



Designation: A 891 – 98

## Standard Specification for Precipitation Hardening Iron Base Superalloy Forgings for Turbine Rotor Disks and Wheels<sup>1</sup>

This standard is issued under the fixed designation A 891; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 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, apply, except as amended herein.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

A 788 Specification for Steel Forgings, General Requirements<sup>2</sup>

E 112 Test Methods for Determining the Average Grain Size<sup>3</sup>

E 139 Practice for Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials<sup>3</sup>

E 165 Practice for Liquid Penetrant Examination<sup>4</sup>

E 292 Practice for Conducting Time-for-Rupture Notch Tension Tests of Materials<sup>3</sup>

### 3. Ordering Information

3.1 Orders for material under this specification shall include the information specified in Specification A 788 and the following:

3.1.1 *Condition*—See Section 4.

3.1.2 *Stress Rupture Test*—Parameters for material furnished in condition 2 of 8.3.3.

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.

### 4. Condition

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  $1650 \pm 25^\circ\text{F}$  ( $900 \pm 14^\circ\text{C}$ ) for 2 to 5 h at temperature liquid quench.

4.1.1.2 Precipitation harden at  $1420 \pm 15^\circ\text{F}$  ( $770 \pm 8^\circ\text{C}$ ) for 16 h at temperature air cool;  $1200 \pm 15^\circ\text{F}$  ( $650 \pm 8^\circ\text{C}$ ) for 16 h at temperature air cool.

#### 4.1.2 Type 2:

4.1.2.1 Solution anneal at  $1800 \pm 25^\circ\text{F}$  ( $980 \pm 14^\circ\text{C}$ ) for 2 to 5 h at temperature liquid quench.

4.1.2.2 Precipitation harden at  $1420 \pm 15^\circ\text{F}$  ( $770 \pm 8^\circ\text{C}$ ) for 16 h at temperature air cool;  $1200 \pm 15^\circ\text{F}$  ( $650 \pm 8^\circ\text{C}$ ) 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. The chemical composition shall conform to the requirements specified in Table 1.

### 7. Heat Treatment

7.1 The forgings shall be heat treated in accordance with 4.1.

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

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 03.03.