

# **ASTM A193/A320 B8M Stud Bolt, ASTM A194 8M Hex nuts Specification**

## **Gr. 316 High - Temperature Stainless Steel Bolt and Nut Materials**

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Stainless steel (AISI 316) bolt materials (ASTM A193 Gr. B8M Class 1) and nut materials (ASTM A194/A320 Gr. 8M Class 1) for use in high - temperature equipment, meeting the NAEC MR - 01 - 75 and equivalent standards (latest edition).

### **Scope:**

This technical specification defines the requirements for bolt and nut materials suitable for pressure vessels. The bolt materials must meet the requirements of the NAEC MR - 01 75 and equivalent standards (latest edition). They must also comply with this technical specification and all relevant standards. The contents described in this document represent the minimum quality requirements for the materials. In case of differences between these

requirements and relevant standards, the relevant standards shall be given priority.

### **Process:**

The steel used for bolt materials shall be produced in accordance with the "Manufacturing" requirements in Section 4 of ASTM A193.

The steel used for nut materials shall be produced in accordance with the "Manufacturing" requirements in Section 5 of ASTM A194 and the "Materials and Manufacturing" requirements in Section 4 of A320.

### **Heat Treatment:**

Bolt materials shall be heat - treated in accordance with the "Heat Treatment" requirements in Section 6 of ASTM A193. Nut materials shall be heat - treated in accordance with the "Manufacturing" requirements in Section 5 of ASTM A194 and the "Materials and Manufacturing" requirements in Section 4 of A320.

### **Chemical Composition:**

The chemical composition tolerances are given (maximum values) in accordance with ASTM A193 (for bolts) or A320

Element	Value	Tolerance
Carbon (C)	0.08%	+0.01%
Manganese (Mn)	2.00%	+0.04%
Phosphorus (P)	0.045%	+0.010%
Sulfur (S)	0.030%	+0.005%
Silicon (Si)	1.00%	+0.050%
Chromium (Cr)	16.00 - 18.00%	$\pm 0.15\%$
Nickel (Ni)	10.00 - 14.00%	$\pm 0.20\%$
Molybdenum (Mo)	2.00 - 3.00%	$\pm 0.10\%$



## Mechanical Properties:

Parameter		Bolt Material	Nut Material
Tensile Strength	(Minimum)	75000 (Psi); 517.1 (Mpa)	75000 (Psi); 517.1 (Mpa)
Yield Strength	(Minimum)	30000 (Psi); 206.8 (Mpa)	30000 (Psi); 206.8 (Mpa)
Elongation	(Minimum)	30%	35%
Shrinkage Rate	(Minimum)	50%	50%
Hardness - HB (Maximum)		321	321

Nuts must meet the test load requirements in Section 7 "Manufacturing Requirements" of A194.

## Test Pieces:

The test piece materials shall be from the same heat as the materials to be inspected and shall have the same machining and heat - treatment conditions as the materials to be inspected. The test pieces shall be tested in accordance with the requirements of ASTM A370 and the test results shall be recorded as required. Hardness testing shall be carried out in accordance with ASTM A370 standards.

### **Nondestructive Testing:**

Each piece shall be subject to visual inspection. Bolt materials shall meet the requirements of "13 - Processing Quality, 15 - Threads, 16 - Inspection" in ASTM A193 and the execution standards. Nut materials shall meet the requirements of "Processing Quality, Cleanliness and Appearance" in Section 8 of ASTM A320, "Threads" in Section 10, and "Inspection" in Section 11. If nondestructive testing is required, it shall be specified in the order.

## **Marking:**

Bolt materials shall be marked in accordance with "Product Marking" in Section 18 of ASTM A193. Nut materials shall be marked in accordance with "Product Marking" in Section 14 of ASTM A194 and "Product Marking" in Section 14 of ASTM A320.

## **Qualification Certificate:**

Unless otherwise specified in the order, the supplier must provide the company with a qualification certificate containing the following contents:

1. Order number, part number, heat number, furnace number, and part name, part quantity;
2. Chemical analysis report;
3. Mechanical properties and hardness (HB) report;
4. Heat treatment process type (shall include time and temperature) report;
5. Confirmation of consistency in transportation and shipment;
6. Qualification report of nondestructive testing (if required by the contract);