

# Uddeholm UHB 11<sup>®</sup>

## Welding recommendations

### GENERAL

The property profile of Uddeholm UHB 11 combine to give a steel suitable for bolsters, top and bottom plates and higher strength support plates.

Good results when welding can be achieved if proper precautions are taken (joint preparation, choice of consumables and welding procedure).

### RECOMMENDED FILLER MATERIAL

Welding Method	Gas Tungsten Arc Welding GTAW (TIG)	Gas Metal Arc Welding GMAW (MIG/MAG)	Shielded Metal Arc Welding SMAW (MMA)	Comments
Filler material	Caldie TIG Weld Unimax TIG Weld	Dievar MIG Weld QRO 90 MIG Weld	UTP 67S UTP 73 G2	
	Type AWS ER 312 AWS ER NiCrMo-3		E 29 9 R	Use soft filler material for buffering layer
Hardness as welded	60 – 64 HRC Caldie 58 – 60 HRC Unimax	48 – 52 HRC	56 – 58 HRC 67S 53 – 55 HRC 73 G2	

### DIMENSIONS FILLER MATERIAL

Type	TIG			MIG	MMA		
Dia. Ø mm	1.0	1.6	2.4	1.2	2.5	3.25	4.0
Dia. Ø Inch	0.040	1/16	3/32	3/64	3/32	1/8	5/32
Caldie TIG Weld	X	X	X				
Unimax TIG Weld		X					
Dievar MIG Weld				X			
QRO 90 MIG Weld				X			
UTP 67S					X	X	X
UTP 73 G2					X	X	X

### PARAMETERS

Condition	Pre-hardened 240 – 270 HB	Comment
Preheating Temperature	225°C ± 25°C 440°F ± 50°F	The temperature should be kept constant during the welding operation. Start with buffering layers if not all cracks are removed. Minor repairs can be made with the TIG-method at room temperature.
Interpass temperature	Max 150°C, 270°F above preheating temperature	The temperature of the tool in the vicinity of the weld. When passed, the tool will have a risk for distortion, soft zones or cracking in and around the weld (the HAZ).
Cooling rate	20 - 40°, 35 - 70°F C/h The first 2 hours then freely in air <70°C, 160°F	
Post treatment	Temper 640°C 1185°F	Holding time when tempering, 2h. The temperature depends on the last used tempering temperature. When soft annealing and hardening, see heat treatment specification in Uddeholm UHB 11 product brochure.*

\* Note. We have seen that in many cases a high temperature tempering, 2h, of ~750°C (1380°F) functions instead of a complete soft annealing when welding in soft annealed material.

## PROCEDURES

- Clean weld area.
- Preheat material to  $225^{\circ}\text{C} \pm 25^{\circ}\text{C}$  /  $440^{\circ}\text{F} \pm 50^{\circ}\text{F}$  and maintain temperature during welding.
- Do not let the temperature in the vicinity of the weld (the HAZ) increase more than  $150^{\circ}\text{C}$  /  $270^{\circ}\text{F}$  above the preheating temperature. There is a risk of lowering (softening) the hardness of the base material or/and cracking in the HAZ. Use temple sticks or other temperature-measuring devices.
- For finishing layers use consumables which give suitable hardness.
- Wait a few minutes between each layer of strings, both for soft and hard filler, in order to let the layer equalize and minimize stresses, if possible use pre-heating furnace. Peen to minimize stresses.
- If possible, change welding direction  $180^{\circ}$  between each layer.
- Cool slowly after welding,  $20 - 40^{\circ}\text{C}/\text{h}$ ,  $35 - 70^{\circ}\text{F}/\text{h}$  for the first two hours and then freely in air  $< 70^{\circ}\text{C}$  /  $160^{\circ}\text{F}$ .
- Temper at  $640^{\circ}\text{C}$  /  $1185^{\circ}\text{F}$  for two hours.
- Tools welded in the annealed condition must undergo a full soft annealing immediately after welding. Allow tool to cool to room temperature before soft annealing. If a complete soft annealing cannot be done, which we recommend, a high temperature tempering at  $750^{\circ}\text{C}$  /  $1380^{\circ}\text{F}$  could be used. Be aware of that the working properties of the material will be somewhat reduced, if the high temperature tempering is used instead of the soft annealing.

Use these guideline recommendations along with  
“Welding of Uddeholm Tool Steel” for complete instructions.