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Designation: A240/A240M – 13

StandardSpecification 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 A240/A240M; 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[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 SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

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

A923 Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels

E112 Test Methods for Determining Average Grain Size

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

2.2 *SAE Standard:*[4]

J 1086 Practice for Numbering Metals and Alloys (UNS)

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.

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 A480/A480M.

[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-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 (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

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

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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.

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 E112.

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 E112.

7. Keywords

7.1 chromium; chromium-nickel stainless steel; chromium-manganese-nickel stainless steel; pressure vessels

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TABLE 1 Chemical Composition Requirements, %[A]

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phosphorus	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	. . .	3.00–4.00	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	. . .
N08700	. . .	0.04	2.00	0.040	0.030	1.00	19.0–23.0	24.0–26.0	4.3–5.0	. . .	0.50	Cb 8×C min 0.40 max
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	4.00–5.00	0.10	1.00–2.00	. . .
N08926	. . .	0.020	2.00	0.030	0.010	0.50	19.0–21.0	24.0–26.0	6.00–7.00	0.15–0.25	0.50–1.50	. . .
S20100	201	0.15	5.50–7.50	0.060	0.030	1.00	16.0–18.0	3.5–5.5	. . .	0.25	. . .	. . .
S20103	. . .	0.03	5.50–7.50	0.045	0.030	0.75	16.0–18.0	3.5–5.5	. . .	0.25	. . .	. . .
S20153	. . .	0.03	6.40–7.50	0.045	0.015	0.75	16.0–17.5	4.0–5.0	. . .	0.10–0.25	1.00	. . .
S20161	. . .	0.15	4.00–6.00	0.040	0.040	3.00–4.00	15.0–18.0	4.0–6.0	. . .	0.08–0.20	. . .	. . .
S20200	202	0.15	7.50–10.00	0.060	0.030	1.00	17.0–19.0	4.0–6.0	. . .	0.25	. . .	. . .
S20400	. . .	0.030	7.00–9.00	0.040	0.030	1.00	15.0–17.0	1.50–3.00	. . .	0.15–0.30	. . .	. . .
S20431	. . .	0.12	5.00–7.00	0.045	0.030	1.00	17.0–18.0	2.0–4.0	. . .	0.10–0.25	1.50–3.50	. . .
S20432	. . .	0.08	3.00–5.00	0.045	0.030	1.00	17.0–18.0	4.0–6.0	. . .	0.05–0.20	2.00–3.00	. . .
S20433	. . .	0.08	5.50–7.50	0.045	0.030	1.00	17.0–18.0	3.5–5.5	. . .	0.10–0.25	1.50–3.50	. . .
S20910	XM-19[J]	0.06	4.00–6.00	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	14.00–16.00	0.045	0.030	0.30–1.00	17.0–18.5	1.00	. . .	0.35 min	. . .	. . .
S21600	XM-17[J]	0.08	7.50–9.00	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	7.50–9.00	0.045	0.030	0.75	17.5–22.0	5.0–7.0	2.00–3.00	0.25–0.50	. . .	. . .
S21640	. . .	0.08	3.50–6.50	0.060	0.030	1.00	17.5–19.5	4.0–6.5	0.50–2.00	0.08–0.30	. . .	Cb 0.10–1.00
S21800	. . .	0.10	7.00–9.00	0.060	0.030	3.5–4.5	16.0–18.0	8.0–9.0	. . .	0.08–0.18	. . .	. . .
S21904	XM-11[J]	0.04	8.00–10.00	0.060	0.030	0.75	19.0–21.5	5.5–7.5	. . .	0.15–0.40	. . .	. . .
S24000	XM-29[J]	0.08	11.50–14.50	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	0.07	2.00	0.045	0.030	0.75	17.5–19.5	8.0–10.5	. . .	0.10	. . .	. . .
S30403	304L	0.030	2.00	0.045	0.030	0.75	17.5–19.5	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
S30435	. . .	0.08	2.00	0.045	0.030	1.00	16.0–18.0	7.0–9.0	. . .	. . .	1.50–3.00	. . .
S30441	. . .	0.08	2.00	0.045	0.030	1.0–2.0	17.5–19.5	8.0–10.5	. . .	0.10	1.5–2.5	Cb 0.1–0.5 W 0.2–0.8
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	. . .	. . .	. . .	. . .
S30530	. . .	0.08	2.00	0.045	0.030	0.50–2.50	17.0–20.5	8.5–11.5	0.75–1.50	. . .	0.75–3.50	. . .
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	. . .	. . .	. . .	. . .

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TABLE 1 *Continued*

UNS Designation[B]	Type[C]	Carbon[D]	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements[E, F]
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
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	0.18–0.25	0.50–1.00	. . .
S31266	. . .	0.030	2.00–4.00	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	2.80–4.00	. . .
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	4.80–6.00	16.5–19.5	19.0–22.0	0.30–1.50	. . .	1.50–2.50	. . .
S32654	. . .	0.020	2.00–4.00	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
S33425	. . .	0.08	1.50	0.045	0.020	1.00	21.0–23.0	20.0–23.0	2.00–3.00	. . .	. . .	Al 0.15–0.60 Ti 0.15–0.60
S34565	. . .	0.030	5.00–7.00	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
S34751	347LN	0.005–0.020	2.00	0.045	0.030	1.00	17.0–19.0	9.0–13.0	. . .	0.06–0.10	. . .	Cb 0.20–0.50, 15 × C min

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