

Cutting Tool Compatibility by Material

Material	HSS	Cobalt HSS	Carbide	Ceramic/CBN	Notes
Aluminum 6061	Excellent	Yes	Optimal	No	HSS fine; carbide gives longer life at high speeds.
Aluminum 7075	Yes	Yes	Optimal	No	Stronger; carbide preferred for production.
Brass (Free Cutting)	Excellent	Yes	Yes	No	Very easy to machine; sharp HSS works well.
Bronze (Phosphor)	Yes	Yes	Optimal	No	Tough; carbide gives best results.
Bronze (Aluminum)	Yes	Yes	Optimal	No	Harder than phosphor; carbide recommended.
Copper (Pure)	Yes	Yes	Yes	No	Prone to built-up edge; use sharp tools.
Mild Steel 1018	Limited	Better	Optimal	No	Cobalt extends life; carbide preferred.
Medium Carbon 1045	Limited	Recommended	Optimal	No	HSS struggles; carbide much better.
Alloy Steel 4140/4142 PH	Limited	Yes	Optimal	No	Carbide strongly preferred.
Tool Steel O1 / A2	Limited	Recommended	Optimal	No	Carbide for hardened states.
>45 HRC Tool Steel	No	No	Coated Carbide	Optimal	Requires CBN or ceramics.
303 Stainless	Yes	Recommended	Optimal	No	Free machining; friendly stainless.
304 Stainless	Poor	Better	Optimal	No	Gummy; carbide strongly preferred.
316 Stainless	Poor	Better	Optimal	No	Even tougher than 304.
416 Stainless	Good	Yes	Optimal	No	One of the most machinable stainless grades.
Gray Cast Iron	Wear	Yes	Optimal	Sometimes	Carbide excels; ceramics for high-speed dry cuts.
Ductile Cast Iron	Limited	Yes	Optimal	Sometimes	Similar to gray cast iron.
Titanium (Ti-6Al-4V)	No	Limited	Optimal	Aerospace	Carbide with coolant is standard; ceramics in aerospace.
Acetal (Delrin)	Excellent	Yes	Yes	No	Any tooling works; keep sharp.
Nylon	Excellent	Yes	Yes	No	Use sharp edges; avoid rubbing heat.
Acrylic / Polycarbonate	Yes	Yes	Yes	No	Prone to melting; sharp tools and light passes.