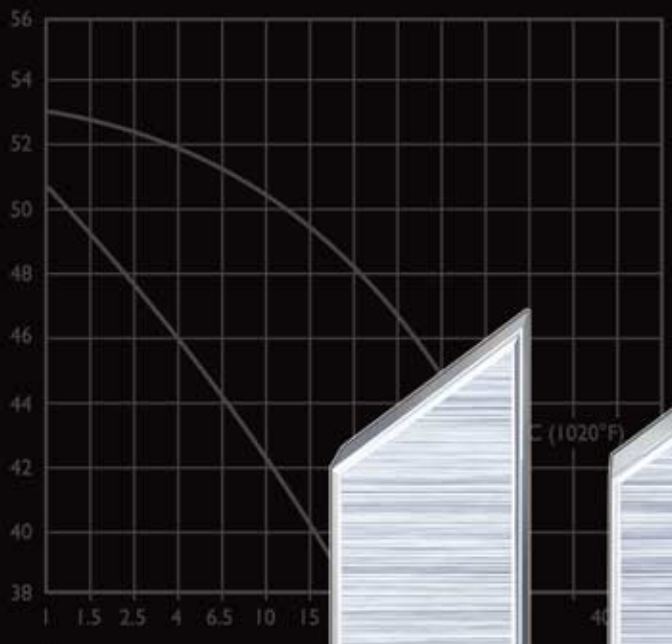
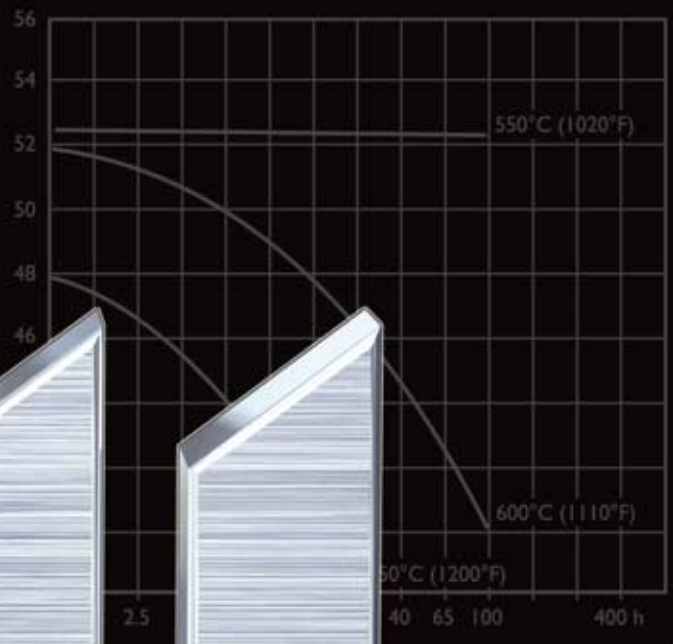
UHB 11

Holder steel

COLD WORK | PLASTIC MOULDING | HOT WORK | HIGH PERFORMANCE STEEL





Typical analysis %	C 2,05			Mn 0,8	Cr 4,5	W 0,2
Standard specifikation	AISI D6, (			D3) (W.Nr. 1.2796)		
Delivery condition	Soft anne			o approx. 200 HB		
Colour code	Red					

Temperature	20°C (68°F)		
Density kg/m³ lbs/m³	7 770 0,281		
Modulus of elasticity N/mm² psi	194 000 28,1 x 10⁶	188 000 27,3 x 10⁶	178 000 25,8 x 10⁶
Coefficient of thermal expansion per °C from 20°C per °F from 68°F	to 100°C 11,7 x 10⁶ to 212°F 6,5 x 10⁶	to 200°C 12 x 10⁶ to 400°F 6,7 x 10⁶	to 400°C 13,0 x 10⁶ to 750°F 7,3 x 10⁶
Thermal conductivity W/m °C Btu in (ft²h°F	- -	27 187	32 221
Specific heat K/kg °C Btu/lbs °F	455 0,109	525 0,126	608 0,145

		200°C (390°F)	400°C (750°F)
		7 650 0,276	7 650 0,275
	194 000 28,1 x 10⁶	189 000 27,4 x 10⁶	173 000 25,1 x 10⁶
Coefficient of thermal expansion per °C from 20°C per °F from 68°F	to 100°C 12,3 x 10⁶ to 212°F 6,1 x 10⁶	to 200°C 14 x 10⁶ to 400°F 6,7 x 10⁶	to 400°C 15,1 x 10⁶ to 750°F 7,3 x 10⁶
Thermal conductivity W/m °C Btu in (ft²h°F	20,5 142	21,5 149	23,0 159
Specific heat K/kg °C Btu/lbs °F	460 0,110	- -	- -

General

Uddeholm's tool steel *UHB 11* is an easily machinable carbon steel characterized by

- Good machinability
- Good mechanical strength.

