

# Uddeholm

## QRO 90 Weld / TIG-Weld

### WELDING OF HOT WORK TOOLS

QRO 90 Weld is a basic coated electrode and QRO 90 TIG-Weld is a TIG filler rod. These are suitable for welding of the following tool steels:

Uddeholm Dievar, Uddeholm Orvar Supreme, Uddeholm Orvar Superior, Uddeholm Orvar 2 Microdized, Uddeholm Vidar 1, Uddeholm Vidar 1 ESR, Uddeholm Vidar Supreme, Uddeholm Vidar Superior, Uddeholm QRO 90 Supreme and Uddeholm Hotvar.

QRO 90 Weld and QRO 90 TIG-Weld give a weld metal similar in composition to Uddeholm QRO 90 Supreme, a high performance hot work steel. In comparison with AISI H13, Uddeholm QRO 90 Supreme exhibits considerably better hot strength and temper resistance. These features confer excellent resistance to thermal fatigue and high-temperature wear.

### DIMENSIONS

#### QRO 90 WELD

Diameter		Length		Current A (DC+)	Voltage V
mm	inch	mm	inch		
2,5	0,10	350	14	90–110	~23
3,25	0,12	350	14	115–140	~24
4,0	0,16	350	14	155–190	~26

Redrying temperature 250–300°C (480–570°F) 2–3 hours.

#### QRO 90 TIG-WELD

Diameter		Length	
mm	inch	mm	inch
1,0	0,04	1000	40
1,6	0,06	1000	40
2,4	0,09	1000	40

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose.

Classified according to EU Directive 1999/45/EC For further information see our "Material Safety Data Sheets".

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### STORAGE OF ELECTRODES

Always keep the electrodes in a thermostatically controlled drying cabinet at 50–150°C (120–300°F) once the package has been opened. The electrodes can be stored unpacked as long as they are kept in the cabinet. Make it a rule that electrodes are clean and dry prior to welding.

### WELDING OF UDDEHOLM HOT WORK TOOL STEELS

#### GENERAL

Good results when welding tool steel can be achieved if proper precautions are taken during welding (elevated working temperature, joint preparation, choice of consumables and welding procedure). Hot work tool steels should be welded using electrodes giving a weld metal which exhibits at least as good thermal-fatigue resistance as the base die steel.

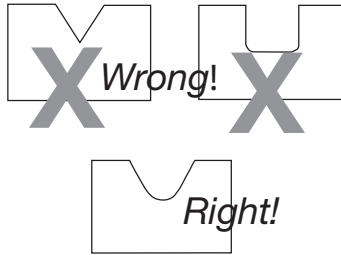
Welding method	Gas Tungsten Arc Welding GTAW/TIG	Shielded Metal Arc Welding SMAW/MMA
Filler metal	QRO 90 TIG-WELD	QRO 90 WELD
Hardness as welded	50–55 HRC	50–55 HRC

#### CLEANING OF TOOL

Clean the tool carefully with degreasing agent or by grinding before welding. The surfaces in the vicinity of the intended repairs/adjustment should be cleaned to base metal prior to doing anything. Make sure that the cavity surfaces are protected during welding.

## JOINT PREPARATION

For a satisfactory result, it is imperative that the region to be welded is carefully prepared. Cracks should be ground out so that the joint bottom is well rounded and such that the sides make an angle of at least 30° to the vertical. The breadth of the joint bottom should be at least 1 mm greater than the diameter of the electrode plus coating. Any damage occurring during welding should be ground down to “sound steel” before re-welding.



## PREHEATING TEMPERATURE

The temperature of the tool during the entire welding process should be constant. This is best achieved using electrical heating elements.

If the tool is preheated in a furnace prior to welding, then it is important that the furnace temperature is below 300°C (570°F) when the tool is put in.

	Soft annealed	Hardened
Hardness	185 HB	42–53 HRC
Preheating temperature	325–375°C (620–710°F)	325–375°C (620–710°F)
Max. interpass temperature	475°C (880°F)	475°C (880°F)

## BUILDING UP THE WELD

The root runs should be made with a small diameter electrode (Ø max. 3,25 mm/0,13”). If TIG-welding, the current should be limited to 120 A. The first two runs should always be welded with the same low heat input, while a greater heat input can be used for the remaining layers.

Ensure that the heat from each run tempers the previous run. Hence even for very minor repairs, the minimum number of runs should be two.

Use a short arc and weld in separate runs. Do not oscillate the gun. Angle the electrode

90° to the joint sides in order to avoid undercut. In addition, the electrode should be held at an angle of 75–85° to the direction of forward movement.

For small repairs and for the final runs along the fusion line, TIG-welding is to be preferred. The transition region between weld and base steel should be carefully inspected prior to stopping welding. Arcing sores or undercut should be repaired while the tool is still hot. After welding, the final layer of weld metal is ground away prior to any heat treatment.

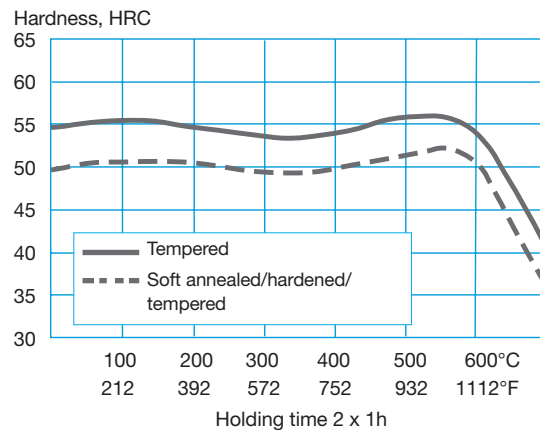
For more detailed information, see the Uddeholm brochure “Welding of Tool Steels”.

## POST TREATMENT

	Soft annealed	Hardened
Hardness	185 HB	42–53 HRC
Cooling rate	20–40°C/h (35–70°F/h) for the first 2 hours then freely in air	
Heat treatment	Soft anneal Harden Temper	Temper 10–20°C (20–35°F) below the higher previous temp. temperature

## TEMPERING GRAPH FOR FILLER MATERIAL

Hardness as welded 50–55 HRC.



## 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](http://www.uddeholm.com)