

# Uddeholm Elmax<sup>®</sup>

## SuperClean Powder Metallurgical Tool Steel

	Vacuum	Salt Bath** / Fluidized Bed	Atmosphere Furnace Muffle Furnace / Packed
	** Salt Bath heat treatment can be performed but is not recommended for details with blind holes or threaded holes that will not be rework after heat treatment.		
<b>Preheating Temperature</b>	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize (optional)	1. 1100 – 1200°F, equalize 2. 1500 – 1600°F, equalize	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize
<b>Hardening Temperature (Austenitizing)</b>	1920 – 2010°F (Normally 1980°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.		
<b>Quenching*</b>	<b>Alt. 1</b> Inert gas, positive pressure <b>Alt. 2</b> Back-filled pressurized gas to 1000°F, then equalize center and surface. Continue to 700°F and equalize. Then cool in circulating air.	<b>Alt. 1</b> Quench in Salt 390-1020°F, equal then air cool. <b>Alt. 2</b> Quench in oil 150°F until the part is black, then air cool. <b>Alt. 3</b> Circulated air.	<b>Alt. 1</b> Oil 150°F until the part is black, then air cool. <b>Alt. 2</b> Circulated inert gas. <b>Alt. 3</b> Circulated air.
	*Cooling rate must be adequate to ensure good mechanical properties. However, also consider the risk of excessive distortion from very fast cooling.		
	• For maximum dimensional stability, a cryogenic treatment can be applied immediately after quench. An increase of 1-2 HRC can then be expected. However, avoid intricate shapes due to the risk of cracking.		
<b>Tempering</b>  (minimum two times)  Temper immediately after quenching when the tool or part reaches 150°F	<b>Hardening Temperature:</b> 1980°F  <b>Tempering Temperature</b> 480°F* 980°F		<b>Hardness</b> 56-58 HRC 56-58 HRC
	Tempering Times: 1 hour per inch of wall thickness, or hold at temperature a minimum of 2 hours. *Not recommended when surface treating tools or when maximum dimensional stability is required.		
<b>Stress Temper performed on hardened tools after EDM or welding</b>	Check hardness to confirm tool status. <b>Temperature:</b> Shall be 50°F below the lowest tempering temperature. <b>Time:</b> Soak 30 minutes per inch of maximum section with a minimum of 2 hours once tool comes to temperature. Cool in still air.  Caution: Stress tempering in an unprotected atmosphere will oxidize the tool. For hot work applications, this can prove beneficial to protect the tooling surface during operation. However, in other applications where surface finish condition is a concern, consult your heat treater on options for protective atmospheres or finish the surface after stress tempering.		
<b>Dimensional Stability</b>	Average size change as a result of hardening and tempering may not exceed 0.003 inch/inch/maximum dimension if the tool has been stress relieved before finish machining. If stress relieving is not performed as recommended, dimensional stability may be inconsistent and cannot be guaranteed.		

### Characteristics

- High hardness PM stainless steel
- Excellent polishability
- Can be readily surface treated
- Good corrosion resistance and very good abrasive wear 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. It is your responsibility to confirm you have the latest revision of this document (verify on our website) and that you forward to your Heat Treatment service provider. Failure to do so may result in inferior material properties. Revision Date: August 15, 2024