

# QRO™ 90 SUPREME

## Premium Hot Work Die Steel

### Heat Treatment Recommendations

	Vacuum	Salt Bath/Fluidized Bed	Atmosphere Furnace Muffle Furnace/Packed
<b>Preheating Temperature</b>	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize	1. 800-900°F, equalize 2. 1100-1200°F, equalize 3. 1500-1600°F, equalize Step 1 only for big blocks (cross section above 6")	1. Bring up to 1200°F, equalize 2. Heat up to 1550°F, equalize
<b>Hardening Temperature Austenitizing</b>	1870-1920°F (Normally 1920°F)  Holding time after the tool or part has fully heated through at the hardening temperature: minimum 30 minutes, maximum 1 hour. Alternatively hold 20 minutes for first 1" and then 15 minutes for each additional inch of wall thickness.		
<b>Quenching</b>  <b>IMPORTANT Quench as quickly as possible*</b>	<b>Alt. 1</b> Inert gas, positive pressure <b>Alt. 2</b> Back-filled pressurized gas to 750-850°F, then equalize center and surface. (Maximum holding time 30 minutes) Continue forced cooling to 150°F.	<b>Alt. 1</b> Quench in salt 950-1050°F. <b>Alt. 2</b> Quench in oil 150°F until the die is black. <b>Alt. 3</b> Circulated air.	<b>Alt. 1</b> Oil 150°F until the die is black, then air cooling <b>Alt. 2</b> Circulated inert gas. <b>Alt. 3</b> Circulated air.
<b>Tempering (minimum two times)  Temper immediately after quenching when the tool or part reaches 150°F</b>	<b>Temperature</b> 1100°F 1130°F 1160°F 1200°F 1230°F  Time: 1 hour per inch of wall thickness, or hold at temperature a minimum of 2 hours.	<b>Hardness</b> 48-52 HRC 46-50 HRC 44-48 HRC 42-46 HRC 40-44 HRC	
Average size change as a result of hardening and tempering should not exceed 0.3% overall (0.0015 inches per inch side) if the tool has been stress relieved before finish machining.			

\* Cooling rate must be adequate to avoid any transformation products, with decreased properties as a result. However, also consider the risk of excessive distortion from very fast cooling. A minimum quench rate of 70-80°F/minute as measured at a depth of ~ 5/8" is recommended to optimize tool properties.

### QRO™ 90 SUPREME - For extended die life

- Greater reliability in production (Optimum Alloy balance)
- Longer die life (Increased hot hardness and temper resistance)
- Lower cost per unit (optimal Mechanical properties)

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. Current revision of this document located on our website.