Zeus Stainless Damascus

Stainless Damascus (154CM / AEB-L) — Heat Treatment Specification

Revision 1.0 | Baker Forge & Tool, Boone NC

STEEL PROFILES

Stainless Damascus of 154CM and AEB-L layered together. Aim the heat treat at the best result for the 154CM + AEB-L blend.

	154CM	AEBL
Classification	High-carbon stainless	Stainless cutlery steel
Carbon	~1.05%	~0.67%
Chromium	~14%	~13%
Molybdenum	~4%	—
Ideal austenitize	1900–1950°F	1950°F

STEP 1 — PRE-HARDENING (ANNEAL, NOT NORMALIZE)

Stainless is NOT normalized like carbon steel. Forge, then mill-anneal or slow-cool, and do rough grinding in the annealed state before hardening.

Parameter	Spec
Condition to harden from	Annealed
Note	Do not run carbon-steel normalize cycles on stainless — no benefit, and grain-coarsening risk

STEP 2 — AUSTENITIZE & HARDEN

This is a 154CM + AEBL blend. The two steels have slightly different ideal austenitize points (154CM 1900–1950°F, AEBL 1950°F). Aim 1950°F as the best compromise for the blend and never exceed 1975°F — toughness and retained-austenite problems climb fast above that.

Parameter	Spec
Austenitize temp	1950°F (target — do NOT exceed 1975°F)
Soak time	15–20 min at temp
Atmosphere	Stainless foil wrap — prevents decarburization and scale
Quench medium	Plate quench (aluminum plates); interrupted oil acceptable
Quench technique	Plates flat and firm; for oil, edge-first straight plunge, up-and-down 10–15 sec
Thermocouple	Required — do not guess austenitize temp

⚠ **Do NOT use canola or slow oil — stainless needs a plate quench (or fast interrupted oil) to beat the nose of the curve. Slow quench = incomplete hardening.**

STEP 3 — SNAP TEMPER (CRITICAL — DO NOT SKIP)

Mandatory for stainless. Relieves quench stress before the martensite cracks. Do it the moment the blade is cool enough to handle.

Parameter	Spec
Timing	Immediately after quench — when cool enough to handle but still warm

Snap temper temp	350°F
Hold time	~1 hour
Cool	Still air — remove from oven, cool on rack

STEP 4 — CRYO

Convert retained austenite to martensite for full hardness and stability. Do this after the snap temper, before the full temper.

Parameter	Spec
Medium	Dry ice slurry minimum — LN2 preferred. A household freezer is NOT effective.
Timing	After snap temper, before full temper
Hold	Until fully soaked at cryo temp, then return to room temp before tempering

STEP 5 — TEMPER

Double-temper standard. Full air cool between cycles.

Parameter	Spec
Cycles	2 cycles (double-temper)
Temper temp	400°F → target HRC 59–61
Hold time	2 hours per cycle
Cool between cycles	Full air cool to room temp before second cycle

EXPECTED HARDNESS RESULTS

Temper Temp	Core (HRC)	Snap / Cryo	Use Case
400°F ×2	59–61	350°F snap + cryo	Corrosion-resistant blade / balanced edge
375°F ×2	60–62	350°F snap + cryo	Higher hardness / max edge retention

FULL PROCESS SUMMARY

#	Step	Temp / Setting	Notes
1	Anneal (post-forge)	—	Harden from annealed state. Do not normalize.
2	Austenitize	1950°F | Soak 15–20 min	Foil wrap. Thermocouple required.
3	Quench	Plate quench	Aluminum plates, flat and firm. No slow oil.
4	Snap Temper ⚠	350°F | ~1 hr	IMMEDIATELY after quench. Do not skip or delay.
5	Cryo	Dry ice or LN2	After snap temper, before full temper.
6	Temper ×2	400°F | 2 hrs each	Full air cool between cycles.

WATCH POINTS & COMMON FAILURES

Issue	What to Watch For / Why It Happens

Skipped/late snap temper	The #1 cause of cracked stainless. Snap temper immediately — cracks form as the blade sits post-quench.
Slow quench	Oil that's too slow leaves soft, non-martensitic steel. Use plate quench or fast interrupted oil only.
No foil wrap	Bare stainless decarburizes and scales at 1950°F. Always foil wrap for austenitize.
Over-temp austenitize	Above 1975°F: toughness collapses and retained austenite climbs. Thermocouple, every time.
Skipped cryo	Retained austenite = soft spots and later dimensional movement. Cryo is not optional on stainless.

POST-HEAT TREAT — ETCHING

Zeus is a fully stainless Damascus — corrosion resistant with strong layer contrast. Gator Piss MAX, single dip.

Product	Use
Gator Piss MAX	Single dip — no double-boiling. Best contrast on stainless Damascus and stainless-clad SanMai.
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.

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