DATA SHEET

LATROBE SPECIALTY STEEL COMPANY
Latrobe, PA 15650-0031 USA

Issue 1

LSS™ D5 Tool Steel

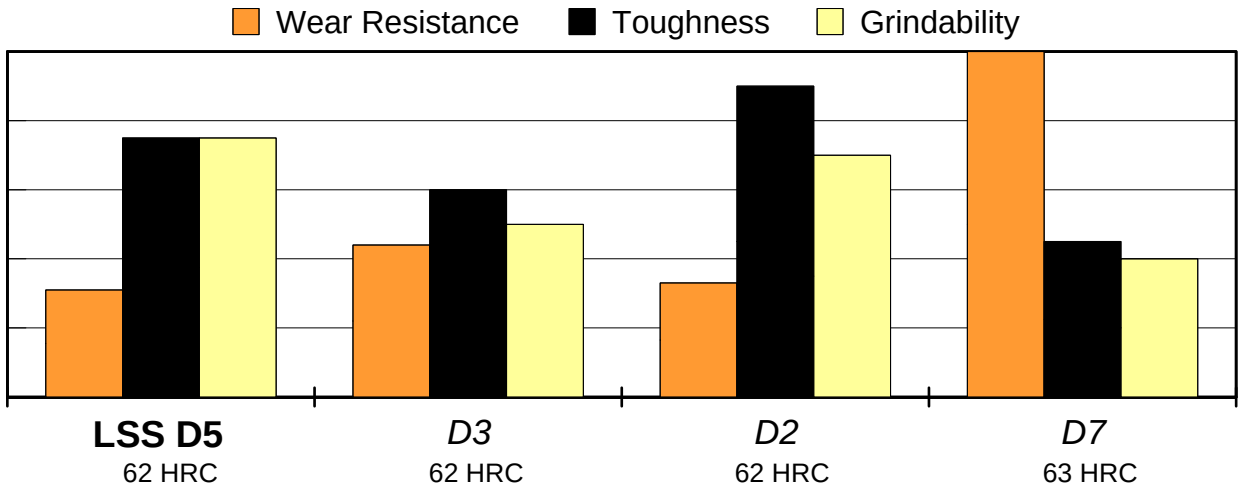
(ASTM D5)

Typical Composition

C	Mn	Si	Cr	Mo	Co
1.50	0.35	0.50	11.65	0.80	2.80

LSS D5 tool steel is an air hardening, high-carbon, high-chromium, tool steel that is characterized by a cobalt addition that provides unique resistance to galling and pick-up. The cobalt also imparts some resistance to tempering, which makes LSS D5 suitable for some semi-hot work tooling applications.

Relative Properties



Physical Properties

Density: 0.279 lb/in^3 (7722 kg/m^3)
Specific Gravity: 7.73
Modulus of Elasticity: 30x10^6 psi (207 GPa)

Machinability: 45-50% of a 1% carbon steel

Coefficient of Thermal Expansion: (at 61-62HRC)

Temperature, °F	in/in °Fx10^{-6}	Temperature, °C	mm/mm °Cx10^{-6}
100 - 500	5.49	38 - 260	9.88
100 - 800	6.14	38 - 427	11.05
100 - 1000	6.68	38 - 538	12.02
100 - 1200	6.89	38 - 649	12.40

LSS™ D5
HEAT TREATING INSTRUCTIONS

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

HARDENING:

Critical Temperatures:
Ac1: 1530°F (832°C)
Ar1: 1390°F (754°C)

Preheating: To minimize distortion and stresses in large or complex tools use a double preheat. Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1200-1250°F (649-677°C) equalize, then heat to 1400-1450°F (760-788°C). For normal tools, use only the second temperature range as a single preheating treatment.

Austenitizing (High Heat): Heat slowly from the preheat.

Furnace or Salt: 1825-1850°F (996-1010°C)

Quenching: Air, pressurized gas, or interrupted oil to 150 - 125°F (61-55°C). Interrupted oil produces maximum hardening response in section thicknesses over 6 inches (153 mm).

