

# Thermodur® 2344 Magnum

## Technical Datasheet

### Chemistry

Comparable Standard:  
Premium Grade AISI H13 ESR

Typical	C	Si	Cr	Mo	V	S
Analysis %	0.4	1.00	5.3	1.4	1.0	.003 max

### Description

Thermodur® 2344 Magnum is an electro slag remelted (ESR) 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

### Applications

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

### Physical Properties

Density: 0.281 lbs/in<sup>3</sup> (room temperature)  
Hardened and tempered to 46 HRc

Coefficient of Thermal Expansion	70°F - 200°F 6.0 x 10 <sup>-6</sup> /°F	70°F - 400°F 6.6 x 10 <sup>-6</sup> /°F	70°F - 750°F 7.0 x 10 <sup>-6</sup> /°F
Thermal Conductivity	70°F 177 Btu/in/ft <sup>2</sup> /hr/°F	650°F 191 Btu/in/ft <sup>2</sup> /hr/°F	1300°F 210 Btu/in/ft <sup>2</sup> /hr/°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

#### Soft Annealing

Temperature	Cooling	Hardness
1380°F – 1470°F	Furnace 20°F/hour to 1200°F, then air cool.	230 HB Max.

#### Stress Relieving (Annealed condition)

Temperature	Cooling	Hardness
1200°F for 2 hours	Cool slowly to 930°F in air	230 HB Max.

#### Hardening (refer to TTT diagram on page 2)

Temperature	Cooling	Hardness
1850°F – 1880°F Hold at temperature for 30 minutes	Vacuum quench at 50°F/min. to 1000°F, then cool to below 150°F	54 HRc Max quenched

#### Tempering (See tempering diagram on page 2)

Temperature °F	752	932	1022	1112	1202	1292
Hardness HRc	54	56	54	50	42	34

Tempering hardness is approximate and based on two hours at temperature.

In order to achieve faster quench rates, generous radii and machining stock should be left on during rough machining.

Optimal heat treatment parameters should be followed to achieve maximum potential die life.

Please contact your Swiss Steel heat treat representative for more detailed information.

### 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.

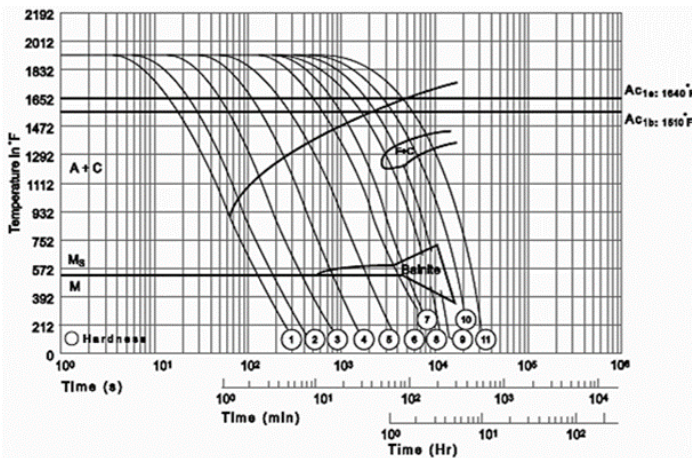
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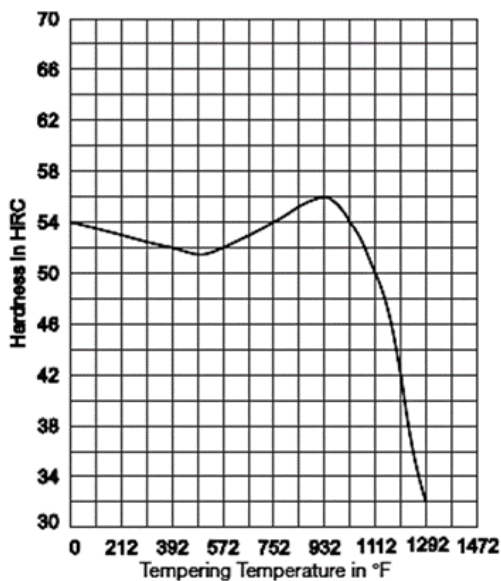
Cooling Curve Number	1	2	3	4	5	6	7	8	9	10	11
Hardness (HV 10)	707	681	673	657	642	634	599	572	488	236	219
Hardness (HRc approx.)	60	59.5	58.5	58	57.5	57	55	54	48	20	15

### 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

Thermodur® 2344 Magnum 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

Thermodur® 2344 Magnum meets or exceeds the following standards:

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



# Thermodur® 2344 Magnum

## Technical Datasheet

### NORTH AMERICAN DISTRIBUTION

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