Nu-Die® V (AISI H13) has been the most popular, and perhaps the most versatile hot work tool steel available for many years. It provides a good balance of toughness, heat check resistance and temper resistance, along with moderate wear resistance. It is air hardenable and is used in most applications in the heat treated condition at HRC 44-52. The normal tempering temperatures for Nu-Die V are quite high (>1000°F, 540°C), allowing it to retain its heat treated hardness and strength while in service at elevated temperatures. Nu-Die V may be used for tool temperatures up to about 1000°F (540°C) with brief exposures up to 1100°F (595°C), making it ideal for forging dies, hot extrusion tooling, and die casting dies. Crucible offers two premium versions, Nu-Die XL and Nu-Die ESR, for applications requiring critical polishability, improved heat check resistance and better transverse toughness.

Crucible Industries LLC
**Annealing:** Heat to 1600°F (870°C), hold 2 hours, slow cool 25°F (15°C) per hour to 1200°F (650°C) then air cool. OR heat to 1600°F (870°C), hold 2 hrs., cool to 1400°F (760°C) hold 6 hrs. then air cool.

**Annealed Hardness:** About BHN 192/235

**Stress Relieving**

**Annealed Parts:** Heat to 1200-1250°F (650-675°C), hold 2 hours, then cool in still air to room temperature.

**Hardened Parts:** Heat to 25-50°F (15-25°C) below the original tempering temperature, hold 2 hours, then cool in still air to room temperature.

**Hardening**

**Critical Temperature:** 1560°F (850°C)

**Preheat:** Heat to 1100-1250°F (595-675°C), equalize, then to 1450-1550°F (790-845°C), equalize.

**Austenitize:** 1825-1875°F (995-1025°C), Hold time at temperature 30-45 minutes. **Hardening from the high end of the range will provide better resistance to softening but with a slight decrease in toughness.**

**Quench:** Air or positive pressure quench (2 bar minimum), salt or interrupted oil to below 150°F (65°C)

A minimum quench rate of about 50°F (25°C) per minute from 1800°F (980°C) down to below 1200°F (650°C) is recommended to achieve maximum impact toughness.

**Temper:** 1000-1200°F (540-650°C). Temper Twice. Temper 2 hours minimum each time or at least 1 hour per inch (25mm) of thickness. Air cool to room temperature.

**Dimensional Change:** Average dimensional change for normally heat treated Nu-Die V is about +0.06% (= a growth of 0.0006 in/in) when tempered in the range 1000-1150°F (540-620°C). Variations in the heat treating process will affect actual results.

**Surface Treatments**

Nu-Die V may be nitrided or PVD coated. Because of its high tempering temperatures (>1000°F, >540°C), it will retain its hardness after such processes. As for most tool steels, higher temperature surface treatments, such as CVD, may result in dimensional distortion.