CopperMai

SanMai / Copper Laminate — Heat Treatment Specification

Revision 1.0 | Baker Forge & Tool, Boone NC

STEEL PROFILES

Copper fusion-welded to a 1084 carbon-steel core (Baker Forge proprietary). The copper is soft and ductile and contributes no hardness — the 1084 core drives the entire heat treat.

	1084 Mono Core	Cladding / Accent
Classification	Carbon / tool steel	Non-hardening copper
Carbon	~0.84%	N/A — non-hardening
Heat treat driver	Drives all HT decisions	Follows core — will not harden
Role	Cutting edge / hardening body	Fusion-welded outer / accent

STEP 1 — NORMALIZE (DO THIS FIRST)

Relieve forge stress and refine grain before hardening. Copper, bronze, nickel and wrought layers are ductile — normalizing does them no harm.

Parameter	Spec
Cycles	2 cycles
Temp	1500°F
Hold time	Until evenly heated through — soak briefly at temp, then still-air cool
Cool	Still air — no forced cooling
Atmosphere	Neutral

STEP 2 — AUSTENITIZE & HARDEN

Heat treat is driven entirely by the 1084 core. Do not adjust temps for the cladding — copper/bronze/nickel/wrought are irrelevant to the hardening schedule.

Parameter	Spec
Austenitize temp	1475°F (target)
Soak time	5–10 min at temp
Atmosphere	Controlled kiln
Quench medium	Parks 50 (preferred) or canola — canola acceptable for 1084
Quench technique	Edge-first, straight vertical plunge
Oil temp	100–120°F (warm oil)
Agitate?	Yes — up-and-down motion only for first 10–15 sec. Never figure-8.

No snap temper and no cryo — there is no stainless layer present. The carbon-steel-core rule applies.

STEP 3 — TEMPER

Double-temper is standard. Carbon steel core: 2 hours per cycle, full air cool between cycles.

Parameter	Spec
Cycles	2 cycles (double-temper)

Temper temp — hard	375°F → target HRC 62–64
Temper temp — balanced	400°F → target HRC 60–62
Temper temp — tough	450°F → target HRC 57–59
Hold time	2 hours per cycle (carbon steel core)
Cool between cycles	Full air cool to room temp before second cycle

EXPECTED HARDNESS RESULTS

Temper Temp	1084 Core (HRC)	Cladding / Contrast	Use Case
375°F	62–64	Soft / ductile	Hard use / high edge retention
400°F	60–62	Soft / ductile	Balanced everyday carry
450°F	57–59	Soft / ductile	High toughness / flexible use

FULL PROCESS SUMMARY

#	Step	Temp / Setting	Notes
1	Normalize ×2	1500°F	Still air cool. 2 cycles.
2	Austenitize	1475°F | Soak 5–10 min	Even heat throughout billet
3	Quench	Parks 50 or canola | 100–120°F	Edge-first, straight plunge. Up-and-down agitation 10–15 sec.
4	Temper ×2	375–450°F | 2 hrs each	Full air cool between cycles. No snap temper, no cryo.

WATCH POINTS & COMMON FAILURES

Issue	What to Watch For / Why It Happens
Soft cladding — expected	Copper layers stay soft after heat treat. This is by design — the 1084 core provides the cutting edge.
Core temp assumption	Heat treat is 100% driven by the 1084 core. Do not adjust temps because copper is present.
Copper oxidation in quench	Copper surface may oxidize/darken in oil. Cosmetic only — clean and continue. Does not affect hardness.

POST-HEAT TREAT — ETCHING

CopperMai etches with a dark iron body and a vivid copper pop at the reveal. Gator Piss Heavy maximizes both the dark and the copper contrast.

Product	Use
Gator Piss Heavy	Blackout etch that reveals the copper/contrast layers. Recommended for production depth.

Gator Skin	Apply after etch for protection. Locks in contrast and extends finish life.
Grime Reaper	Pre-etch cleaning. Remove all oil, fingerprints, and grinding residue before etching.