Cutting Tool Compatibility by Material

Material	HSS	Cobalt HSS	Carbide	Ceramic/CBN	Notes
Aluminum 6061	■ Excellent	■	■ Optimal	■	HSS fine; carbide gives longer life at high speeds.
Aluminum 7075	■	■	■ Optimal	■	Stronger; carbide preferred for production.
Brass (Free Cutting)	■ Excellent	■	■	■	Very easy to machine; sharp HSS works well.
Bronze (Phosphor)	■	■	■ Optimal	■	Tough; carbide gives best results.
Bronze (Aluminum)	■	■	■ Optimal	■	Harder than phosphor; carbide recommended.
Copper (Pure)	■	■	■	■	Prone to built-up edge; use sharp tools.
Mild Steel 1018	■ Gummy	■ Better	■ Optimal	■	Cobalt extends life; carbide preferred.
Medium Carbon 1045	■ Limited	■ Recommended	■ Optimal	■	HSS struggles; carbide much better.
Alloy Steel 4140/4142 PH	■	■	■ Optimal	■	Carbide strongly preferred.
Tool Steel O1 / A2	■	■	■ Optimal	■	Carbide for hardened states.
>45 HRC Tool Steel	■	■	■ Coated Carbide	■ Optimal	Requires CBN or ceramics.
303 Stainless	■	■ Recommended	■ Optimal	■	Free machining; friendly stainless.
304 Stainless	■ Poor	■ Better	■ Optimal	■	Gummy; carbide strongly preferred.
316 Stainless	■ Poor	■ Better	■ Optimal	■	Even tougher than 304.
416 Stainless	■ Good	■	■ Optimal	■	One of the most machinable stainless grades.
Gray Cast Iron	■ Wear	■	■ Optimal	■ Sometimes	Carbide excels; ceramics for high-speed dry cuts.
Ductile Cast Iron	■	■	■ Optimal	■ Sometimes	Similar to gray cast iron.
Titanium (Ti-6Al-4V)	■	■ Limited	■ Optimal	■ Aerospace	Carbide with coolant is standard; ceramics in aerospace.
Acetal (Delrin)	■ Excellent	■	■	■	Any tooling works; keep sharp.
Nylon	■ Excellent	■	■	■	Use sharp edges; avoid rubbing heat.
Acrylic / Polycarbonate	■	■	■	■	Prone to melting; sharp tools and light passes.