



Designation: A 240/A 240M-05 Designation: A 240/A 240M – 05a

**Standard Specification for
Chromium and Chromium-Nickel Stainless Steel Plate,
Sheet, and Strip for Pressure Vessels and for General
Applications¹**

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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification² 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*:⁴

J 1086 *Practice for Numbering Metals and Alloys (UNSA)*

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/A 480M/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;

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/September 2005. Published March/September 2005. Originally approved in 1940. Last previous edition approved in 2004 as ~~A 240/A 240M-04~~ ~~and~~ ~~A 240/A 240M-05~~.

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.

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



- 3.1.12 Inspection;
- 3.1.13 Rejection and reheating;
- 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/A 480M/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.

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 112E 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 112E 112.

iTeh Standards
[tps://standards.itih.](https://standards.itih)
Document Preview

7. **Keywords**

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

[ASTM A240/A240M-05a](#)

[//standards.itih.ai/catalog/standards/sist/c50f3e3d-4000-8c64-18da4f208269/astm-a240-a240m-05a](https://standards.itih.ai/catalog/standards/sist/c50f3e3d-4000-8c64-18da4f208269/astm-a240-a240m-05a)

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	...	3.0–4.0	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	...
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	4.0–5.0	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	...	...	...	...

TABLE 1 Continued

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements ^{E,F}
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	0.18–0.22	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

5

with Standards
 standards.tech.ai/catalog/standards/sis/e50k
 4000-4-18da08269-240
 05a

ASTM A 240/A 240M – 05a

TABLE 1 Continued

UNS Designation ^B	Type ^C	Carbon ^D	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen	Copper	Other Elements ^{E,F}
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
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 Al 0.10–0.30
S40500	405	0.08	1.00	0.040	0.030	1.00	11.5–14.5	0.60	...	...	...	...
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;
S40945	...	0.030	1.00	0.040	0.030	1.00	10.5–11.7	0.50	...	0.030	...	Ti 0.05 min 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

6