

# **ASTM A320 L7/L43-L7M STUD BOLT SPECIFICATION**

**[www.semetailrgroup.com](http://www.semetailrgroup.com)**

## **Title**

Alloy steel bolt materials for low-temperature service, ASTM A320 Gr L7, meeting API 6A and NACE MR-01-75 (latest edition). For diameters greater than 63.5mm (2-1/2"), ASTM A320 Gr L43 shall be used. ASTM A320 Gr L7M may also be used if it meets this technical requirement (see physical properties).

## **Scope**

This technical specification defines the requirements for bolt materials suitable for pressure vessels. The material must comply with ASTM A320 (Gr L7, L43, L7M), API 6A, and NACE MR-01-75 CLASS III (latest edition). The contents described herein represent the minimum quality requirements for the material and do not supersede relevant standards. In case of conflicts, relevant standards shall take precedence.

## **Process**

Materials shall be produced in accordance with the "Manufacturing" requirements in Section 4 of ASTM A320 for melting and refining processes.

## Heat Treatment

Bolt materials must be heat-treated before supply. Heat treatment of bolt materials shall comply with the relevant requirements in Section 4.3 "Heat Treatment" of ASTM A320.

## Chemical Composition

Allowable variations shall follow ASTM A320 (maximum values, unless ranges are specified).

Element	Gr L7/L7M		Gr L43	
	Content Range	Tolerance	Content Range	Tolerance
Carbon (C)	0.38~0.48 %	±0.02%	0.38~0.48 %	±0.02%
Manganese (Mn)	0.75~1.10 %	±0.04%	0.60~0.85 %	±0.03%
Phosphorus (P)	0.035%	±0.005%	0.035%	±0.005%

Element	Gr L7/L7M		Gr L43	
Sulfur (S)	0.040%	±0.005%	0.040%	±0.005%
Silicon (Si)	0.15~0.35 %	±0.02%	0.15~0.35 %	±0.02%
Chromium (Cr)	0.80~1.10 %	±0.05%	0.70~0.90 %	±0.03%
Molybdenum (Mo)	0.15~0.25 %	±0.02%	0.20~0.30 %	±0.02%
Nickel (Ni)	~		1.65~2.00 %	±0.05%

## Mechanical Properties

Parameter	L7/L43	L7M
Tensile Strength (min)	125000 (Psi) / 861.8 (Mpa)	100000 (Psi) / 689.4 (Mpa)
Yield Strength (min)	105000 (Psi) / 723.9 (Mpa)	80000 (Psi) / 551.5 (Mpa)
Elongation (min)	16%	18%
Shrinkage Rate (min)	50%	50%

Parameter	L7/L43	L7M
Hardness HRB (max)	93~99	93~99

## Low-Temperature Impact Test Requirements

- For L7/L43: -101.1°C (-150°F), 27 Joules
  - For L7M: -73°C (-100°F), 27 Joules
1. Bolt testing shall comply with the "Impact Properties" requirements in ASTM A320.
  2. No requirement for diameters  $\leq 1/2"$ .

**Test Temperature:** (-100°F) -73°C, minimum value for a single specimen:

20FT-LBF (27 Joules).

## Test Pieces

Test materials shall be from the same heat as the material to be verified and shall have the same machining and heat treatment conditions. Test pieces shall comply with API 6A 406 specimen standards and be tested in accordance with API 6A, ASTM A370, and A320 requirements. Records shall be maintained

as required by this document. Low-temperature impact testing shall be performed in accordance with ASTM A370.

## **Non-Destructive Testing**

Each part shall undergo visual inspection. Bolt materials shall comply with the "8-Machining Quality, 10-Threads, 11-Inspection" requirements in ASTM A193 and A320 execution standards. If non-destructive testing is required, it shall be specified in the purchase order.

## **Marking**

Product marking shall comply with the "Product Marking" requirements in Section 14 of ASTM A320. Bolts, studs with diameters  $< 3/8"$ , and screws with diameters  $< 3/4"$  do not require marking.

## **Certification of Conformity**

Unless otherwise specified in the order, the supplier must provide LETE Company with a certificate of conformity containing:

1. Order number, part number, batch number, heat number, part name, and quantity;
2. Chemical analysis report;

3. Mechanical properties, hardness (HRB), and low-temperature impact report;
4. Heat treatment process type (including time and temperature) report;
5. Confirmation of consistency in shipment and mailing;
6. Non-destructive testing conformity report (if required by the contract).