DATA SHEET

LATROBE SPECIALTY STEEL COMPANY
Latrobe, PA 15650-0031 USA

Issue 1

LSS™ MGR™ Tool Steel

(ASTM A8)

Typical Composition

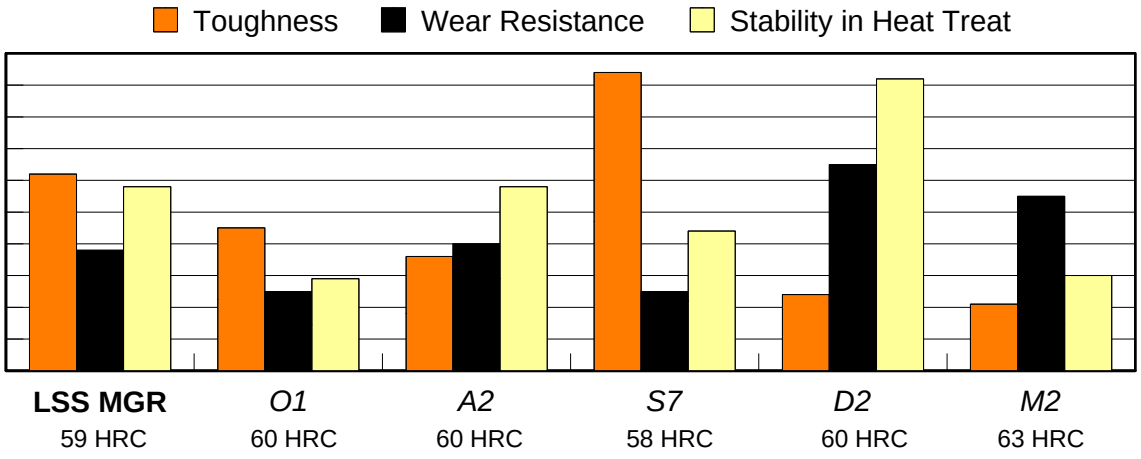
C	Mn	Si	Cr	Mo	W
0.55	0.30	0.95	5.00	1.25	1.25

LSS MGR tool steel is an air-hardening tool steel that is characterized by a combination of very good toughness, intermediate wear resistance, and excellent dimensional stability in heat treatment. MGR tool steel is an excellent steel for punches and dies that operate in the 55 to 60 Rockwell C hardness range. The combination of toughness and wear resistance make MGR tool steel an excellent choice for applications that require higher toughness than that of the high-carbon, high-chromium steels such as D2 and better wear resistance than that of shock-resisting steels such as S7.

For hot work tooling applications, MGR tool steel provides better resistance to erosion, wear and wash-out than the typical chromium-molybdenum hot work steels such as H11 and H13. However, it is not recommended for hot applications where thermal fatigue (heat checking) is the primary failure mode.

Typical applications for MGR tool steel include punches, drift pins, pneumatic tools, chuck jaws, hammers, hot rolls, and hot and cold shear knives.

Relative Properties



Physical Properties

Density: 0.281 lb/in^3 (7780 kg/m^3)
Specific Gravity: 7.78
Modulus of Elasticity: 30x10^6 psi (207 GPa)

Machinability: 75-80% of a 1% carbon steel

Coefficient of Thermal Expansion: (at 62-63HRC)

Temperature, °F	in/in °Fx10^{-6}	Temperature, °C	mm/mm °Cx10^{-6}
100 - 800	6.65	38 - 427	12.0
100 - 1000	6.88	38 - 538	12.4
100 - 1200	7.06	38 - 649	12.7

LSS™ MGR™
HEAT TREATING INSTRUCTIONS

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

HARDENING:

Preheating: Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1400-1450°F (760-788°C) and equalize.

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

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

Soak for 30 minutes for the first inch (25.4 mm) of thickness, plus 15 minutes for each additional inch (25.4 mm).

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

Note: Sizes over 5 inches (127 mm) in cross section may not achieve full hardness by cooling in still air. It is usually necessary to increase the quench cooling rate between 1400 to 900°F (760 to 482°C) by using an air blast, pressurized gas, or an interrupted oil quench. 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. The typical tempering range is 300 to 600°F (149 to 316°C). Double tempering is recommended for tempering temperatures of 900°F (482°C) and higher.

