

# Thermodur® 2367 EFS

## Technical Datasheet

### Chemistry

Typical	C	Si	Cr	Mo	V
Analysis %	0.37	0.40	5.0	3.0	0.60

### Description

Thermodur® 2367 EFS is a single melt Extra Fine Structure (EFS) hot work die steel developed for applications where high temperature properties (tensile strength & thermal conductivity) are required to resist thermal fatigue and tempering.

### Characteristics

Excellent resistance to heat checking  
 Excellent resistance to wear (erosion & abrasion)  
 Excellent high-temperature strength  
 Good tempering resistance  
 Good toughness

### Applications

Shot sleeves                      Forming dies  
 Hot forging dies                Plastic molds  
 Hot extrusion tooling         Mandrels

### 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 6.6 x 10 <sup>-6</sup> /°F	70°F - 400°F 6.9 x 10 <sup>-6</sup> /°F	70°F - 750°F 7.0 x 10 <sup>-6</sup> /°F
Thermal Conductivity	70°F 206Btu/in/ft <sup>2</sup> /hr/°F	650°F 235/in/ft <sup>2</sup> /hr/°F	1300°F 245/in/ft <sup>2</sup> /hr/°F

### Mechanical Properties

Tensile Properties: (room temperature)

Hardness HRc	Y.S. (0.2%) KSI	T.S. KSI	EL (%)	RA (%)
52	225	267	12	35
48	193	234	13	38
44	171	203	12	40

### Heat Treatment

#### Soft Annealing

Temperature	Cooling	Hardness
1345°F – 1435°F	Furnace 20°F/hour to 1200°F, then air cool.	235 HB Max.

#### Stress Relieving

Temperature	Cooling	Hardness
1200°F for 2 hours	Cool slowly to 900°F in air	230 HB Max.

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

Temperature	Cooling	Hardness
1875°F – 1920°F Hold at temperature for 30 minutes	Vacuum quench at 50°F/min. to 1000°F, then cool to below 150°F	55 HRc Max quenched

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

Temperature °F	752	932	1022	1112	1202	1292
Hardness HRc	52	55	55	52	45	36

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 performance.

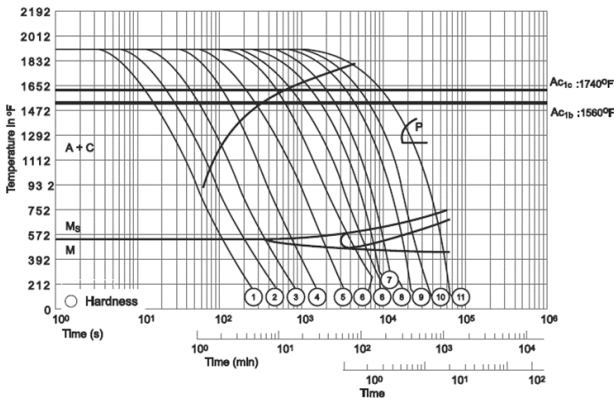
Please contact your Swiss Steel heat treat representative for more detailed information.

### General Note

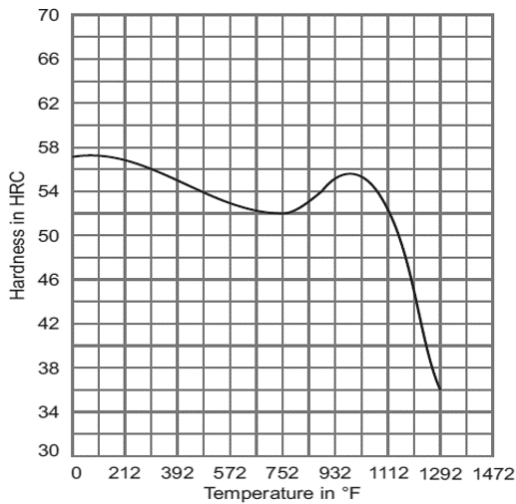
All statements regarding the properties or utilization of the materials or products mentioned are for the purpose of description only. Guarantees regarding the existence of certain properties or a certain utilization are only valid if agreed upon in writing.

Cooling Curve Number	1	2	3	4	5	6	7	8	9	10	11	12
Hardness (HV 10)	690	673	665	627	620	620	634	606	606	554	548	525
Hardness (HRc approx.)	62	61	59	58	58	58	59	57	57	54.5	54	53

### Time-Temperature-Transformation Austenitizing temperature 1875°F - 1920°F



### Tempering Diagram



### Welding

Thermodur® 2367 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
Flow (L/mm)	10
Filler Rod	AISI H-13

### Welding Temperatures

Preheat Temp.	Maintained Temperature during welding	Cool down to:	Stress Relieve
620°F - 900°F	Above 600°F	150°F	1050°F for 2 hours or 30°F – 50°F below previous tempering temperature

### NORTH AMERICAN DISTRIBUTION

#### HEADQUARTERS + TECHNICAL SUPPORT

SWISS STEEL USA, INC.  
365 Village Dr.  
Carol Stream, IL 60188  
Phone: 800.323.1233  
Fax: 630.879.0498

#### MANUFACTURING + CENTRAL STOCKING FACILITY

SWISS STEEL USA, INC.  
1609 E. Wilson Street  
Batavia, IL 60510

### DISTRIBUTION LOCATIONS

#### WEST COAST

556 Vanguard Way  
Brea, CA 92861

#### MIDWEST

365 Village Dr.  
Carol Stream, IL 60188

1455 Miller Pkwy.  
Streetsboro, OH 44241

#### SOUTHEAST

119 Old Airport Rd.  
Roebuck, SC 29376

#### NORTHEAST

370 Franklin Turnpike  
Mahwah, NJ 07430

#### CANADA

SWISS STEEL CANADA, INC.  
6350 Vipond Dr.  
Mississauga, ONT L5T 1G2

[www.swisssteel-international.us](http://www.swisssteel-international.us)  
[www.swisssteel-international.ca](http://www.swisssteel-international.ca)