Designation: ~~A560/A560M – 11~~ A560/A560M – 12

Standard Specification for Castings, Chromium-Nickel Alloy[1]

This standard is issued under the fixed designation A560/A560M; 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 chromium-nickel alloy castings intended for heat-resisting and elevated-temperature corrosion applications, such as structural members, containers, supports, hangers, spacers, and the like, in corrosive environments up to 2000°F [1090°C].

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

~~A370~~A781/A781M ~~Test Methods and Definitions for Mechanical Testing of Steel Products~~Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use

~~A781/A781M~~A957/A957M Specification for Investment Castings, Steel and Alloy, Common Requirements, for General Industrial Use

3. General Conditions for Delivery

3.1 ~~Material~~ Except for steel investment castings, 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.

3.2 Steel investment castings furnished to this specification shall conform to the requirements of Specification A957/A957M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A957/A957M constitutes nonconformance with this specification. In case of conflict with this specification and Specification A957/A957M, A957/A957M shall prevail.

4. Ordering Information

4.1 ~~The purchaser should specify the alloy grade desired and whether tension tests are required, and shall include standards of acceptance where necessary.~~ Orders for material under this specification should include the following information in proper sequence:

4.1.1 Quantity;
4.1.2 Specification and grade (50 Cr-50 Ni, R20500; 60 Cr-40 Ni, R20600; 50 Cr-50 Ni-Cb, R20501);
4.1.3 Description of the casting by pattern number or drawing;
4.1.4 Options in the specification:
4.1.4.1 Process,
4.1.4.2 Heat treatment,
4.1.4.3 Tensile properties,
4.1.4.4 Tension tests,
4.1.4.5 Charpy impact tests, and
4.1.4.6 Test specimens or test bars.
4.1.5 Supplementary requirements desired, including standards of acceptance.

5. Materials and Manufacture

5.1 *Process*—The alloy for the castings shall be made by the electric-arc or induction-furnace process unless otherwise agreed upon between the manufacturer and the purchaser. Castings may be poured in sand, shell, investment, or centrifugal molds.

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

5.2 *Heat Treatment*—Castings may be shipped in the as-cast condition. If heat treatment is required, the treatment shall be established by mutual consent between the manufacturer and purchaser and shall be so specified in the inquiry, purchase order, or contract.

6. Chemical Composition

6.1 The castings shall conform to the requirements as to chemical composition prescribed in Table 1.

7. Tensile Properties

7.1 Tensile properties, if required, of the alloy used for the castings shall conform to the requirements prescribed in Table 2.

~~7.2 Tension tests, if required, shall be performed in accordance with Test Methods and Definitions A370.~~

8. Test Specimens

8.1 Test ~~specimens, if required, shall be prepared in accordance with Test Methods and Definitions A370. Test~~ bars shall be poured in special blocks from the same heat as the castings represented. Test bars, if required, shall be furnished in sufficient number to furnish specimens for the test required in Section 9.

8.2 The test coupons shall be cast from the same melt from which the castings they represent are poured, and shall represent the full melting practice. Chemical composition of the test coupons shall conform to the requirements prescribed in Table 1.

~~8.3 Tension test specimens shall be machined to the form and dimensions of the standard round 2-in. [50-mm] gage length specimen shown in Fig. 4 of Test Methods and Definitions A370.~~

8.3 Impact test specimens ~~shall conform to the length and cross section dimensions of the specimens shown in Fig. 10 of Test Methods and Definitions A370. The impact specimens~~ are to be broken ~~unnotched.~~un-notched.

[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.

TABLE 1 Chemical Requirements[A,B]

Element	Composition, %		
	Grade		
	50 Cr-50 Ni (R20500)	60 Cr-40 Ni (R20600)	50 Cr-50 Ni-Cb (R20501)
~~Carbon, max~~	~~0.10~~	~~0.10~~	~~0.10~~
Carbon	0.10	0.10	0.10
~~Manganese, max~~	~~0.30~~	~~0.30~~	~~0.30~~
Manganese	0.30	0.30	0.30
~~Silicon, max~~	~~1.00~~	~~1.00~~	~~0.50~~
Silicon	1.00	1.00	0.50
~~Sulfur, max~~	~~0.02~~	~~0.02~~	~~0.02~~
Sulfur	0.02	0.02	0.02
~~Phosphorus, max~~	~~0.02~~	~~0.02~~	~~0.02~~
Phosphorus	0.02	0.02	0.02
~~Nitrogen, max~~	~~0.30~~	~~0.30~~	~~0.16~~
Nitrogen	0.30	0.30	0.16
~~Nitrogen + Carbon, max~~	~~...~~	~~...~~	~~0.20~~
Nitrogen + Carbon	...	...	0.20
~~Iron, max~~	~~1.00~~	~~1.00~~	~~1.00~~
Iron	1.00	1.00	1.00
~~Titanium, max~~	~~0.50~~	~~0.50~~	~~0.50~~
Titanium	0.50	0.50	0.50
~~Aluminum, max~~	~~0.25~~	~~0.25~~	~~0.25~~
Aluminum	0.25	0.25	0.25
Columbium	...	...	1.4–1.7
Chromium	48.0–52.0	58.0–62.0	47.0–52.0
Nickel	balance	balance	balance

[A] The total of the nickel, chromium, and columbium contents must exceed 97.5 %.

[B] ~~Where ellipses (...) appear~~ All values are maximum, unless a range or minimum is indicated. Where ellipses appear (...) in this table, there is no ~~requirement.~~minimum and analysis for the element need not be determined or reported.