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An American National Standard

Standard Specification for Steel Forgings, Stainless, for Compressor and Turbine Airfoils[1]

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1. Scope

1.1 This specification covers stainless steel forgings for compressor and turbine bucket, blade, and airfoil applications.

1.2 The values stated in inch-pound units are to be considered the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

A 275 Test Method for Magnetic Particle Examination of Steel Forgings[2]

A 788 Specification for Steel Forgings, General Requirements[2]

E 381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings[3]

E 562 Practice for Determining Volume Fraction by Systematic Manual Point Count[3]

3. Ordering Information

3.1 In addition to the ordering information required by Specification A 788, the purchaser shall include a sketch or written description of the forging with the inquiry and order.

4. General Requirements

4.1 Materials supplied to this specification shall conform to the requirements of Specification A 788 which outlines additional ordering information, manufacturing requirements, testing and retesting methods and procedures, marking, certification, product analysis variations and additional supplementary requirements.

4.2 If the requirements of this specification are in conflict with the requirements of Specification A 788, the requirements of this specification shall prevail.

5. Manufacture

5.1 *Melting Process*—All melting processes of Specification A 788 are permitted unless Supplementary Requirement S1 is invoked by the purchaser.

5.2 *Forging Process*—Either the closed impression die or the open die forging processes may be utilized unless the purchaser specifies one or the other.

5.2.1 *Forging Temperature*—The maximum part temperature during forging shall be 2150°F.

5.3 *Heat Treatment*—Heat treating all forgings is required in accordance with Table 1 to develop the required mechanical properties.

5.3.1 *Number of Heat Treatments*—Two complete heat treatments, consisting of an austenitize, quench and temper, are permitted. Purchaser approval is required prior to any additional heat treatments.

5.3.2 *Temperature Variation*—Heat treating temperatures shall be controlled in the range of ±25°F.

5.4 *Stress Relief*—When heat treatment for mechanical properties is followed by straightening a stress relieving heat treatment is required at a temperature equal to or less than 25°F below the tempering or aging temperature.

5.4.1 *Quenching after Stress Relief*—Water or oil quenching of stress relieved forgings is prohibited.

6. Chemical Composition

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

7. Mechanical Properties

7.1 *Tension, Impact and Hardness Tests*—All testing shall be performed after heat treatment and stress relief, as applicable. The test specimens shall meet the requirements of Table 3.

7.1.1 *Number of Tests*—A minimum of two forgings from each lot shall be randomly selected for longitudinal tensile, impact, and hardness testing. Hardness values of the tension test specimen shall be reported with the tensile data.

7.1.1.1 *Lot Size*—A lot shall consist of all forgings of the same size from one electric furnace heat of steel and heat treated either in the same charge in either a batch furnace or a continuous type furnace.

7.1.1.2 *Continuous Heat Treating Furnaces*—Test forgings shall be taken from each of the first and last push or tray to exit the furnace. Additional forgings shall be taken so that the maximum time between samples is 4 h.

7.1.1.3 *Test Locations*—One tension test specimen and one set of three impact test specimens shall be machined from the

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[2] *Annual Book of ASTM Standards,* Vol 01.05.

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