

Chemistry

~AISI H13 – W.Nr. 1.2344 – X40CrMoV5-1

Typical	C	Mn	Si	Cr	Mo	V
Analysis %	0.38	0.35	1.00	5.25	1.50	1.00

Description

DC® Superior is a Vacuum remelted (VAR) hot work die steel, designed to meet all die casting industry specifications.

Characteristics

Excellent resistance to thermal shock and fatigue
 Excellent hardenability
 Good high-temperature strength
 Good toughness
 Good polishability

Typical Applications

High pressure die casting dies Hot forging dies
 Hot extrusion tooling Forming dies
 Plastic molds Shot sleeves

Physical Properties

Density: 0.281 lbs/in³ (room temperature)
 Hardened and tempered to 46 HRc

Coefficient of Thermal Expansion	$\frac{70^{\circ}\text{F} - 200^{\circ}\text{F}}{6.0 \times 10^{-6} / ^{\circ}\text{F}}$	$\frac{70^{\circ}\text{F} - 400^{\circ}\text{F}}{6.6 \times 10^{-6} / ^{\circ}\text{F}}$	$\frac{70^{\circ}\text{F} - 750^{\circ}\text{F}}{7.0 \times 10^{-6} / ^{\circ}\text{F}}$
Thermal Conductivity	$\frac{70^{\circ}\text{F}}{177 \text{ Btu/in/ft}^2/\text{hr/}^{\circ}\text{F}}$	$\frac{650^{\circ}\text{F}}{191 \text{ Btu/in/ft}^2/\text{hr/}^{\circ}\text{F}}$	$\frac{1300^{\circ}\text{F}}{210 \text{ Btu/in/ft}^2/\text{hr/}^{\circ}\text{F}}$

Mechanical Properties

Toughness (CVN): 10 ft-lbs. minimum at 44-46 HRc
 Tensile Properties: (room temperature)

Hardness HRc	Y.S. (0.2%) KSI	T.S. KSI	EL (%)	RA (%)
52	220	260	12	35
48	190	230	13	38
44	170	200	14	40

Heat Treatment

Annealing

Temperature	Cooling	Hardness
1500°F - 1550°F	25°F max per hour	229 BHN Max.

Key parameter of the NADCA recommended procedure for hardening dies for die casting service are:

Hardening

Temperature	Quenching
Slowly preheat: 1200°F – 1300°F Hardening temp: 1875F - 1895°F Time at temp. 30-45 min.	To 300°F

Tempering

Tempering temperature: 1050°F minimum

Stress relieving

Temperature	Cooling
50°F - 100°F below final tempering temperature, Slow cool to 875°F	Air cool

Size (Finished / approx.)

Max weight	36,000lbs
Max section	1,400 sq in
Max width	50"
Max thickness	30"

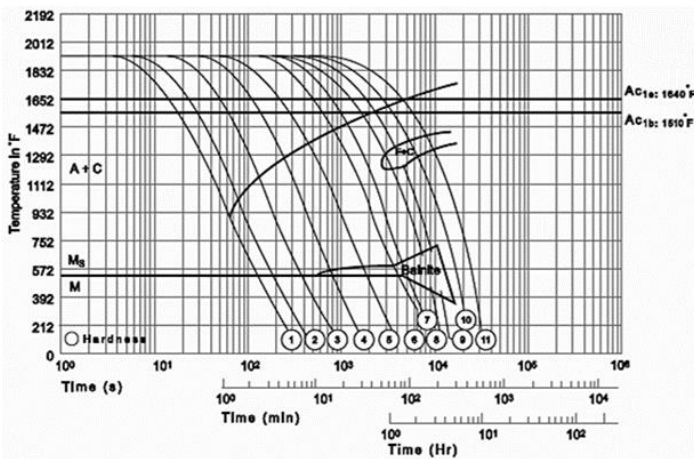
General Note

All statements regarding the properties or utilization of the materials or products mentioned are for the purpose of description only. Guarantees regarding the existence of certain properties or a certain utilization are only valid if agreed upon in writing.

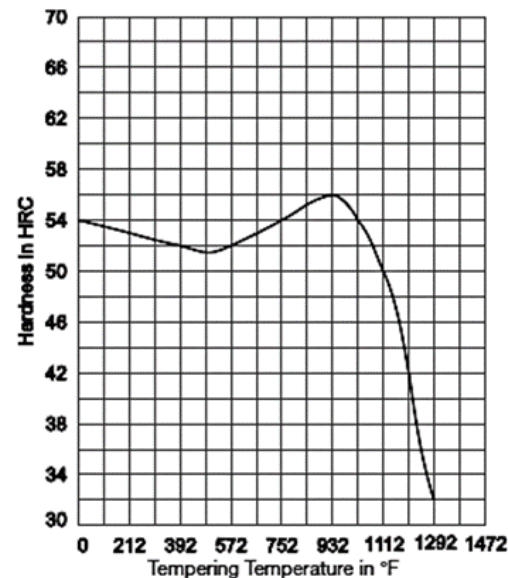
Cooling Curve Number	1	2	3	4	5	6	7	8	9	10	11
Hardness (HV 10)	707	681	673	657	642	634	599	572	488	236	219
Hardness (HRc approx.)	60	59.5	58.5	58	57.5	57	55	54	48	20	15

Time-Temperature-Transformation Diagram

Austenitizing temperature 1875°F - 1920°F



Tempering Diagram



Polishing

For highly cosmetic applications, the tool should be heat treated to the highest hardness possible. Size of the tool will determine the maximum hardness. A-1 polish is achievable when proper procedures are followed. A Swiss Steel representative should be consulted when determining the proper hardness.

Welding

DC® Superior can be welded in an annealed and hardened condition if machining errors, design changes or minor cracking have occurred. TIG (Tungsten Inert Gas) should preferably be used.

Welding Guidelines

Process	Tig/MMA
Current	D.C.
Amperage (A)	100-150
Electrode	Tungsten Thorium
Electrode Diameter	0.10 – 0.17
Protective Gas	Argon Helium
Flow (L/mm)	10
Filler Rod	AISI H-13

Welding Temperatures

Preheat Temp.	Maintained Temperature during welding	Cool down to:	Stress Relieve
700°F to 800°F	Above 600°F	150°F	1050°F for 2 hours

Industry Standards

DC® Superior meets or exceeds the following standards:

- NADCA #207 – Latest Revision
- General Motors Powertrain HPDC-G-2
- Ford Motor Company AMTD-DC2010
- Chrysler NP 2080

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