UDDEHOLM VIDAR™ 1

General

Uddeholm Vidar 1 is a chromium-molybde-num-vanadium-alloyed steel which is characterized by:

- good high-temperature strength
- good toughness and ductility
- good machinability and polishability
- good through-hardening properties
- good size stability during hardening

Typical analysis %	C 0,38	Si 1,0	Mn 0,4	Cr 5,0	Mo 1,3	V 0,4
Standard specification	AISI H11, B H11, W.-Nr. 1.2343, AFNOR Z38 CDV 5, UNI X37 CrMoV 51 KU, UNE X37 CrMoV 5					
Delivery condition	Soft annealed to approx.185 HB					
Colour code	Orange/light blue					

Properties

Mechanical properties

Tensile strength at room temperature.

Hardness	44 HRC	48 HRC
Tensile strength, R_m	1 400	1 620
Yield point, $R_{p0,2}$	1 150	1 380

HIGH-TEMPERATURE STRENGTH
AT ELEVATED TEMPERATURES

Hardness 48 HRC.

Testing temperature	R_m MPa	$R_{p0,2}$ MPa
200°C (390°F)	1 490	1 250
400°C (750°F)	1 370	1 120
500°C (930°C)	1 190	910
550°C (1020°F)	1 170	790
600°C (1110°F)	880	600

Heat treatment

Soft annealing

Protect the steel and heat through to 850°C (1562°F). Then cool in furnace at 10°C (20°F) per hour to 650°C (1202°F), then freely in air.

Stress relieving

After rough machining the tool should be heated through to 650°C (1202°F), holding time 2 hours. Cool slowly to 500°C (932°F), then freely in air.

Hardening

Preheating temperature: 600–850°C (1112–1562°F) (normally two preheating steps).
Austenitizing temperature: 990–1010°C (1814–1850°F), normally 990–1000°C (1814–1832°F).
Soaking time: 30–45 minutes. Soaking time = time at austenitizing temperature after the tool is fully heated through.

Protect the tool against decarburization and oxidation during austenitizing.

Quenching media

- High speed gas/circulating atmosphere
- Vacuum (high speed gas with sufficient positive pressure)
- Martempering bath (salt or fluidized bed) at 500–550°C (932–1022°F)
- Martempering bath (salt or fluidized bed) at 180–220°C (356–428°F)
- Warm oil

Note 1: Temper the tool as soon as its temperature reaches 50–70°C (122–158°F).
Note 2: In order to obtain the optimum properties for the tool, the cooling rate should be fast, but not at a level that gives excessive distortion or cracks.

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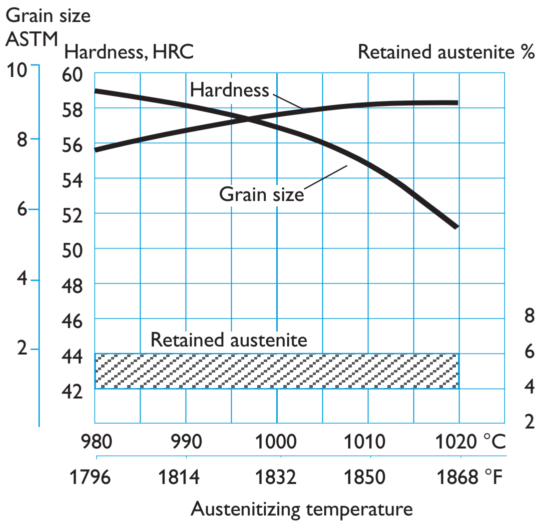
HARDNESS, GRAIN SIZE AND RETAINED AUSTENITE AS A FUNCTION OF AUSTENITIZING TEMPERATURE



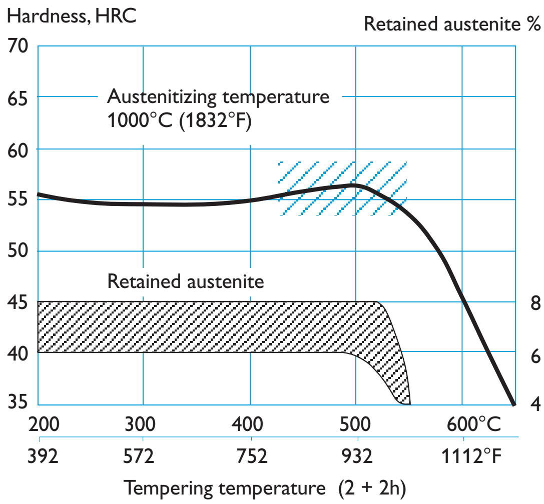
Tempering

Choose the tempering temperature according to the hardness required by reference to the tempering graph below. Temper twice with intermediate cooling to room temperature. Lowest tempering temperature 180°C (356°F). Holding time at temperature minimum 2 hours.

Tempering in the range of 425–550°C (797–1022°F) for the intended final hardness will result in a lower toughness.

TEMPERING GRAPH

Air cooling of specimen 15 x 15 x 40 mm (0,6" x 0,6" x 1,6")



Nitriding and nitrocarburizing

Nitriding and nitrocarburizing result in a hard surface layer which is very resistant to wear and erosion. The nitrided layer is, however, brittle and may crack or spall when exposed to mechanical or thermal shock, the risk increasing with layer thickness. Before nitriding, the tool should be hardened and tempered at a temperature at least 50°C (120°F) above the nitriding temperature.

Nitriding in ammonia gas at 510°C (950°F) or plasma nitriding in a 75% hydrogen/25% nitrogen at 480°C (896°F) both result in a surface hardness of 1100 $HV_{0,2}$. In general, plasma nitriding is the preferred method because of better control over nitrogen potential; in particular, formation of the so-called "white layer", which is not recommended of hot work service, can readily be avoided. However, careful gas nitriding can give perfectly acceptable results.

Uddeholm Vidar 1 can also be nitrocarburized in either gas or salt bath. The surface hardness after nitrocarburizing is 900–1000 $HV_{0,2}$.

DEPTH OF NITRIDING

Process	Time	Depth* mm	Depth* inch
Gas nitriding at 510°C (950°F)	10 h 30 h	0,12 0,20	0,0047 0,0079
Plasma nitriding at 480°C (895°F)	10 h 30 h	0,14 0,19	0,0055 0,0075
Nitrocarburizing – in gas at 580°C (1075°F)	2,5 h	0,12	0,0047
– in salt bath at 580°C (1075°F)	1 h	0,07	0,0028

* Depth of case = distance from surface where hardness is 50 $HV_{0,2}$ over base hardness

FURTHER INFORMATION

Please contact your local Uddeholm office for further information on the selection, heat treatment, application and availability of Uddeholm tool steels. For more information, please visit www.uddeholm.com or www.assab.com