FUTURON FORGE

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FF CONTRAST

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FF CONTRAST is a stainless damascus composed of Uddeholm AEB-L + AISI 304 steels. AEB-L is martensitic stainless steel with a fine structure developed for razors and surgical scalpel.The austenitic stainless AISI 304 adds toughness and a bright shine. This material is intended for knives, jewelry, watchcases, and artwork production.

Steel	Color	C	Si	Mn	P	S	Cr	Ni
AEB-L	Black-Grey	0,65	0,4	0,65	<0,025	<0,015	12,8	
304L	Silver-shiny	<0,03	<0,75	<2	<0,045	<0,03	18-20	9

MACHINING

Our products are soft annealed to achieve optimal machinability, with a hardness of approximately 280 HV. You can use all conventional machining methods. Avoid cutting or shaping the material with machine shears. We recommend using a bandsaw, milling, laser cutting, or waterjet cutting.

MILLING/DRILLING

- Milling – monolithic carbide mill --- Vc50-60 m/min
- For hard-milling (sizing) with monolithic carbide, mill feed up to Vc100 m/min
- Milling with VBD mill --- Vc75-100 m/min
- Milling with HSS-Co mill --- Vc14-16 m/min
- Drilling - HSS-Co drill --- Vc10-12 m/min
- Drilling – PVD coated carbide drill ---Vc60-80 m/min.

GRINDING

You can grind our steel on all conventional types of grinders. We recommend belt-grinders or Berger grinding machines. For belt grinders, we recommend sanding belts with ceramic grains, like 3M Cubitron II; however, all range of conventional abrasives is usable (for example, SAIT, Klingspor, Norton, VSM, etc.). Avoid overheating (tempering) the steel while grinding. When heat-treated, it may lose the required properties.

HEAT TREATMENT

FORGING

Generally, we do not recommend further forging of our damascus steel, as it may cause degradation of the steel's grain structure and properties. In such cases, the structure and properties are not guaranteed. If forging is necessary, follow these instructions:

- The forging temperature is 950-1050 °C / 1742- 1922 °F
- Forging must be done smoothly to avoid the creation of cracks.
- Forged steel is very durable, so forging is more difficult in comparison with usual carbon steels.
- Slow cooling is necessary after the forging process.
- The forged piece has to be properly annealed.

SOFT ANNEALING

- Our materials are delivered soft annealed. You have to apply this process only after forging.
- Heat the material in a furnace to 820 °C / 1508°F
- Hold at the temperature for 4 hours at least
- Slow cooling in a furnace
- You can remove the steel from a furnace when the temperature drops below 380°C / 716°F.

HARDENING

Hardening is essential to achieve full corrosion resistance and the final hardness of the steel. The steel has to be hardened by a professional company using vacuum technology like Bodycote. Recommended hardening process:

- Preheating temperature 1050-1080 °C / 1922-1976°F.
- Hold at the temperature for 15 minutes
- Cooling by nitrogen gas (oil cooling is also possible)
- Deep freeze -150/-196 °C / -302/-384 °F and hold for 1-3 hours. (optional process - increases hardness and durability of steel)

In case of a heat-treating failure, the material can be re-hardened only once. Multiple re-hardening cycles will cause material degradation.

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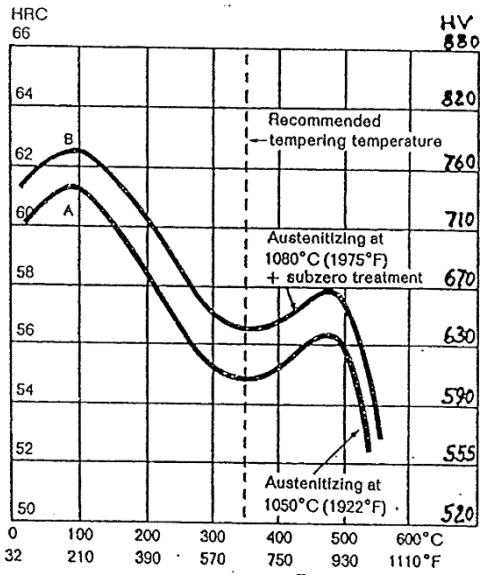
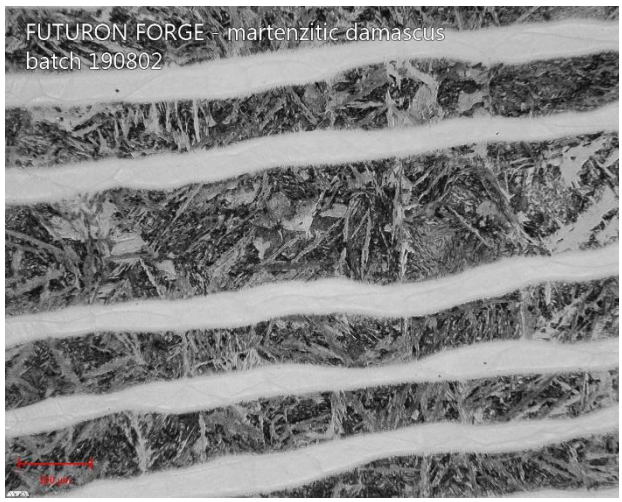
TEMPERING

Tempering have to begin as soon as possible, no later than one hour after hardening.

- We recommend tempering process 2x1h 150-180 °C / 302-356°F for knife blades (AEB-L 60-61 HRc)
- For decorative and art pieces we recommend tempering process 1x2h 250°C / 480°F. Final hardness of AEB-L is 56-57 HRc.





ETCHING

To properly contrast the damascus steel layers, etching the material (blade) is necessary.You can experiment with various etching techniques depending on your skill level. By following the steps below, you'll achieve good results.

Etchant	Solution	Concentration	Time	AEB-L	304L
Ferric Chloride $FeCl_3$	$FeCl_3$ + Distilled water	20-25%	5-10 minutes	Black-Grey	Silver - shiny

- Ensure that the blade's surface is smooth, clean, and free of scratches (etching won't hide imperfections). Finished up to 1000+ grit or polished.
- Properly degrease the blade; cleaning it in the soap-water works well.
- Before etching, test the solution on a sample piece of heat-treated material.
- Before immersing the blade, check for surface dirt in the solution. The etched part has to be degreased and clean. Do not use automatic stirrers or shaking baths during etching. The etching solution can be reused multiple times.
- After etching, neutralize the blade using Na_2CO_3 (Sodium carbonate) or $NaHCO_3$ (Baking soda). You can also use soap water and properly clean the etching residues from a blade.
- Dry the etched blade properly. We recommend spraying the blade with WD-40 (or similar) and drying again to remove any residues.
- For enhanced contrast, lightly polish the etched blade on a buffing wheel. We recommend testing this on a sample piece first.
- To make your etching solution more reactive, increase the temperature, concentration of $FeCl_3$, or add vinegar.

MARKING

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