UHB 11 is primarily intended to be used in the as-delivered condition. It is only to be heat treated for special applications.

Typical analysis	C 0,46	Si 0,2	Mn 0,7
Standard specification	W.-Nr. 1.1730		
Delivery condition	As rolled. Hardness approx. 200 HB		
Colour code	White		

Applications

- Punch holders
- Die holders
- Guide plates
- Backing plates
- Jigs
- Fixtures
- Simple bending dies
- Simple structural components.

Properties

Approximate values at room temperature. Hardness 200 HB.

Tensile strength, Rm	640 N/mm^2 65 kp/mm^2
Yield strength, Rp0,2	340 N/mm^2 35 kp/mm^2
Reduction of area, Z	40 %
Elongation, A_5	20 %

Note: The given figures are typical values and shall not be considered as guaranteed values.

Heat Treatment

UHB 11 is intended to be used untreated, i.e. in the as-delivered condition.
For applications where the material must be hardened to a higher hardness, the following instructions should be followed.

SOFT ANNEALING

Temperature approx. 700° C (1290° F).
Protect the steel and heat through to 700° C (1290° F). Cool in furnace 25° C / h (78° F / h) to 600° C (1110° F) and subsequently freely in air.
Hardness after soft annealing approx. 170 HB.

NORMALIZING

Normalizing temperature 840–870° C (1545–1066° F). Cooling in air.

STRESS RELIEVING

Temperature approx. 650° C (1200° F). After rough machining with chip-cutting tools, stress relieving may be advisable to minimize distortion if the tool is to be hardened. Holding time: 2 h after the entire piece has attained a temperature of approx. 650° C (1200° F). Cooling in furnace to approx. 500° C (930° F), followed by cooling in air.

HARDENING

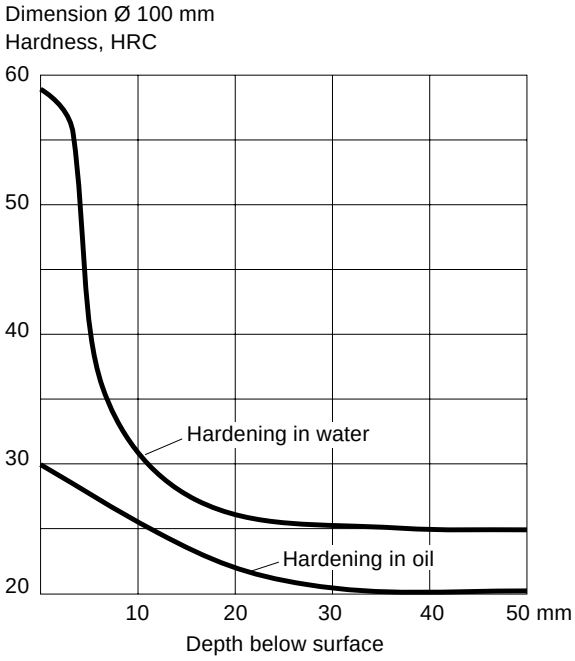
Preheating temperature: 650° C (1200° F).
Austenitizing temperature: 820–870° C (1510–1600° F).
Holding time: 30 min. Protect against decarburization.

QUENCHING MEDIA

- Water
- Oil.

UHB 11 cross ground ready for delivery.

Hardness as a function of depth under surface



TEMPERING

Tempering temperature and hardness.

Quenching media	Hardness, HRC, after tempering Holdig time 1 h. Approx. value					
	200°C 390°F	250°C 480°F	300°C 570°F	400°C 750°F	500°C 930°F	600°C 1110°F
Water	58	56	53	45	37	27
Oil	31	30	29	27	25	20

Austenitizing temperature 830°C.

