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Designation: A 1014 – 02

Standard Specification for Precipitation-Hardening Bolting Material (UNS N07718) for High Temperature Service[1]

This standard is issued under the fixed designation A 1014; 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 precipitation hardening bolting material (UNS N07718) for high temperature service.

2. Referenced Documents

2.1 *ASTM Standards:*

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[2]

A 962/A 962M Specification for Common Requirements for Steel Fasteners or Fastener Materials, or Both, Intended for Use at Any Temperature from Cryogenic to the Creep Range[3]

B 637 Specification for Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service[4]

B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys, and Cobalt Alloys[4]

E 112 Test Methods for Determining the Average Grain Size[5]

E 292 Test Methods for Conducting Time-For-Rupture Notch Tension Tests of Materials[5]

2.2 *ANSI Standards:*

B1.1 Screw Threads[6]

3. Ordering Information

3.1 *Ordering*—It shall be the responsibility of the purchaser to specify all requirements that are necessary for product under this specification including any supplementary ones and those included in the ordering information required by Specification A 962/A 962M.

4. Common Requirements

4.1 *Common Requirements*—Product furnished to this specification shall conform to Specification A 962/A 962M, including any supplementary requirements indicated on the purchase order. Failure to comply with Specification A 962/A 962M constitutes non-conformance with this specification. If the requirements of this specification conflict with those of Specification A 962/A 962M, then the requirements of this specification shall prevail.

5. Manufacture

5.1 *Melting Process*—Alloy shall be multiple melted using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting is not performed in vacuum, electrodes produced by vacuum induction melting shall be used.

5.2 *Heat Treatment*:

5.2.1 *Solution Treatment*—Material shall be solution heat treated at a temperature within the range of 1725 to 1850°F (941 to 1010°C), held at the selected temperature for a time commensurate with cross-sectional thickness, and cooled at a rate equivalent to an air cool or faster.

5.2.1.1 *Temperature Variation*—Solution treating temperatures shall be controlled in the range of ± 25°F (± 14°C).

5.2.2 *Precipitation Heat Treatment*—Material shall be heated to a temperature of 1325°F (718°C), held at temperature for eight hours minimum, furnace cooled to 1150°F (621°C) at 100°F (56°C) per hour, held at temperature for eight hours, and cooled to room temperature. Alternatively, material may be furnace cooled to 1150°F (621°C) at any rate provided the time at 1150°F (621°C) is adjusted so the total precipitation heat treatment time is 18 hours minimum.

5.2.2.1 *Temperature Variation*—Precipitation treatment temperatures and cooling rates shall be controlled in the range of ± 15°F (± 8°C).

[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 A01.22 on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

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[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 01.01.

[4] *Annual Book of ASTM Standards*, Vol 02.04.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] Available form American National Standards Institute, 11 W. 42 nd St., 13th Floor, New York, NY 10036.

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

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