Uddeholm Vanadis® 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.		
Preheating Temperature	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
Hardening Temperature* **(Austenitizing)**	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.		
Quenching*	**Alt. 1** Pressurized inert gas Assure sufficient cooling **Alt. 2** Interrupted oil quench. Handle with extreme care	**Alt. 1** Step quench in Salt 1000°F equalize and cool in air **Alt. 2** Interrupted oil quench for larger tools to 1000°F; then cool in air. **Alt. 3** Air	**Alt. 1** Step quench in oil (150°F) with wrapping, once black, remove foil and cool in air. **Alt. 2** Circulated inert gas **Alt. 3** 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.		

Tempering

(minimum three times)

Temper immediately after quenching when the complete tool reaches 150°F

Tempering Temperature 1040°F

Hardening Temperatures and Hardness

Grade	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

Tempering Times:
Temper a minimum of three times, 1 hour each temper. Check hardness between tempers.

Stress temper performed on hardened tools after EDM, welding or during preventative maintenance	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 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

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