



Designation: **A890/A890M – 12a A890/A890M – 13**

Standard Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application¹

This standard is issued under the fixed designation A890/A890M; 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.

1. Scope*

1.1 This specification covers a group of cast duplex stainless steels (austenitic/ferritic).

1.2 The duplex stainless steel alloys offer a combination of enhanced mechanical properties and corrosion resistance when properly balanced in composition and properly heat treated. Ferrite levels are not specified, but these alloys will develop a range of approximately 30 to 60 % ferrite with the balance austenite. It is the responsibility of the purchaser to determine which grade shall be furnished depending on design and service conditions, mechanical properties, and corrosion-resistant characteristics.

NOTE 1—Because of the possibility of precipitation of embrittling phases, the grades included in this specification are not recommended for service at temperatures above 600°F [315°C].

1.3 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.

1.3.1 Within the text, the SI units are shown in brackets.

2. Referenced Documents

2.1 *ASTM Standards*:²

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A732/A732M Specification for Castings, Investment, Carbon and Low Alloy Steel for General Application, and Cobalt Alloy for High Strength at Elevated Temperatures](#)

[A781/A781M Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

[E562 Test Method for Determining Volume Fraction by Systematic Manual Point Count](#)

[E1245 Practice for Determining the Inclusion or Second-Phase Constituent Content of Metals by Automatic Image Analysis](#)

3. Ordering Information

3.1 Orders for material to this specification shall include the following, as required, to describe the material adequately:

3.1.1 Description of casting by pattern or drawing number (dimensional tolerance shall be included on the casting drawing),

3.1.2 Specification designation and grade including year of issue,

3.1.3 Options in the specification (See 9.1), and

3.1.4 Supplementary requirements desired, including the standards of acceptance.

4. Process

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

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



5. Heat Treatment

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

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.

6. Chemical Composition

6.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 2.

7. General Requirements

7.1 Material furnished to this specification shall conform to the requirements of Specification A781/A781M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A781/A781M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A781/A781M, this specification shall prevail.

8. Repair by Welding

8.1 The composition of the deposited weld metal may be similar to that of the casting or may be suitably alloyed to achieve the desired corrosion resistance and mechanical properties.

8.2 Weld repairs shall be subject to the same quality standards as are used to inspect the castings.

8.3 When post weld/heat treatment is believed necessary for adequate corrosion resistance or impact resistance, Supplementary Requirement S33 Post Weld/Heat Treatment shall be included in the purchase order.

9. Product Marking

9.1 Castings shall be marked for material identification with the specification designation and grade. In addition, the manufacturer’s name or identification mark and the pattern number shall be cast or stamped using low-stress stamps on all castings. Small-size castings may be such that marking must be limited consistent with the available area. The marking of heat numbers on individual castings shall be agreed upon between the manufacturer and the purchaser. Marking shall be in such position as not to injure the usefulness of the casting.

10. Keywords

10.1 austenite; duplex stainless steel; ferrite; stainless steel; steel castings

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TABLE 1 Heat Treatment Requirements

Grade	Heat Treatment
1B, 1C	Heat to 1900°F [1040°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means.
2A	Heat to 2050°F [1120°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means.
3A	Heat to 1950°F [1070°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means.
4A	Heat to 2050°F [1120°C] minimum for sufficient time to heat casting uniformly to temperature and water quench, or the casting may be furnace cooled to 1850°F [1010°C] minimum, hold for 15 min minimum and then water quench. A rapid cool by other means may be employed in lieu of water quench.
5A	Heat to 2050°F [1120°C] minimum, hold for sufficient time to heat casting to temperature, furnace cool to 1910°F [1045°C] minimum, quench in water or rapid cool by other means.
6A	Heat to 2010°F [1100°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or cool rapidly by other means.
7A	Heat to 2065°F [1130°C] minimum, hold for sufficient time to heat casting to temperature, furnace cool to 1940°F [1060°C] minimum, quench in water or rapid cool by other means.



TABLE 2 Chemical Requirements

Grade		1B ^A		1C ^B		2A
Type		25Cr-5Ni-Mo-Cu-N		25Cr-6Ni-Mo-Cu-N		24Cr-10Ni-Mo-N
UNS		J93372		J93373		J93345
ACI		CD4MCuN		CD3MCuN		CE8MN
Composition:						
Carbon, max		0.04		0.030		0.08
Manganese, max		1.0		1.20		1.00
Silicon, max		1.0		1.10		1.50
Phosphorus, max		0.04		0.030		0.04
Sulfur, max		0.04		0.030		0.04
Chromium		24.5–26.5		24.0–26.7		22.5–25.5
Nickel		4.7–6.0		5.6–6.7		8.0–11.0
Molybdenum		1.7–2.3		2.9–3.8		3.0–4.5
Copper		2.7–3.3		1.40–1.90		...
Tungsten		...		...		...
Nitrogen		0.10–0.25		0.22–0.33		0.10–0.30
Grade	3A	4A	5A ^B	6A ^B		7A ^C
Type	25Cr-5Ni-Mo-N	22Cr-5Ni-Mo-N	25Cr-7Ni-Mo-N	25Cr-7Ni-Mo-N		27Cr-7Ni-Mo-W-N
UNS	J93371	J92205	J93404	J93380		J93379
ACI	CD6MN	CD3MN	CE3MN	CD3MWCuN		CD3MWN
Composition:						
Carbon, max	0.06	0.03	0.03	0.03		0.030
Manganese, max	1.00	1.50	1.50	1.00		1.00–3.00
Silicon, max	1.00	1.00	1.00	1.00		1.00
Phosphorus, max	0.040	0.04	0.04	0.030		0.030
Sulfur, max	0.040	0.020	0.04	0.025		0.020
Chromium	24.0–27.0	21.0–23.5	24.0–26.0	24.0–26.0		26.0–28.0
Nickel	4.0–6.0	4.5–6.5	6.0–8.0	6.5–8.5		6.0–8.0
Molybdenum	1.75–2.5	2.5–3.5	4.0–5.0	3.0–4.0		2.0–3.5
Copper	...	1.00, max	...	0.5–1.0		1.00, max
Tungsten	...	...	...	0.5–1.0		3.0–4.0
Nitrogen	0.15–0.25	0.10–0.30	0.10–0.30	0.20–0.30		0.30–0.40
Boron	...	...	...	...		0.0010–0.0100
Barium	...	...	...	...		0.0010–0.0100
Barium	...	...	...	...		0.0002–0.0100
Ce + La	...	...	...	...		0.005–0.030

^A CD4MCu has been removed from the standard. CD4MCuN is an acceptable substitute for CD4MCu.

^B % Cr + 3.3 % Mo + 16 % N ≥ 40.

^C %Cr+3.3(%Mo+0.5%W)+16%N ≥ 45.

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SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall not apply unless specified in the purchase order. A list of standardized supplementary requirements for use at the option of the purchaser is included in Specification **A781/A781M**. Those that are ordinarily considered suitable for use with this specification are listed below by title only. Others enumerated in Specification **A781/A781M** may be used with this specification upon agreement between the manufacturer and purchaser.