

STAVAX® ESR

Premium stainless mold steel (AISI 420, modified)

Heat Treatment Recommendations

	Vacuum <small>(See reverse for more specific guidelines)</small>	Salt Bath/Fluidized Bed	Atmosphere Furnace Muffle Furnace/Packed
Preheating Temperature	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize	1. 800-900°F, equalize 2. 1100-1200°F, equalize 3. 1500-1600°F, equalize Step 1 only for big blocks (cross section above 6")	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize
Hardening Temperature Austenitizing	1870-1920°F (Normally 1885°F) Holding time after the tool or part has fully heated through at the hardening temperature: minimum 30 minutes, maximum 1 hour. Alternatively hold 20 minutes for first 1" and then 15 minutes for each additional inch of wall thickness.		
Quenching	Alt. 1 Inert gas, positive pressure; direct quench Alt. 2 Inert gas, positive pressure; interrupted quench (See reverse for specific guidelines)	Alt. 1 Quench in fluidized bed at 700°F then cool in circulated air. Alt. 2 Quench in oil 150°F until the die is black. Alt. 3 Quench in Circulated air.	Alt. 1 Oil 150°F until the die is black, then air cooling Alt. 2 Circulated inert gas. Alt. 3 Circulated air.
Temper immediately after quenching when the tool or part reaches 150°F			
Tempering (minimum two times) Avoid high hardening temperature (>1885°F) in combination with low (<480°F) tempering temperature. Tempering at high temperatures (>1020°F) may be necessary to relieve residual stresses for large/complex tools.	Temperature 480°F 570°F 1020°F 1150°F 1200°F	Hardness 50-52 HRC 49-51 HRC 40-42 HRC 34-36 HRC 30-32 HRC	
Time: 1 hour per inch of wall thickness, or hold at temperature a minimum of 2 hours.			
Average size change as a result of hardening and tempering should not exceed 0.3% overall (0.0015 inches per inch side) if the tool has been stress relieved before finish machining.			

* Cooling rate must be adequate to avoid any transformation, with decreased properties as a result. However, also consider the risk of excessive distortion from very fast cooling. (See reverse for specific quenching guidelines)

STAVAX® ESR - Premium stainless mold steel

- Special re-melting techniques - excellent polishability
- Isotropic mechanical properties - greater reliability in production
- Unique cleanness - excellent corrosion resistance

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose. Current revision of this document located on our website.

STAVAX® ESR

Vacuum Heat Treatment

Guidelines For Optimal Tool Properties

Max Wall Thickness	Shape	Furnace Type	Pre-Heat Temperature	Hardening Temperature	Holding time once soaked through	Quenching Process	Target Quench Rate 1885-1000°F, °F/min.	Temper	Hardness HRC
≤ 2"	Simple	Vacuum	1200°F, equalize 1550°F, equalize	1885°F	30 minutes	4-5 bar; cool to 150°F	70-90	Twice at 480°F	50-52
≤ 2"	Complex	Vacuum	1200°F, equalize 1550°F, equalize	1885°F	30 minutes	2-3 bar; cool to 150°F - or - 4-5 bar; step quench between 1000-700°F (Δ T=200°F min.); continue forced quenching. Temper immediately when tool core reaches 150°F.	70-90	Twice at 480°F	50-52
2" - 4"	All	Vacuum	1200°F, equalize 1550°F, equalize	1885°F	30 minutes	4-5 bar; step quench between 1000-700°F (Δ T=200°F min.); continue forced quenching. Temper immediately when tool core reaches 150°F.	70-90	Twice at 480°F	49-51
4" - 6"	All	Vacuum	1200°F, equalize 1550°F, equalize	1885°F	30 minutes	4-5 bar; step quench between 1000-700°F (Δ T=200°F min.); continue forced quenching. Temper immediately when tool core reaches 150°F.	70-90	Twice at 480°F	47-49
> 6"	All	Vacuum	1200°F, equalize 1550°F, equalize	1885°F	30 minutes	4-5 bar; step quench between 1000-700°F (Δ T=200°F min.); continue forced quenching. Temper immediately when tool core reaches 150°F.	Recommendations on case-by-case basis.	All recommend- ations on individual case- by-case basis*	36-46

*Double temper at 980°F or higher may be necessary to relieve residual stress.

- NOTE:
- 1) Exact heat treatment parameters will change slightly from chemistry to chemistry. Contact the mold material supplier for specific guidelines.
 - 2) These are general guidelines. Heat treatment must be tailored to the actual design of the mold and specified in writing to the heat treater.
 - 3) The required properties for an AISI 420 mold depend upon each specific application.

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