FLAME AND INDUCTION HARDENING

UHB 11 can be flame or induction hardened to a hardness of 57 ±3 HRC. Water is normally used for quenching during continuous hardening. Temper immediately after hardening.

Cutting data recommendations

The cutting data below are to be considered as guiding values which must be adapted to existing local conditions. More detailed information can be found in Uddeholm "Cutting Data Recommendations".

TURNING

Cutting data parameters	Turning with carbide		Turning with high speed steel
	Rough turning	Fine turning	Fine turning
Cutting speed (v_c) m/min.	150–220	220–300	50
f.p.m.	500–660	730–990	160
Feed (f) mm/r	0,3–0,6	–0,3	–0,3
i.p.r.	0,012–0,023	–0,012	–0,012
Depth of cut (a_p) mm	2–6	–2	–2
inch	0,08–0,20	–0,08	–0,08
Carbide designation ISO	P20–P30 Coated carbide	P10 Coated carbide or cermet	–

DRILLING

High speed steel twist drills

Drill diameter Ø mm	Drill diameter Ø inch	Cutting speed (v_c) m/min.	Cutting speed (v_c) f.p.m.	Feed (f) mm/r	Feed (f) i.p.r.
–5	–3/16	25*	50*	0,08–0,20	0,003–0,008
5–10	3/16–3/8	25*	50*	0,20–0,30	0,008–0,012
10–15	3/8–5/8	25*	50*	0,30–0,35	0,012–0,014
15–20	5/8–3|4	25*	50*	0,35–0,40	0,014–0,016

**) For coated HSS drill v_c ~35 m/min. (115 f.p.m.).*

Carbide drills

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Brazed carbide[1)]
Cutting speed (v_c) m/min.	175–225	85	75
f.p.m.	580–740	250	280
Feed (f) mm/r	0,05–0,25[2)]	0,10–0,25[2)]	0,15–0,25[2)]
i.p.r.	0,002–0,010[2)]	0,004–0,010[2)]	0,006–0,010[2)]

[1)] Drill with internal cooling channels and brazed carbide tip.

[2)] Depending on drill diameter.

MILLING

Face and square shoulder face milling

Cutting data parameters	Milling with carbide		Milling with high speed steel
	Rough milling	Fine milling	Fine milling
Cutting speed (v_c) m/min.	160–200	200–300	35
f.p.m.	530–660	660–990	115
Feed (f_z) mm/tooth	0,2–0,4	0,1–0,2	0,1
inch/tooth	0,008–0,016	0,004–0,008	0,004
Depth of cut (a_p) mm	2–5	–2	–2
inch	0,08–0,2	–0,08	–0,08
Carbide designation ISO	P20–P40 Coated carbide	P10–P20 Coated carbide	–

End milling

Cutting data parameters	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (v_c) m/min.	75	140–190	40[1]
f.p.m.	248	460–630	130
Feed (f_z) mm/tooth	0,03–0,20[2]	0,08–0,20[2]	0,05–0,35[2]
inch/tooth	0,001–0,008[2]	0,003–0,008[2]	0,002–0,014[2]
Carbide designation ISO	K10	P10–P20	–

[1] For coated HSS end mill $v_c \approx 50$ m/min. (165 f.p.m.).
[2] Depending on radial depth of cut and cutter diameter.

GRINDING

General grinding wheel recommendation is given below. More information can be found in the Uddeholm publication “Grinding of Tool Steel”.

Grinding operation	Soft annealed condition	Hardened condition
Face grinding straight wheel	A 46 HV	A 46 GV
Face grinding segment	A 24 GV	A 36 GV
Cylindrical grinding	A 46 LV	A 60 JV
Internal grinding	A 46 JV	A 60 IV
Profile grinding	A 100 LJ	A 120 JV

Welding

As is the case with most tool steels, the welding of *UHB 11* is associated with a risk of cracking. In order to minimize the risk, welding should be carried out with preheating at 100–350° C (210–660° F).

Electrode: Unalloyed basic electrode for welding of unalloyed structural steel.

Note: Always use well dried basic electrodes. Welding can also be performed with an austenitic stainless electrode. The demand of preheating can be reduced but the filler metal does not reach the same hardness level as the base material when hardening.

Further information

Please contact your local Uddeholm office for further information on the selection, heat treatment, application and availability of Uddeholm tool steels.