

## Bohler-Uddeholm UDDEHOLM VANADIS 6 Cold Work Tool Steel

Category : Metal , Ferrous Metal , Alloy Steel , Chrome-moly Steel , Tool Steel , Hot Work Steel

### Material Notes:

Description: Chromium-molybdenum-vanadium alloyed PM steel. Toolmaking with highly alloyed tool steel means that machining and heat treatment have to be considered more than with lower alloyed grades. This can, of course, raise the cost of toolmaking. Due to the very carefully balanced alloying and the powder metallurgical manufacturing route, Uddeholm Vanadis 6 has a similar hardening procedure as the common cold work tool steel. In order to reduce the amount of retained austenite and to optimize the abrasive wear resistance high temperature tempering is recommended. One very big advantage with Uddeholm Vanadis 6 is that the dimensional stability after hardening and tempering is much better than for conventionally produced cold work steel and HSS used for cold work. This also means that Uddeholm Vanadis 6 is a tool steel which is very suitable for CVD and PVD coating. Vanadis 6 is characterized by: Very high abrasive-adhesive wear resistance High compressive strength Good toughness Very good dimensional stability at heat treatment and in service Very good through-hardening properties Good resistance to tempering back High cleanliness

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Physical Properties	Metric	English	Comments
Density	7.47 g/cc	0.270 lb/in <sup>3</sup>	hardness of 60 HRC

Mechanical Properties	Metric	English	Comments
Hardness, Brinell	255	255	Soft annealed
Hardness, Rockwell C	60	60	Hardened and tempered
Modulus of Elasticity	225 GPa	32600 ksi	(hardness of 60 HRC)
	190 GPa	27500 ksi	hardness of 60 HRC
	@Temperature 399 °C	@Temperature 750 °F	
Compressive Yield Strength	210 GPa	30400 ksi	hardness of 60 HRC
	@Temperature 199 °C	@Temperature 390 °F	
	2290 MPa	332000 psi	0.2%, hardness of 60 HRC, tempered at 977°F 2 + 2h.
	2530 MPa	367000 psi	0.2%, hardness of 62 HRC, tempered at 977°F 2 + 2h.
	2760 MPa	400000 psi	0.2%, hardness of 64 HRC, tempered at 977°F 2 + 2h.
Impact Test	18.3 J	13.5 ft-lb	hardness of 62 HRC

Thermal Properties	Metric	English	Comments
	11.2 μm/m-°C	6.20 μin/in-°F	

CTE linear Thermal Properties	Metric @ Temperature 199 °C	English @ Temperature 390 °F	hardness of 60 HRC Comments
	12.1 $\mu\text{m}/\text{m}\cdot^{\circ}\text{C}$	6.70 $\mu\text{in}/\text{in}\cdot^{\circ}\text{F}$	hardness of 60 HRC
	@Temperature 399 °C	@Temperature 750 °F	
Specific Heat Capacity	0.460 J/g-°C	0.110 BTU/lb-°F	hardness of 60 HRC
	@Temperature 20.0 °C	@Temperature 68.0 °F	
Thermal Conductivity	22.0 W/m-K	153 BTU-in/hr-ft <sup>2</sup> -°F	hardness of 60 HRC
	@Temperature 199 °C	@Temperature 390 °F	
	25.0 W/m-K	174 BTU-in/hr-ft <sup>2</sup> -°F	hardness of 60 HRC
	@Temperature 399 °C	@Temperature 750 °F	

Component Elements Properties	Metric	English	Comments
Carbon, C	2.1 %	2.1 %	
Chromium, Cr	6.8 %	6.8 %	
Manganese, Mn	0.40 %	0.40 %	
Molybdenum, Mo	1.5 %	1.5 %	
Silicon, Si	1.0 %	1.0 %	
Vanadium, V	5.4 %	5.4 %	

Descriptive Properties	Value	Comments
Pin-On-Disc wear	3.3 mg/min	62HRC

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