

# 1117 Free-Machining Carbon Steel (UNS G11170) — Material Data Sheet

ASTM A108 / A29 bar · UNS G11170 · AISI/SAE 1117

*Resulfurized low-carbon steel for machining and case hardening*

Low-carbon steel with added sulfur and manganese for fast machining and a good carburized case — the screw-machine grade for case-hardened pins, gears and fittings.

|                               |             |                 |                 |
|-------------------------------|-------------|-----------------|-----------------|
| TENSILE, COLD DRAWN (TYPICAL) | 69 ksi      | SULFUR          | 0.08–0.13 %     |
| YIELD, COLD DRAWN (TYPICAL)   | 58 ksi      | CASE HARDENABLE | Yes, good case  |
| CARBON                        | 0.14–0.20 % | WELDABLE        | Not recommended |

## Nominal composition

■ Fe balance ~ 98.6% ■ Mn ~ 1.15% ■ C, P, S trace

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

## Chemical composition — 1117 (UNS G11170)

| Element    | Symbol | Min % | Max % |
|------------|--------|-------|-------|
| Carbon     | C      | 0.14  | 0.20  |
| Manganese  | Mn     | 1.00  | 1.30  |
| Phosphorus | P      | —     | 0.040 |
| Sulfur     | S      | 0.08  | 0.13  |

Per SAE J403 / ASTM A29, confirmed by ASTM A311 Table 1, Alro, Niagara LaSalle and AZoM.

## Physical properties (typical)

|                       |                                                    |
|-----------------------|----------------------------------------------------|
| DENSITY               | 0.284 lb/in <sup>3</sup> (7.85 g/cm <sup>3</sup> ) |
| MODULUS OF ELASTICITY | 29.0 × 10 <sup>6</sup> psi (200 GPa)               |
| MAGNETIC              | Yes                                                |

## Heat treatment

Supplied cold drawn; carburize at 1650 to 1700 °F and quench for a hard case over a tough core.

## Mechanical properties — 1117

| 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                 | 69                              | 58                                        | 15                      | 40                             | 137 HB            |

Typical values for cold-drawn bar, confirmed by Niagara LaSalle and AZoM (Alro's 1-in. mill average is 69 / 58 ksi). ASTM A108 sets no mechanical requirements, so order to a stated minimum where one matters.

## Applicable standards

|                     |                                           |
|---------------------|-------------------------------------------|
| ASTM A108           | Cold-finished carbon steel bars           |
| ASTM A29 / SAE J403 | Chemical composition of carbon steel bars |

## Forms we supply in 1117

- Machined components from certified bar
- Pins, shafts and bushings
- Case-hardened wear parts
- Washers and spacers

## Typical applications

- Screw-machine pins, studs and fittings
- Case-hardened bushings, gears and shafts
- High-volume turned components
- Hydraulic and pneumatic fittings