [540°C], subject to the applicable allowable stress table of the ASME Code, when the material meets all requirements of this specification and the grain size is ASTM No. 7 or coarser as determined in accordance with Test Method E 112. The grain size shall be reported on a Certified Test Report.

SUMMARY OF CHANGES

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-04 issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved March 1, 2004.)

(*1*) Added S31727 to Tables 1 and 2.
(*2*) Added S32053 to Tables 1 and 2.
(*3*) Added S32506 to Tables 1 and 2.
(*4*) Added S39274 to Tables 1 and 2.

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-03c issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved Jan. 1, 2004.)

(*1*) Added new grade, UNS S31060, to Section 6 and Tables 1 and 2.

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-03b issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved Sept. 10, 2003.)

(*1*) In Table 2, HBN and HRB for S20100, S30451, and S30453 were reconciled with those in Specification A 666, annealed condition.

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-03a issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved May 10, 2003.)

(*1*) Added new alloy UNS S31277 to Tables 1 and 2.

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-03 issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved April 10, 2003.)

(*1*) Added UNS S32906 to Tables 1 and 2.

(*2*) Added UNS S32101 to Tables 1 and 2.

This section identifies the location of selected changes to this standard that have been incorporated since the A 240/A 240M-02a issue. For the convenience of the user, Committee A01 has highlighted those changes that impact the use of this standard. This section may also include descriptions of changes or reasons for changes, or both. (Approved February 10, 2003.)

(*1*) Added a new duplex stainless steel (S32003) to Tables 1 and 2.