

1045 Carbon Steel (UNS G10450) — Material Data Sheet

ASTM A108 cold-finished bar · chemistry per ASTM A29 / SAE J403 · UNS G10450 · AISI/SAE 1045

Medium-carbon steel, hardenable

The medium-carbon workhorse: hardenable by quench and temper, induction hardenable at the surface, strong as drawn — for shafts, axles, studs, gears and hydraulic components.

TENSILE, COLD DRAWN (TYPICAL)	91 ksi	HARDENABLE	Quench and temper; full hardness only in thin sections
YIELD, COLD DRAWN (TYPICAL)	77 ksi	WELDABLE	With preheat
CARBON	0.43–0.50 %	MAGNETIC	Yes

Nominal composition

■ Fe balance ~ 98.7% ■ Mn ~ 0.75% ■ C, P, S trace

Midpoints of the specification ranges, for orientation only. Limits are in the table.

Chemical composition — 1045 (UNS G10450)

Element	Symbol	Min %	Max %
Carbon	C	0.43	0.50
Manganese	Mn	0.60	0.90
Phosphorus	P	—	0.040
Sulfur	S	—	0.050

Per SAE J403 / ASTM A29, confirmed by AZoM, eFunda, Eaton Steel Bar and Capital Steel.

Physical properties (typical)

DENSITY	0.284 lb/in ³ (7.85 g/cm ³)
MODULUS OF ELASTICITY	29.0 × 10 ⁶ psi (200 GPa)
THERMAL EXPANSION (68–212 °F)	6.5 µin/in·°F
MAGNETIC	Yes

Heat treatment

Normalize at 1600 to 1700 °F. Harden by austenitizing at 1500 to 1600 °F, water or oil quench, and temper 700 to 1200 °F to the hardness required. Full martensite forms only in thin sections, under about ½ in.; the core of a 1 in. bar reaches about 30 to 35 HRC. Flame and induction hardening give a surface of about 55 to 60 HRC.

Mechanical properties — 1045

Condition (¾–1¼ in. round)	Tensile strength, typical (ksi)	Yield strength 0.2% offset, typical (ksi)	Elongation, typical (%)	Reduction of area, typical (%)	Hardness, typical
Cold drawn	91	77	12	35	179 HB
Hot rolled	82	45	16	40	163 HB

Typical values for ¾ to 1¼ in. round bar, confirmed by Capital Steel, MW Components (MatWeb data), Alro and Online Metals. ASTM A108 sets no mechanical requirements, so order to a stated minimum where one matters. Quenched-and-tempered properties depend on section size and tempering temperature; confirm them with our estimating team.

Applicable standards

ASTM A108	Cold-finished carbon steel bars
ASTM A29 / SAE J403	Chemical composition of carbon steel bars
ASTM A311	Cold-drawn, stress-relieved carbon steel bars (Classes A and B)

Forms we supply in 1045

- Machined components from certified bar
- Studs, threaded rod and U-bolts
- Hex bolts and cap screws
- Nuts, washers and spacers
- Pins, shafts and bushings

Typical applications

- Shafts, axles and spindles
- Hydraulic cylinder rods and pistons
- Studs, bolts and threaded rod in medium strength
- Gears, sprockets and induction-hardened wear parts
- Machinery components and fixtures