



Designation: A 290 – 95 (Reapproved 1999)

Standard Specification for Carbon and Alloy Steel Forgings for Rings for Reduction Gears¹

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1. Scope

1.1 This specification covers normalized and tempered, and quenched and tempered carbon and alloy steel forged or rolled rings for reduction gears.

1.2 Several classes of steel are covered as follows:

1.2.1 Classes A, B, C, and D are carbon steel.

1.2.2 Classes E, F, G, H, I, J, K, L, M, P, and T are alloy steel.

1.2.3 All classes are considered weldable under proper conditions. Welding techniques are of fundamental importance and it is presupposed that welding procedure and inspection will be in accordance with proper methods for the class of material used.

1.3 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 275/A275M Test Method for Magnetic Particle Examination of Steel Forgings²

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products³

A 388/A388M Practice for Ultrasonic Examination of Heavy Steel Forgings²

E 44 Definitions of Terms Relating to Heat Treatment of Metals⁴

3. Terminology

3.1 *Definitions*—Definitions of the terms used in 5.4.2 may be found in Definitions E 44.

4. Ordering Information

4.1 The purchaser shall specify in the inquiry, contract, and order the class desired and the supplementary requirements, if any, which should apply.

5. Materials and Manufacture

5.1 *Melting Process:*

5.1.1 The steel shall be produced by any of the following primary processes: open hearth; basic oxygen; electric furnace; or vacuum induction (V.I.M.). The primary melting may incorporate separate degassing or refining and may be followed by secondary melting using electroslag remelting (E.S.R.) or vacuum arc remelting (V.A.R.).

5.1.2 The molten steel may be vacuum degassed prior to or during pouring of the ingot.

5.2 *Discard*—Sufficient discard shall be taken from each ingot to secure freedom from piping and undue segregation.

5.3 *Forging Process*—The forgings shall receive their hot mechanical work under a press or a hammer, or in a mill, each of ample power to work the metal uniformly through its section. These forgings shall be upset or punched, trepanned, and expanded.

5.4 *Heat Treatment:*

5.4.1 *Cooling Prior to Heat Treatment*—After forging and before reheating for heat treatment, the forgings shall be allowed to cool in a manner to prevent injury, to accomplish transformation, and prevent flakes.

5.4.2 Heat treatment shall consist of normalizing and tempering for classes A and B and quenching and tempering for all other classes.

5.4.2.1 *Normalizing*—A furnace charge thus treated is termed a normalizing charge.

5.4.2.2 *Quenching*—The forgings shall be completely austenitized and then quenched in a suitable medium. A group thus treated is termed a quenching charge.

5.4.2.3 *Tempering*—A furnace charge thus treated is termed a tempering charge. Minimum tempering temperatures shall be as follows:

¹ This specification is under the jurisdiction of ASTM 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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² *Annual Book of ASTM Standards*, Vol 01.05.

³ *Annual Book of ASTM Standards*, Vol 01.03.

⁴ *Annual Book of ASTM Standards*, Vol 01.02.