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

Tempering: *Temper immediately after quenching.* The typical tempering range is 350 - 600°F (177-316°C) Hold at temperature for 1 hour per inch (25.4 mm) of thickness, 2 hours minimum, then air cool to ambient temperature.

For semi-hot work applications, temper at 900-950°F (482-510°C). Double tempering is required.

To minimize internal stresses in cross sections greater than 6 inches (152.4 mm) and to improve stability in tools that will be EDM'd after heat treatment, soaking times of 4 to 6 hours at the tempering temperature are strongly recommended.

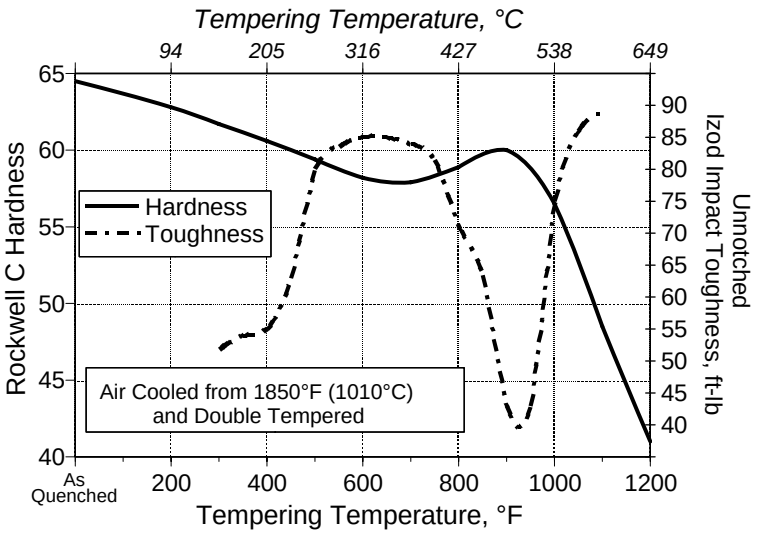
Cryogenic Treatment: Refrigeration treatments should typically be performed after the first temper, and must be followed by a second temper.

ANNEALING: Annealing must be performed after hot working and before rehardening.

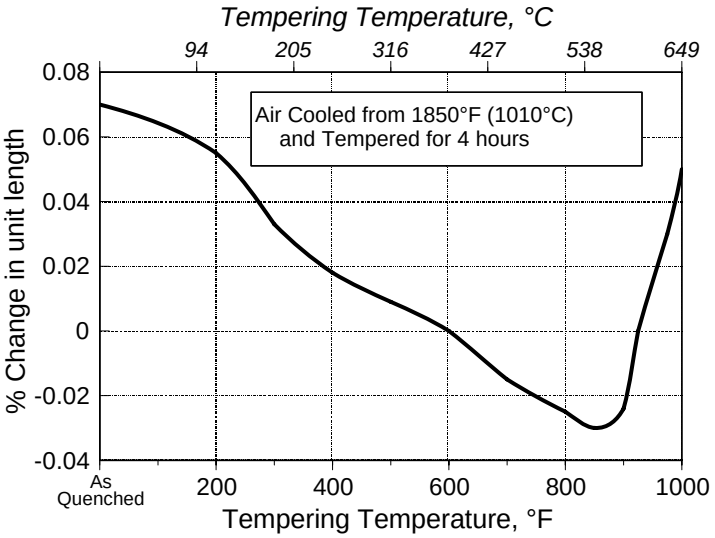
Heat at a rate not exceeding 400°F per hour (222°C per hour) to 16251650°F (871-899°C), and hold at temperature for 1 hour per inch (25.4mm) of maximum thickness; 2 hours minimum. Then cool slowly with the furnace at a rate not exceeding 50°F per hour (28°C per hour) to 1000°F (538°C). Continue cooling to ambient temperature in the furnace or in air. The resultant hardness should be a maximum of 241 HBW.

HEAT TREATMENT RESPONSE

As Air Cooled from	HRC
1800°F (982°C), 45 minutes	62.5
1825°F (996°C), 30 minutes	63.0
1850°F (1010°C), 30 minutes	63.0
1900°F (1038°C), 30 minutes	62



Size Change During Hardening



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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.

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