

4330V Modified Alloy Steel — Material Data Sheet

AMS 6427 (aircraft quality) · AMS 6411 (vacuum-arc remelted) · UNS K23080 · AISI 4330 modified (vanadium)

Nickel-chromium-molybdenum-vanadium alloy steel, high toughness

A 4340-class steel with lower carbon and a vanadium addition for toughness: 220 to 240 ksi with good impact resistance — the aerospace and oil-tool grade for highly stressed components.

TENSILE, AMS 6411 MIN	220 ksi	CARBON	0.28–0.33 %
YIELD, AMS 6411 MIN	185 ksi	VANADIUM	0.05–0.10 %
CHARPY V-NOTCH, AMS 6411 MIN	15 ft-lbf (longitudinal)	MAGNETIC	Yes

Nominal composition

■ Fe balance ~ 95.7% ■ 1.65–2.00 ~ 1.65% ■ 0.75–1.00 ~ 0.75% ■ 0.75–1.00 ~ 0.65%
■ 0.28–0.33, 0.025, 0.025, 0.15–0.35, 0.35–0.50, 0.05–0.10, 0.35 trace

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

Chemical composition — 4330V (UNS K23080)

Element	AMS 6427	AMS 6411
Carbon	0.28–0.33	0.28–0.33
Manganese	0.75–1.00	0.65–1.00
Phosphorus, max	0.025	0.015
Sulfur, max	0.025	0.015
Silicon	0.15–0.35	0.15–0.35
Nickel	1.65–2.00	1.65–2.00
Chromium	0.75–1.00	0.75–1.00
Molybdenum	0.35–0.50	0.35–0.50
Vanadium	0.05–0.10	0.05–0.10
Copper, max	0.35	0.35

AMS 6427 limits confirmed by Michlin Metals and Aircraft Materials; AMS 6411 limits by Service Steel Aerospace, Michlin Metals and Tech Steel. Percent maximum unless a range is shown.

Physical properties (typical)

DENSITY	0.283 lb/in ³ (7.84 g/cm ³)
MAGNETIC	Yes

Heat treatment

Normalize at 1600 to 1700 °F. Harden by austenitizing at 1550 to 1600 °F and oil quenching, then double temper (2 + 2 h) at 500 to 700 °F for 220 to 240 ksi; the full tempering range is about 500 to 1100 °F depending on the strength required. Stress relieve at about 400 °F after machining at full strength.

Mechanical properties — 4330V

Condition	Tensile strength (ksi)	Yield strength 0.2% offset (ksi)	Elongation (%)	Reduction of area (%)	Hardness
AMS 6411 minimum, 220 ksi level (longitudinal)	220	185	10	35	—
Typical, tempered at 600 °F	225	193	11	47	47 HRC

AMS 6411 minimums for the 220 ksi level, longitudinal, confirmed by Service Steel Aerospace, EMJ and Tech Steel; Charpy V-notch 15 ft-lbf min. Typical values are from the Latrobe (Carpenter) Lescalloy 4330+V VAR datasheet. Strength follows the tempering temperature: 220 to 240 ksi needs a temper of about 500 to 700 °F.

Applicable standards

AMS 6427	4330 modified bars and forgings, aircraft quality (AMS 2301), vacuum degassed
AMS 6411	4330 modified bars and forgings, consumable-electrode vacuum remelted (AMS 2300 premium quality)

Forms we supply in 4330V

- 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

- Drilling tools, subs and crossovers
- Landing-gear and aircraft structural parts
- Crankshafts, connecting rods and highly stressed shafts
- High-pressure valve and wellhead components
- Fracture-critical studs and pins