Thermodur® 2344 EFS

Technical Datasheet

Chemistry
Comparable Standard: AISI H13

Typical	C	Si	Cr	Mo	V
Analysis %	0.4	1.00	5.3	1.4	1.0

Description
Thermodur® 2344 EFS is a single melt Extra Fine Structure (EFS) hot work die steel, supplied in the annealed condition.

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

Applications
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	70°F - 200°F 6.0 x 10^{-6} /°F	70°F - 400°F 6.6 x 10^{-6} /°F	70°F - 750°F 7.0 x 10^{-6} /°F
Thermal Conductivity	70°F 177Btu/in/ft²/hr/°F	650°F 191Btu/in/ft²/hr/°F	1300°F 210Btu/in/ft²/hr/°F

Mechanical Properties
Approximate Tensile Properties: (room temperature)

Hardness HRc	Tensile Strength Ksi
52	259
50	242
42	192

Polishing
For highly cosmetic applications, Thermodur® 2344 Magnum should be used. A Swiss Steel representative should be consulted when determining the hardness.

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

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.

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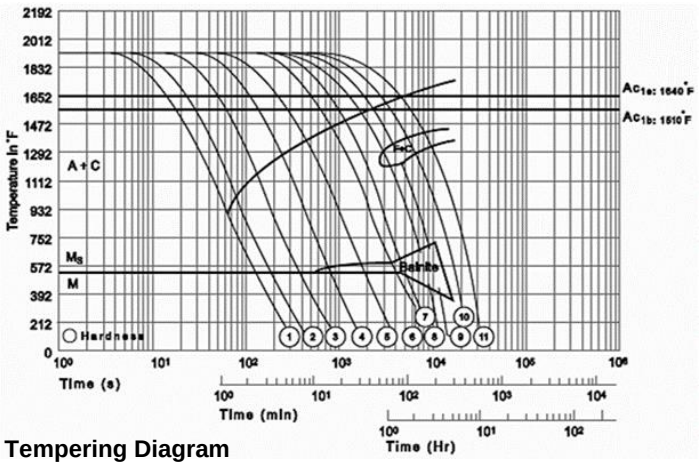
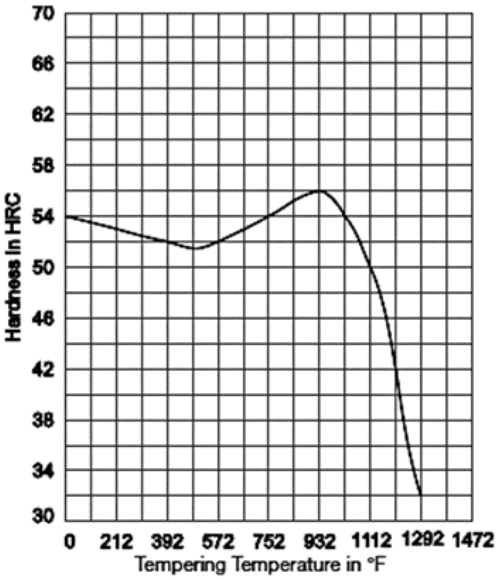
Cooling Curve Number	1	2	3	4	5	6	7	8	9	10	11
Hardness (HV 10)	707	681	673	657	642	634	599	572	488	236	219
Hardness (HRc approx.)	60	59.5	58.5	58	57.5	57	55	54	48	20	15

Time-Temperature-Transformation Diagram

Austenitizing temperature 1875°F - 1920°F



Tempering Diagram



Welding

Thermodur® 2344 EFS 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

Condition	Preheat Temp.	Maintained Temperature during welding	Cool down to:	Stress Relieve
Annealed	1000°F	Above 600°F	150°F	Re-anneal completely or temper at appropriate tempering temperature
Hardened	800°F - 1000°F	Above 600°F	150°F	Temper at 25°F below the previous tempering temperature for 2 hours min.

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.

Swiss Steel International

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