



Designation: A 743/A 743M – 06

Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application¹

This standard is issued under the fixed designation A 743/A 743M; 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 iron-chromium and iron-chromium-nickel alloy castings for general corrosion-resistant application. The grades covered by this specification represent types of alloy castings suitable for broad ranges of application which are intended for a wide variety of corrosion environments.

NOTE 1—For alloy castings for severe corrosion-resistant service, reference should be made to Specification A 744/A 744M. For general heat-resistant alloy castings, reference should be made to Specification A 297/A 297M. For nickel alloy castings for corrosion-resistant service, reference should be made to Specification A 494/A 494M.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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. Inch-pound units are applicable for material ordered to Specification A 743 and SI units for material ordered to Specification A 743M.

2. Referenced Documents

2.1 ASTM Standards:²

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

A 297/A 297M Specification for Steel Castings, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application

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

A 494/A 494M Specification for Castings, Nickel and Nickel Alloy

A 744/A 744M Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service

A 781/A 781M Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use

A 890/A 890M Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application

A 957 Specification for Investment Castings, Steel and Alloy, Common Requirements, for General Industrial Use

3. General Conditions for Delivery

3.1 Except for investment castings, castings furnished to this specification shall conform to the requirements of Specification A 781/A 781M, including any supplementary requirements that are indicated on the purchase order. Failure to comply with the general requirements of Specification A 781/A 781M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 781/A 781M, this specification shall prevail.

3.2 Steel investment castings furnished to this specification shall conform to the requirements of Specification A 957, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 957 constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 957, Specification A 957 shall prevail.

4. Ordering Information

4.1 Orders for material to this specification should include the following, as required, to describe the material adequately:

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 A01.18 on Castings.

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² 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.

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

- 4.1.1 Description of the casting by pattern number or drawing,
- 4.1.2 Grade,
- 4.1.3 Heat treatment,
- 4.1.4 Options in the specification,
- 4.1.5 Whether castings are to be produced using the investment casting process, and
- 4.1.6 Supplementary requirements desired, including the standards of acceptance.

5. Process

5.1 The steel shall be made by the electric furnace process with or without separate refining such as argon-oxygen decarburization (AOD).

6. Heat Treatment

6.1 Castings shall be heat treated in accordance with the requirements in Table 1.

TABLE 1 Heat Treatment Requirements

Grade	Heat Treatment
CF8, CG3M, CG8M, CG12, CF20, CF8M, CF8C, CF16F, CF16Fa, CH10, CH20, CE30, CK20	Heat to 1900°F [1040°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means. Heat to 2000°F [1093°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CA15, CA15M, CA40, CA40F	(1) Heat to 1750°F [955°C] minimum, air cool and temper at 1100°F [595°C] minimum, or (2) Anneal at 1450°F [790°C] minimum.
CB30, CC50	(1) Heat to 1450°F [790°C] minimum, and air cool, or (2) Heat to 1450°F [790°C] minimum, and furnace cool.
CF3, CF3M, CF3MN	(1) Heat to 1900°F [1040°C] minimum, hold for sufficient time to heat casting to temperature, and cool rapidly. (2) As cast if corrosion resistance is acceptable.
CN3M	Heat to 2150°F [1175°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CN3MN	Heat to 2100°F [1150°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CN7M, CG6MMN	Heat to 2050°F [1120°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CN7MS	Heat to 2100°F [1150°C] minimum, 2150°F [1180°C] maximum, hold for sufficient time (2 h minimum) to heat casting to temperature and quench in water.
CA6NM	Heat to 1850°F [1010°C] minimum, air cool to 200°F [95°C] or lower prior to any optional intermediate temper and prior to the final temper. The final temper shall be between 1050°F [565°C] and 1150°F [620°C].
CA6N	Heat to 1900°F [1040°C], air cool, reheat to 1500°F [815°C], air cool, and age at 800°F [425°C], holding at each temperature sufficient time to heat casting uniformly to temperature.
CF10SMnN	Heat to 1950°F [1065°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CA28MWV	(1) Heat to 1875–1925°F [1025–1050°C], quench in air or oil, and temper at 1150°F [620°C] minimum, or (2) Anneal at 1400°F [760°C] minimum.
CK3MCuN	Heat to 2100°F [1150°C] minimum, hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CK35MN	Heat to 2100–2190°F [1150–1200°C], hold for sufficient time to heat casting to temperature, quench in water or rapid cool by other means.
CB6	Heat between 1800°F [980°C] and 1920°F [1050°C], forced air, cool to 120°F [50°C] maximum, and temper between 1100°F and 1160°F [595°C and 625°C].

NOTE 2—Proper heat treatment of these alloys is usually necessary to enhance corrosion resistance and in some cases to meet mechanical properties. Minimum heat treat temperatures are specified; however, it is sometimes necessary to heat treat at higher temperatures, hold for some minimum time at temperature and then rapidly cool the castings in order to enhance the corrosion resistance and meet mechanical properties.

