

Maraging 250 / VASCOMAX® 250 Steel

- AMS 6512

Maraging 250 / VASCOMAX® 250 is an 18% nickel, cobalt strengthened steel (C-type) with excellent properties, workability and heat treatment characteristics. Maraging is double vacuum melted by VIM (Vacuum Induction Melt) followed by VAR (Vacuum Arc Remelt). Maraging material is supplied in the annealed and descaled condition. The alloy is very tough, relatively soft (RC 30/35), readily machined or formed. Maraging provides a high value for critical parts in aerospace, structural, component and tooling applications.

Chemical Composition:

| Symbol | Element | Nominal % |
|--------|------------|-----------|
| C | Carbon | 0.03 max |
| Si | Silicon | 0.10 max |
| Mn | Manganese | 0.10 max |
| Ni | Nickel | 18.50 |
| Co | Cobalt | 7.50 |
| Mo | Molybdenum | 4.80 |
| Ti | Titanium | 0.40 |
| Al | Aluminum | 0.10 |
| Fe | Iron | Balance |

Maraging 250 Machinability (Annealed):

| Operation | Tool Material | Tool Geometry | Depth of cut | Width of cut | Feed | Cutting Speed | Wearland | Cutting Fluid |
|--------------|---------------|--|--------------|--------------|----------------|---------------|----------|------------------------|
| Turning | M2 or T-15 | BR: 0°; SR: 10° SCEA: 15°; ECEA: 5° Relief: 5°; NR: 0.030 in | 0.060 in | -- | 0.009 in/rev | 80 ft/min | 0.060 in | Soluble oil (1:20) |
| Turning | C3 | BR: -5°; SR: -5° SCEA: 15°; ECEA: 15° Relief: 5°; NR: 0.030 in | | -- | 0.009 in/rev | 475 | 0.010 | Soluble oil (1:20) |
| Face milling | M2 or M-7 | AR: 5°; RR: 5°; CA: 45° ECEA: 10°; CI: 8° | 0.060 | 2 in | 0.005 in/tooth | 140 | 0.060 | Highly chlorinated oil |
| Face milling | C2 | AR: 10°; RR: 0° CA: 45° | 0.060 | 2 | 0.005 | 330 | 0.015 | Dry |

| ECEA: 10° CI: 8° | | | in/tooth | | | | | |
|------------------------|----|---|-------------------------|-------|-------------------|-----|-------------------|------------------------|
| Peripheral end milling | M2 | Helix Angle: 30°; RR: 10° CA: 45° x 0.060 in; CI: 7° | 0.250 | 0.750 | 0.004 in/tooth | 225 | 0.012 | Soluble oil (1:20) |
| End mill slotting | M2 | Helix angle: 30°; RR: 10° CA: 45 x 0.060 in; CI: 7° | 0.250 | 0.750 | 0.002 in/tooth | 140 | 0.012 | Highly chlorinated oil |
| Drilling | M1 | 118° plain point; CI: 7° | 0.500 (through hole) | -- | 0.005 in/rev | 100 | 0.015 | Highly sulfurized oil |
| Reaming | M2 | Helix angle: 0°; CA: 45° CI: 7° | 0.500 (through hole) | -- | 0.009 in/rev | 60 | 0.006 | Highly sulfurized oil |
| Tapping | M1 | 2 flute plug; 75% thread | 0.500 (through hole) | -- | -- | 150 | Undersize threads | Highly sulfurized oil |

Machining data provided for informational purposes only.

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Maraging

MARTensitic - a very hard form of steel crystalline structure.

Subsequent AGING (precipitation hardening - approx 3-6 hours @ 900°F yields optimum material characteristics)

Excellent Mechanical Properties

high yield and ultimate tensile strengths

high toughness, ductility and impact strengths

high fatigue strength

high compressive strength

hardness and wear resistance sufficient for many tooling applications

Excellent Workability

high resistance to crack propagation

readily formed – cold, warm, hot (w/o in process anneals)

good weldability w/o preheating or post heating

excellent polishability

Advantages During Application

low coefficient of expansion minimizes heat checking

pitting and corrosion resistance superior to common tool steel

good repair weldability

excellent mechanical properties have led to longer tool life

easily reworked and retreated for secondary tool life

Common Specifications:

AMS 6512

AMS 6520

MIL-S-46850 - Fracture Toughness Applies

Heat Treatment / Aging:

Maraging alloys are essentially carbon-free, a protective atmosphere is not required during annealing or aging. Material is supplied in the solution annealed condition with a hardness of 30/35 Rc. Typical heat treat time/temperature are listed below. Large cross sections should be aged for longer periods.

| Temperature | Time | Resulting Hardness |
|-------------|-------|--------------------|
| 900/925 °F | 6 hrs | 48/52 Rc |

NOTE: A modified aging cycle is suggested for die casting applications for increased die life. The following thermal treatments have been used to obtain desirable characteristics for die casters. Following the rough machining of the die, anneal at 1500-1525 °F for 1 hour per inch of thickness is typical. After finish machining, an aging heat treatment of 980-1000 °F for 6 hours is typical.