

Uddeholm Caldie®

Premium Cold Work 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.																							
Preheating Temperature	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize	1. 1100 – 1200°F, equalize 2. 1500 – 1550°F, equalize	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize																					
	3. For cross section larger than 6" thick use a third preheat at 1700°F.																							
Hardening Temperature (Austenitizing)	1830 – 1920°F																							
	Holding time after the tool or part has fully heated through at the hardening temperature: 30 minutes, 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 Alt. 2 Back-filled pressurized gas to 1050°F, then equalize center and surface. Continue to 600°F and equalize. Then cool in circulating air.	Alt. 1 Martempering bath at 930-1020°F Alt. 2 Circulated high speed inert gas	Alt. 1 Circulated inert gas Alt. 2 Circulated air																					
	Quench as rapidly as possible without cracking or creating excessive distortion.																							
Tempering (minimum twice*)	<table border="1"> <thead> <tr> <th><u>Tempering Temperatures</u></th> <th colspan="3"><u>Hardening Temperatures and Hardness</u></th> </tr> <tr> <td></td> <td><u>1830°F**</u></td> <td><u>1885°F</u></td> <td><u>1910°F*</u></td> </tr> </thead> <tbody> <tr> <td>1000°F</td> <td>57-59 HRC</td> <td>58-60 HRC</td> <td>60-62 HRC</td> </tr> <tr> <td>1020°F</td> <td>56-58 HRC</td> <td>57-59 HRC</td> <td>59-61 HRC</td> </tr> <tr> <td>1040°F</td> <td>54-56 HRC</td> <td>55-57 HRC</td> <td>58-60 HRC</td> </tr> </tbody> </table>				<u>Tempering Temperatures</u>	<u>Hardening Temperatures and Hardness</u>				<u>1830°F**</u>	<u>1885°F</u>	<u>1910°F*</u>	1000°F	57-59 HRC	58-60 HRC	60-62 HRC	1020°F	56-58 HRC	57-59 HRC	59-61 HRC	1040°F	54-56 HRC	55-57 HRC	58-60 HRC
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Temper immediately after quenching when the complete tool reaches 150°F	Tempering Times: 1 hour per inch of wall thickness, or hold at temperature for a minimum of 2 hours once the tool comes to temperature. Check hardness between tempers. *For higher dimensional stability, triple tempers 3 x 1 hour should be used. Or, if austenitizing at 1900°F or higher, triple tempers 3 x 2 hours should be used. **The 1830°F hardening temperature should be used for larger cross sections above 6" thick.																							
Stress Temper performed on hardened tools after EDM or after welding with Caldie TIG or Caldie Weld	Check hardness to confirm tool status. Temperature: Shall be 50°F below the lowest tempering temperature. Time: Soak 30 minutes per inch of maximum section with a minimum of 2 hours once tool comes to temperature. Cool in still air.																							
Dimensional Stability	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

- Good chipping resistance similar to AISI S7
- Wear resistance similar to AISI A2
- Can be welded easily with chemistry matched consumables

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: July 10, 2019