7. Chemical Requirements

7.1 The chemical requirements are shown in Table 2

TABLE 2 Chemical Requirements

Grade (UNS)	Type	Composition, %													
		Carbon, max	Manganese, max	Silicon, max	Phosphorus, max	Sulfur, max	Chromium	Nickel	Molybdenum	Columbium	Selenium	Copper	Tungsten, max	Vanadium, max	Nitrogen
CF8 (J92600)	19 Chromium,	0.08	1.50	2.00	0.04	0.04	18.0–21.0	8.0–	...	...	...	...	...	...	...
	9 Nickel							11.0							



TABLE 2 Continued

Grade (UNS)	Type	Composition, %													
		Carbon, max	Man- ganese, max	Silicon, max	Phospho- rus, max	Sulfur, max	Chromium	Nickel	Molybde- num	Colum- bium	Sele- nium	Copper	Tung- sten, max	Vana- dium, max	Nitrogen
CG12 (J93001)	22 Chromium, 12 Nickel	0.12	1.50	2.00	0.04	0.04	20.0–23.0	10.0– 13.0	...	...	...	...	...	...	...
CF20 (J92602)	19 Chromium, 9 Nickel	0.20	1.50	2.00	0.04	0.04	18.0–21.0	8.0– 11.0	...	...	...	...	...	...	...
CF8M (J92900)	19 Chromium, 10 Nickel, with Molybdenum	0.08	1.50	2.00	0.04	0.04	18.0–21.0	9.0– 12.0	2.0–3.0	...	...	...	...	...	...
CF8C (J92710)	19 Chromium, 10 Nickel, with Columbium	0.08	1.50	2.00	0.04	0.04	18.0–21.0	9.0– 12.0	...	^A	...	...	...	...	...
CF16F (J92701)	19 Chromium, 9 Nickel, Free Machining	0.16	1.50	2.00	0.17	0.04	18.0–21.0	9.0– 12.0	1.50 max	...	0.20– 0.35	...	...	...	...
CF16Fa	19 Chromium, 9 Nickel, Free Machining	0.16	1.50	2.00	0.04	0.20– 0.40	18.0–21.0	9.0– 12.0	0.40–0.80	...	...	...	...	...	...
CH10 (J93401)	25 Chromium, 12 Nickel	0.10	1.50	2.00	0.04	0.04	22.0–26.0	12.0– 15.0	...	...	...	...	...	...	...
CH20 (J93402)	25 Chromium, 12 Nickel	0.20	1.50	2.00	0.04	0.04	22.0–26.0	12.0– 15.0	...	...	...	...	...	...	...
CK20 (J94202)	25 Chromium, 20 Nickel	0.20	2.00	2.00	0.04	0.04	23.0–27.0	19.0– 22.0	...	...	...	...	...	...	...
CE30 (J93423)	29 Chromium, 9 Nickel	0.30	1.50	2.00	0.04	0.04	26.0–30.0	8.0– 11.0	...	...	...	...	...	...	...
CA15 (J91150)	12 Chromium	0.15	1.00	1.50	0.04	0.04	11.5–14.0	1.00 max	0.50 max	...	...	...	...	...	...
CA15M (J91151)	12 Chromium	0.15	1.00	0.65	0.040	0.040	11.5–14.0	1.0 max	0.15–1.0	...	...	...	...	...	...
CB30 (J91803)	20 Chromium	0.30	1.00	1.50	0.04	0.04	18.0–21.0	2.00 max	...	...	...	...	...	...	...
CC50 (J92615)	28 Chromium	0.50	1.00	1.50	0.04	0.04	26.0–30.0	4.00 max	...	...	...	...	...	...	...
CA40 (J91153)	12 Chromium	0.20– 0.40	1.00	1.50	0.04	0.04	11.5–14.0	1.0 max	0.5 max	...	...	...	...	...	...
CA40F (J91154)	12 Chromium, Free Machining	0.20– 0.40	1.00	1.50	0.04	0.20– 0.40	11.5–14.0	1.0 max	0.5 max	...	...	...	...	...	...
CF3 (J92500)	19 Chromium, 9 Nickel	0.03	1.50	2.00	0.04	0.04	17.0–21.0	8.0– 12.0	...	...	...	...	...	...	...
CF10SMnN (J92972)	17 Chromium, 8.5 Nickel with Nitrogen	0.10	7.00– 9.00	3.50– 4.50	0.060	0.030	16.0–18.0	8.0– 9.0	...	...	...	...	...	...	0.08– 0.18
CF3M (J92800)	19 Chromium, 10 Nickel, with Molybdenum	0.03	1.50	1.50	0.04	0.04	17.0–21.0	9.0– 13.0	2.0–3.0	...	...	...	...	...	...
CF3MN (J92804)	19 Chromium, 10 Nickel, with Molybdenum, and Nitrogen	0.03	1.50	1.50	0.040	0.040	17.0–22.0	9.0– 13.0	2.0–3.0	...	...	...	...	...	0.10– 0.20
CG6MMN (J93790)	19 Chromium, 11 Nickel, with Molybdenum	0.06	4.00– 6.00	1.00	0.04	0.03	20.5–23.5	11.5– 13.5	1.50–3.00	0.10– 0.30	...	...	...	0.10– 0.30	0.20– 0.40
CG3M (J92999)	19 Chromium, 11 Nickel, with Molybdenum	0.03	1.50	1.50	0.04	0.04	18.0–21.0	9.0– 13.0	3.0–4.0	...	...	...	...	...	...

