



Designation: A 891/A 891M – 07

Standard Specification for Precipitation Hardening Iron Base Superalloy Forgings for Turbine Rotor Disks and Wheels¹

This standard is issued under the fixed designation A 891/A 891M; 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.

1. Scope*

1.1 This specification covers precipitation hardening iron base superalloy forgings which are primarily intended for use as turbine rotor disks and wheels.

1.2 Two heat treatments are covered. Selection will depend upon design, service conditions, mechanical properties, and elevated temperature characteristics.

1.3 All of the provisions of Specification A 788/A 788MA788/A788M, apply, except as amended herein.

1.4

2. Referenced Documents

2.1 *ASTM Standards*:²

A788/A788M Specification for Steel Forgings, General Requirements

E112 Test Methods for Determining Average Grain Size

E139 Test Methods for Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials

E165 Practice for Liquid Penetrant Examination for General Industry

E292 Test Methods for Conducting Time-for-Rupture Notch Tension Tests of Materials

3. Ordering Information

3.1 Orders for material under this specification shall include the following:

3.1.1 *Condition*—See Section 4.

3.1.2 *Stress Rupture Test*—Parameters for material furnished in condition 2 of 7.3.3.

3.1.3 *Forging Drawing*—Each forging shall be manufactured in accordance with a drawing furnished by the purchaser showing the dimensions of the forging and the location of mechanical test specimens.

¹ This specification is under the jurisdiction of Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.06 on Steel Forgings and Billets.

Current edition approved May 1, 2007. Published May 2007. Originally approved in 1988. Last previous edition approved in 2003 as A 891 – 98 (2003).

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.

3.1.4 Include the information specified in Specification A 788/A 788MA788/A788M.

4. Condition and Heat Treatment

4.1 The forgings covered in this specification may be ordered in two different solution treated and aged conditions:

4.1.1 *Type 1*:

4.1.1.1 Solution anneal at 1650 \pm 25°F [900 \pm 14°C] for 2 to 5 h at temperature liquid quench.

4.1.1.2 Precipitation harden at 1420 \pm 15°F [770 \pm 8°C] for 16 h at temperature air cool; 1200 \pm 15°F [650 \pm 8°C] for 16 h at temperature air cool.

4.1.2 *Type 2*:

4.1.2.1 Solution anneal at 1800 \pm 25°F [980 \pm 14°C] for 2 to 5 h at temperature liquid quench.

4.1.2.2 Precipitation harden at 1420 \pm 15°F [770 \pm 8°C] for 16 h at temperature air cool; 1200 \pm 15°F [650 \pm 8°C] for 16 h at temperature air cool.

5. Manufacture

5.1 The material shall be made by vacuum melting followed by consumable electrode vacuum arc or electroslag remelting as agreed upon between producer and user.

5.2 The forgings shall be upset forged so that the axis of the disk corresponds with that of the ingot.

6. Chemical Requirements

6.1 *Heat Analysis*—Each heat shall be analyzed by the manufacturer in accordance with Specification A 788/A 788MA788/A788M. The chemical composition shall conform to the requirements specified in Table 1.

7. Mechanical Properties

7.1 The forgings shall conform to the mechanical property requirements specified in Table 2 after heat treatment as prescribed in 4.1.

7.2 *Tension and Hardness*—Tension and hardness testing shall be conducted in accordance with Specification A 788/A 788MA788/A788M.

7.3 *Stress Rupture*:

7.3.1 Combination smooth and notched bar specimens using 0.252 in. [6.4 mm] diameter bars shall be tested to rupture in accordance with Practice E 292E292. Rupture must occur in

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