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, a soaking time of 4 to 6 hours at the tempering temperature is strongly recommended.

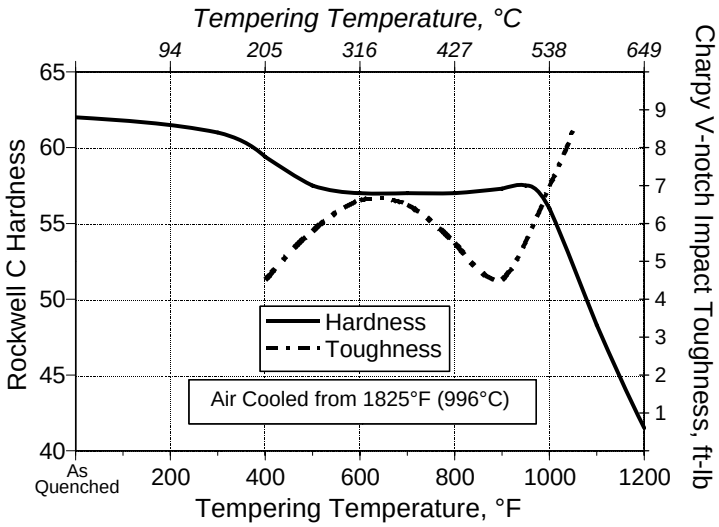
Cryogenic Treatment: Some prefer to do cryogenic treatment as an extension of the quench from the austenitizing treatment. Others prefer to cryogenically treat after tempering.

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

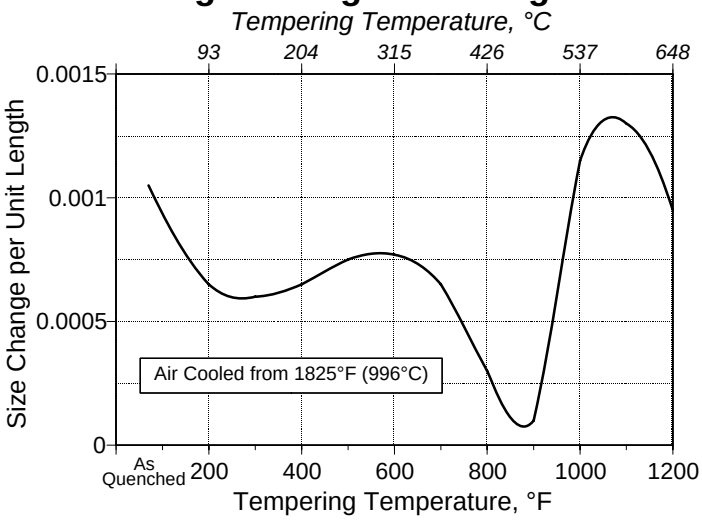
Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1550°F (843°C), and hold at temperature for 1 hour per inch (25.4mm) of maximum thickness; 2 hours minimum. Then cool slowly with the furnace at a rate not exceeding 50°F per hour (28°C per hour) to 1000°F (538°C). Continue cooling to ambient temperature in the furnace or in air. The resultant hardness should be a maximum of 241 HBS.

HEAT TREATMENT RESPONSE

As Air Cooled from	HRC
1750°F (954°C), 30 minutes	60
1800°F (982°C), 30 minutes	61.5
1825°F (996°C), 30 minutes	62
1850°F (1010°C), 30 minutes	62
1900°F (1038°C), 30 minutes	61.5



Size Change During Hardening



Tensile Properties

	Tensile Strength		Yield Strength		EL	RA
HRC	ksi	MPa	ksi	MPa	%	%
18	103	710	65	448	24	41
40	184	1269	165	1138	12	29
52	265	1827	225	1551	9	22
56	297	2048	250	1724	10	7

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.

LATROBE SPECIALTY STEEL COMPANY

Latrobe, PA Phone: 724-537-7711 FAX: 724-532-6316
Vienna, OH Phone: 800-321-6446 FAX: 330-609-2054
Marlborough, MA Phone: 800-444-4447 FAX: 508-481-6581
WEB: www.latrobesteel.com