TABLE 2 *Continued*

Grade (UNS)	Type	Composition, %													
		Carbon, max	Manganese, max	Silicon, max	Phosphorus, max	Sulfur, max	Chromium	Nickel	Molybdenum	Columbium	Seelenium	Copper	Tungsten, max	Vanadium, max	Nitrogen
CG8M (J93000)	19 Chromium,	0.08	1.50	1.50	0.04	0.04	18.0–21.0	9.0–	3.0–4.0	...	...	...	...	...
	11 Nickel, with Molybdenum							13.0							
CN3M (J94652)		0.03	2.0	1.0	0.03	0.03	20.0–22.0	23.0–27.0	4.5–5.5	...	...	...	...	...
CN3MN (J94651)	21 Chromium, 24 Nickel with Molybdenum and Nitrogen	0.03	2.00	1.00	0.040	0.010	20.0–22.0	23.5–25.5	6.0–7.0	...	...	0.75 max	...	0.18–0.26
CN7M (N08007)	20 Chromium,	0.07	1.50	1.50	0.04	0.04	19.0–22.0	27.5–	2.0–3.0	...	...	3.0–	...	...
	29 Nickel, with Copper and Molybdenum							30.5				4.0			
CN7MS (J94650)	19 Chromium,	0.07	1.00	2.50–	0.04	0.03	18.0–20.0	22.0–	2.5–3.0	...	...	1.5–	...	...
	24 Nickel, with Copper and Molybdenum			3.50				25.0				2.0			
CA6NM (J91540)	12 Chromium,	0.06	1.00	1.00	0.04	0.03	11.5–14.0	3.5–	0.40–1.0	...	...	...	...	...
CA6N	4 Nickel 11 Chromium, 7 Nickel	0.06	0.50	1.00	0.02	0.02	10.5–12.5	4.5 6.0–8.0	...	...	...	...	...	...
CA28MWV (J91422)	12 Chromium, with Molybdenum, Tungsten and Vanadium	0.20–0.28	0.50–1.00	1.0	0.030	0.030	11.0–12.5	0.50–1.00	0.90–1.25	...	...	...	0.90–1.25	0.20–0.30
CK3MCuN (J93254)	20 Chromium 18 Nickel, with Copper and Molybdenum	0.025	1.20	1.00	0.045	0.010	19.5–20.5	17.5–19.5	6.0–7.0	...	...	0.50–1.00	...	0.180–0.240
CK35MN	23 Chromium, 21 Nickel, with Molybdenum and Nitrogen	0.035	2.00	1.00	0.035	0.020	22.0–24.0	20.0–22.0	6.0–6.8	...	...	0.40	...	0.21–0.32
CB6 (J91804)	16 Chromium, 4 Nickel	0.06	1.00	1.00	0.04	0.03	15.5–17.5	3.5–5.5	0.5 max	...	...	...	...	...

^A Grade CF8C shall have a columbium content of not less than eight times the carbon content and not more than 1.0%. If a columbium-plus-tantalum alloy in the approximate Cb:Ta ratio of 3:1 is used for stabilizing this grade, the total columbium-plus-tantalum content shall not be less than nine times the carbon content and shall not exceed 1.1%.

^B For Grade CB30 a copper content of 0.90 to 1.20% is optional..

8. Repair by Welding

8.1 Repair welding of Grade CA28MWV is not permitted unless by agreement between the manufacturer and the purchaser.

8.2 When methods involving high temperature are used in the removal of discontinuities, castings shall be preheated in accordance with Table 3. Weld repairs shall be subject to the same quality standards as are used to inspect the castings.

8.3 Post weld heat treatment, if required, shall be in accordance with Table 1.

8.3.1 The martensitic grades CA6NM, CA15, CA15M, CB6, and CA40 shall be retempered after weld repairing, except that local tempering will be permitted if, in the opinion of the manufacturer, furnace heat treating will be damaging to the finished surface of a machined casting. Heat treatment, other than tempering, of grades CA6NM, CA15, CA15M, CB6, and CA40 after weld repairing shall be performed only when agreed upon between the manufacturer and the purchaser. Weld repair on Grade CA40F is not recommended because of the risk of local hardening and possible cracking in the heat affected zone.

8.3.2 Post weld heat treatment is not required on the other grades of this specification. When post weld heat treatment is believed necessary for adequate corrosion resistance in the service environment, castings should be ordered in accordance with Specification A 744/A 744M.

TABLE 3 Minimum Preheat Temperatures

Grade	Minimum Preheat Temperatures	
	°F	°C
CA15, CA15M CA40, CA28MWV	400	[205]
Others	50	[10]