

# Uddeholm Vanadis<sup>®</sup> 23, 30, 60

## SuperClean Powder Metallurgical Tool Steel

	Vacuum	Salt Bath**	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 reworked after heat treatment.																																										
<b>Preheating Temperature</b>	1. Bring up to 840-930°F, equalize 2. Heat up to 1500-1600°F, equalize	1. 1000°F, equalize 2. 1550°F, equalize 3. 1850°F, equalize	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize																																								
<b>Hardening Temperature* (Austenitizing)</b>	Holding times after the tool or part has fully heated through at the hardening temperature:  2025°F 20 min 2100°F 15 min 2175°F 10 min	Immersion time after preheating:  2000°F 10 min 2075°F 8 min 2150°F 6 min	Holding times after the tool or part has fully heated through at the hardening temperature:  2025°F 20 min 2100°F 15 min 2175°F 10 min																																								
	*For tools with a wall thickness of 1-1/2" or greater, use an austenitizing temperature higher than indicated in chart to achieve the stated hardness.																																										
<b>Quenching *</b>	<b>Alt. 1</b> Pressurized inert gas Assure sufficient cooling  <b>Alt. 2</b> Interrupted oil quench. Handle with extreme care	<b>Alt. 1</b> Step quench in Salt 1000°F equalize and cool in air <b>Alt. 2</b> Interrupted oil quench for larger tools to 1000°F; then cool in air. <b>Alt. 3</b> Air	<b>Alt. 1</b> Step quench in oil (150°F) with wrapping, once black, remove foil and cool in air. <b>Alt. 2</b> Circulated inert gas <b>Alt. 3</b> Circulated air																																								
	*Cooling rate must be adequate to avoid any transformation products, with decreased properties as a result. However, also consider the risk of excessive distortion from very fast cooling. *For maximum dimensional stability, a fourth temper can be done.																																										
<b>Tempering</b>  (minimum three times)  Temper immediately after quenching when the complete tool reaches 150°F	<table border="1"> <thead> <tr> <th rowspan="3">Grade</th> <th colspan="6">Hardening Temperatures and Hardness</th> </tr> <tr> <th colspan="3">Vacuum/Atmosphere</th> <th colspan="3">Salt</th> </tr> <tr> <th>2025°F</th> <th>2100°F</th> <th>2175°F</th> <th>2000°F</th> <th>2075°F</th> <th>2150°F</th> </tr> </thead> <tbody> <tr> <td>Vanadis 23</td> <td>61-63</td> <td>63-65</td> <td>65-67</td> <td>61-63</td> <td>63-65</td> <td>65-67</td> </tr> <tr> <td>Vanadis 30</td> <td>63-65</td> <td>64-66</td> <td>66-68</td> <td>63-65</td> <td>64-66</td> <td>66-68</td> </tr> <tr> <td>Vanadis 60</td> <td>65-67</td> <td>66-68</td> <td>67-69</td> <td>65-67</td> <td>66-68</td> <td>67-69</td> </tr> </tbody> </table> <p><b>Tempering Times:</b> Temper a minimum of three times, 1 hour each temper. Check hardness between tempers.</p>			Grade	Hardening Temperatures and Hardness						Vacuum/Atmosphere			Salt			2025°F	2100°F	2175°F	2000°F	2075°F	2150°F	Vanadis 23	61-63	63-65	65-67	61-63	63-65	65-67	Vanadis 30	63-65	64-66	66-68	63-65	64-66	66-68	Vanadis 60	65-67	66-68	67-69	65-67	66-68	67-69
Grade	Hardening Temperatures and Hardness																																										
	Vacuum/Atmosphere				Salt																																						
	2025°F	2100°F	2175°F	2000°F	2075°F	2150°F																																					
Vanadis 23	61-63	63-65	65-67	61-63	63-65	65-67																																					
Vanadis 30	63-65	64-66	66-68	63-65	64-66	66-68																																					
Vanadis 60	65-67	66-68	67-69	65-67	66-68	67-69																																					
<b>Stress temper performed on hardened tools after EDM, welding or during preventative maintenance</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 should 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

- Very good chipping resistance with high abrasive wear resistance
- Excellent machinability
- Excellent choice for cutting and forming high strength work materials
- Readily coatable

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 20, 2024