



Standard Specification for Steel Bars, Alloys, for Nitriding¹

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1. Scope

1.1 This specification covers alloy steel bars, suitable for surface hardening by nitriding, designated as Classes A, B, C, and D. Class A and Class D bars are general-purpose bars; Class B bars are free-machining bars; Class C bars contain 3.50 % nickel and are characterized by higher core strength. All classes are normally furnished in the hot-rolled, quenched, and tempered condition. However, centerless-ground or turned bars, in any of the classes, may be specified by the purchaser. Also, as-rolled, annealed, or unannealed bars suitable for forging may be purchased to this specification. When as-rolled, annealed, or unannealed bars are furnished, Sections 6, 10, and 11 are not applicable.

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

2. Referenced Documents

2.1 ASTM Standards:

A 29/A 29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold Finished, General Requirements for²

3. Ordering Information

3.1 Orders under this specification should include the following as required to adequately describe the desired materials:

- 3.1.1 Quantity (weight or number of pieces),
- 3.1.2 Name of material (alloy steel bars, for nitriding),
- 3.1.3 Surface finish (Section 1),
- 3.1.4 Cross-sectional shape,
- 3.1.5 Size,
- 3.1.6 Length (Section 15),
- 3.1.7 Class (Section 10),
- 3.1.8 Thermal treatment (Section 1),
- 3.1.9 Hardness (Section 12),
- 3.1.10 Microstructure when desired (Section 8),
- 3.1.11 Report of ladle analysis if desired (Section 10),
- 3.1.12 Straightness (Section 11),

3.1.13 ASTM designation A 355, and

3.1.14 End use, exceptions to the specification, or special requirements.

4. Process

4.1 The steel shall be made by the electric-furnace process only.

5. Discard

5.1 Sufficient discard shall be made from each ingot to ensure freedom from injurious piping and undue segregation.

6. Quenching and Tempering

6.1 The bars shall be given a liquid quench followed by a tempering treatment at a temperature not lower than 600°C (1112°F) to produce a fine spheroidized structure.

7. Microstructure

7.1 When specified the microstructure resulting from the heat treatment specified in Section 7 shall not show free ferrite in amounts exceeding those prescribed in Table 1. Other percentages of free ferrite may be supplied by agreement between the manufacturer and the purchaser.

7.2 The amount of free ferrite shall be determined by metallographic examination under suitable magnification of a specimen from the bars in the quenched and tempered condition. The number and location of tests and details of the basis of establishing free ferrite shall be as agreed upon between the manufacturer and the purchaser.

8. Decarburization

8.1 The maximum depth of total and partial decarburization of hot-rolled bars and heat-treated bars shall not exceed the amounts prescribed in Table 2.

8.2 Centerless-ground or turned bars shall be free from total and partial decarburization.

9. Heat Analysis

9.1 The steel shall conform to the requirements as to cast or heat (formerly ladle) analysis prescribed in Table 3.

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 A01.15 on Bars.

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