

Low Temperature Service Bolting Alloy Steels

Standard specification covering alloy steel and stainless steel bolting materials for pressure vessels, valves, flanges, and fittings intended for low-temperature service. This standard covers fasteners used down to dynamic cryogenic conditions requiring strict chemical limits and high impact resistance.

CHEMICAL ANALYSIS & ALLOY GRADE MATRIX

ELEMENT / GRADE	L7	L43	B8 CL. 1	B8 CL. 2	B8T CL. 1	B8M CL. 1	B8M CL. 2	B8C CL. 1
Carbon (C)	0.38 - 0.48	0.38 - 0.43	≤ 0.08	≤ 0.08	≤ 0.08	≤ 0.08	≤ 0.08	≤ 0.08
Manganese (Mn)	0.75 - 1.00	0.60 - 0.85	≤ 2.00	≤ 2.00	≤ 2.00	≤ 2.00	2.00	≤ 2.00
Phosphorus (P) Max	0.035	0.035	0.045	0.045	0.045	0.045	0.045	0.045
Sulphur (S) Max	0.040	0.040	0.030	0.030	0.030	0.030	0.030	0.030
Silicon (Si)	0.15 - 0.35	0.15 - 0.35	≤ 1.00	≤ 1.00	≤ 1.00	≤ 1.00	≤ 1.00	≤ 1.00
Nickel (Ni)	—	1.65 - 2.00	8.0 - 10.5	8.0 - 10.5	9.0 - 12.0	10.0 - 14.0	10.0 - 14.0	9.0 - 13.0
Chromium (Cr)	0.80 - 1.10	0.70 - 0.90	18.0 - 20.0	18.0 - 20.0	17.0 - 19.0	16.0 - 18.0	16.0 - 18.0	17.0 - 19.0
Molybdenum (Mo)	0.15 - 0.25	0.20 - 0.30	—	—	—	2.00 - 3.00	2.00 - 3.00	—
Titanium (Ti)	—	—	—	—	5 × C Min	—	—	—
Columbium + Tantalum	—	—	—	—	—	—	—	10 × C Min

INTERNATIONAL STANDARD EQUIVALENTS

GRADE	AISI	AFNOR	DIN	BS
L7 (Gr A)	4142	42CD4	42CrMo4	1506.621
L43 (Gr B)	4340	40NCD7.03	—	—
B8 CL. 1 & 2 (Gr B)	304	Z6CN18.09 / .10	X5 Cr Ni 18.09	1506.801
B8T CL. 1 (Gr Ti)	321	Z6CNT18.10	X10 Cr Ni Ti 18.09	1506.821
B8M CL. 1 & 2	316	Z6CND17.11	X5 Cr Ni Mo 18.10	1506.845
B8C CL. 1 (Nb)	347	—	X10 Cr Ni Nb 18.09	1506.821



GRADE PERFORMANCE & APPLICATION SUMMARIES

Grade L7 & L43 (Alloy Steels)

Grade L7: Chromium-molybdenum steel heat-treated to achieve superior toughness at low temperatures (service down to -150°F / -101°C). Extremely common for cryogenic valve and flange applications.

Grade L43: Nickel-chromium-molybdenum alloy offering deeper hardenability for larger bolt diameters while maintaining high Charpy impact values at low temperatures.

Grade B8 & B8 Class 2 (Austenitic Stainless)

Class 1: Carbide solution treated AISI 304 stainless steel providing excellent corrosion resistance and toughness down to sub-zero service temperatures.

Class 2: Strain hardened variant providing higher tensile and yield strength requirements for high-pressure cryogenic equipment.

Grade B8M & B8M Class 2 (Molybdenum Alloyed)

AISI 316 Based: Addition of 2.0% - 3.0% Molybdenum significantly enhances resistance to pitting, crevice corrosion, and chlorides.

Class 2 strain hardening provides higher design strength for aggressive chemical process lines operating under low-temperature conditions.

Stabilized Grades: B8T & B8C

B8T (AISI 321): Titanium-stabilized grade engineered to prevent chromium carbide precipitation during thermal cycles or welding.

B8C (AISI 347): Columbium/Tantalum-stabilized grade providing high temperature/low temperature integrity in intergranular corrosion environments.

TESTING & COMPLIANCE REQUIREMENTS

- **Charpy V-Notch Impact Test:** Mandatory impact testing required for all ferrite alloy grades (L7, L43) at specified low temperatures to guarantee resistance to brittle failure.
- **Carbide Solution Treatment:** All Class 1 austenitic stainless steels (B8, B8M, B8T, B8C) are solution heat-treated after fabrication to optimize corrosion performance.
- **Strain Hardening:** Class 2 materials undergo cold working after solution treatment to enhance mechanical strength proper ties.
- **Dimensional Standards:** Manufactured in accordance with ASME B18.2.1 heavy hex bolts or ASME B18.31.2 stud bolts where applicable.

LIBERTY BOLT & NUT QUALITY COMMITMENT

Liberty Bolt and Nut supplies fully certified ASTM A320 fasteners with complete mill test reports (MTRs), trace numbers, and full compliance with low-temperature pressure equipment directives. Contact our engineering support team for specialized coating, plating, or non-standard pitch requirements.