



## **LSS™ 4140 and 4142HT Alloy Steels** (AISI 4140 and 4142)

### Typical Composition

<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>Cr</b>	<b>Mo</b>
<b>0.40</b>	<b>1.00</b>	<b>0.25</b>	<b>1.00</b>	<b>0.20</b>

**LSS 4140 and 4142HT** are versatile, alloy steels that are used in variety of tooling and other industrial applications. LSS 4140 is the classic AISI 4140 alloy steel that is sold in the annealed condition at a hardness less than or equal to 217 HBW. LSS 4142HT is a similar steel which is sold prehardened to 28 to 32 HRC (269 to 302 HBW). Pieces of LSS 4142HT that are greater than about 3 inches (76.2mm) in thickness typically exhibit a lower hardness in the central region of the cross section.

Typical applications for these steels include break dies, bending dies, support tooling, die holders, gears, flanges, collets, arbors, spindles, axles, clutch parts, forming rolls, wrenches and other hand tools, and various machine tool components.

### Physical Properties

Density: 0.283 lb/in<sup>3</sup> (7833 kg/m<sup>3</sup>)

Specific Gravity: 7.83

Modulus of Elasticity: 29x10<sup>6</sup> psi (200 GPa)

#### Thermal Conductivity:

Temperature, °F	Btu/hr/ft/ °F	Temperature, °C	W/m/ °K
212	24.7	100	42.7
392	24.4	200	42.3
752	21.8	300	37.7

#### Coefficient of Thermal Expansion:

Temperature, °F	in/in °F×10 <sup>-6</sup>	Temperature, °C	mm/mm °C×10 <sup>-6</sup>
70 - 212	6.5	21 - 100	11.68
70 - 392	6.8	21 - 200	12.22
70 - 572	7.1	21 - 300	12.76

Machinability: 60 - 65% of a 1% carbon steel

## LSS™ 4140 (4142) HEAT TREATING INSTRUCTIONS

(See Tech-Topics Bulletin 102 for a more thorough explanation of heat treating.)

LSS 4140 is supplied in the annealed condition and is typically heat treated prior to be placed into service. The following heat treatment parameters should be used to harden the steel.

LSS 4142HT is typically not heat treated by the customer. In those rare circumstances where LSS 4142HT must be rehardened, the steel must first be annealed prior to hardening.

### HARDENING:

#### Critical Temperatures:

Ac1: 1350°F (732°C)	Ac3: 1480°F (804°C)
Ar1: 1255°F (680°C)	Ar3: 1370°F (743°C)
M <sub>s</sub> : 650°F (343°C)	M <sub>f</sub> : 500°F (260°C)

**Preheating:** Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1250°F (677°C) and equalize.

**Austenitizing (High Heat):** Heat rapidly from the preheat to 1500 - 1600°F (816 - 871°C). Soak for 30 minutes per inch (25.4 mm) of thickness.

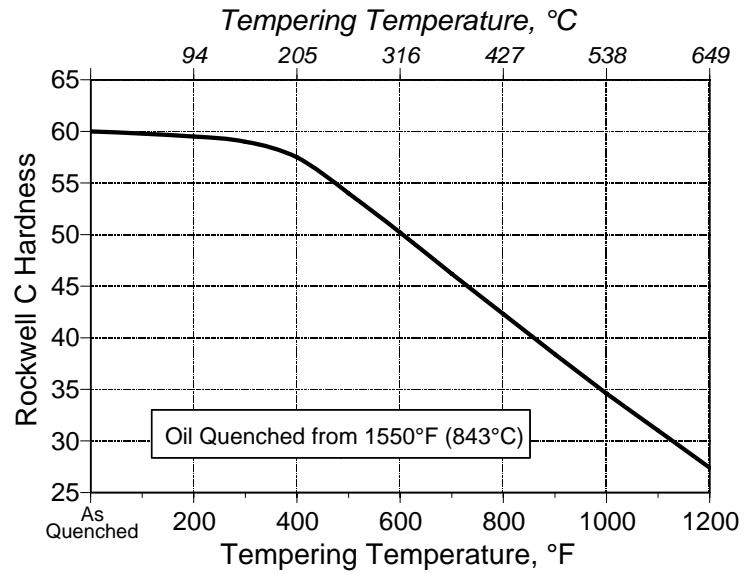
**Quenching:** Pressurized gas, or interrupted oil to 150-125°F (66-51°C).

For the oil quench, quench until black, about 900°F (482°C), then cool in still air to 150-125°F (66-51°C).

**Tempering:** *Temper immediately after quenching.* Hold at temperature for 1 hour per inch (25.4 mm) of thickness, 2 hours minimum, then air cool to ambient temperature.

**ANNEALING:** Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1500°F (816°C), and hold at temperature for 1 hour per inch (25.4mm) of maximum thickness; 2 hours minimum. Then cool slowly with the furnace at a rate not exceeding 20°F per hour (11°C per hour) to 1230°F (666°C). Continue cooling to ambient temperature in the furnace or in air. The final hardness should be a maximum of 217 HBW.

## HEAT TREATMENT RESPONSE



**LATROBE SPECIALTY  
STEEL COMPANY**

Latrobe, PA Phone: 724-537-7711  
FAX: 724-532-6316  
WEB: www.latrobesteel.com

Vienna, OH Phone: 800-321-6446  
FAX: 330-609-2054

Marlborough, MA Phone: 800-444-4447  
FAX: 508-481-6581

The data presented herein are typical values, and do not warrant suitability for any specific application or use of this material. Normal variations in the chemical composition, the size of the product, and heat treatment parameters may result in different values for the various physical and mechanical properties.