

Thermodur® 2999 ESR SUPRA

Technical Datasheet

Chemistry

Comparable Standard: AISI H13

Typical	C	Si	Mn	Cr	Mo	V
Analysis %	0.45	0.30	0.30	3.0	5.0	1.0

Description

Thermodur® 2999 ESR SUPRA is an electro slag remelted (ESR) hot work die steel developed for maximum high-temperature strength, and supplied in the annealed condition.

Characteristics

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

Applications

Inserts for high-speed forging tools
 Inserts near the gate area for die casting tools
 Inserts for small to medium impression forging dies

Physical Properties

Density: 0.283 lbs/in³ (room temperature)

Thermal Conductivity	212°F 229Btu/in/ft ² / hr/°F	400°F 241Btu/in/ft ² / hr/°F	575°F 248Btu/in/ft ² / hr/°F
	750°F 250Btu/in/ft ² / hr/°F	950°F 253Btu/in/ft ² / hr/°F	1115°F 259Btu/in/ft ² / hr/°F

Mechanical Properties

Tensile Properties: (room temperature)

Hardness HRC	Tensile Strength Ksi
54	277
49	234
46	214

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-2 polish is achievable when proper procedures are followed. 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.

Hardening (refer to TTT diagram on page 2)

Temperature	Cooling	Hardness
2000°F – 2010°F Hold at temperature for 30 minutes	Vacuum quench at 70°F/min. to 300°F, then cool to below 150°F	57 HRc Max quenched

- Preheat to 1200°F and equalize Ts and Tc within 200°F
- Preheat to 1550°F and equalize Ts and Tc within 200°F
- Rapidly heat to 2012°F +/- 10°F
- Soak time should be 30 minutes after Ts-Tc<25°F or 90 minutes maximum after Ts = 2012°F
- Quench rate 70°F/minute to 300°F as measured by Tc
- Cool until Tc<150°F and immediately load into first temper

Tempering (See tempering diagram on page 2)

Temperature °F	572	752	932	1022	1112	1202
Hardness HRc	54	54	55	56	49	46

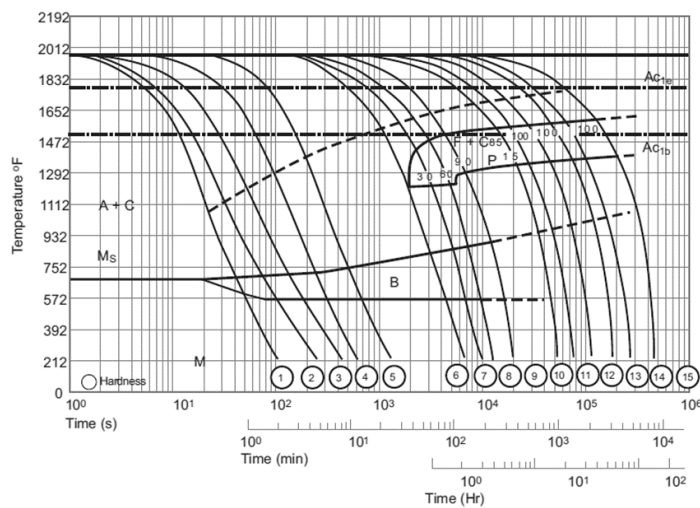
- Minimum of three tempering cycles are required
- First tempering should be at 1050°F – cool to ambient temperature
- Second tempering should be at 1150°F
- Third tempering should be done at 1050°F or adjust to desired hardness
- Tempering hardness is approximate and based on two hours at temperature
- Please contact your Swiss Steel heat treatment representative for more detailed information.

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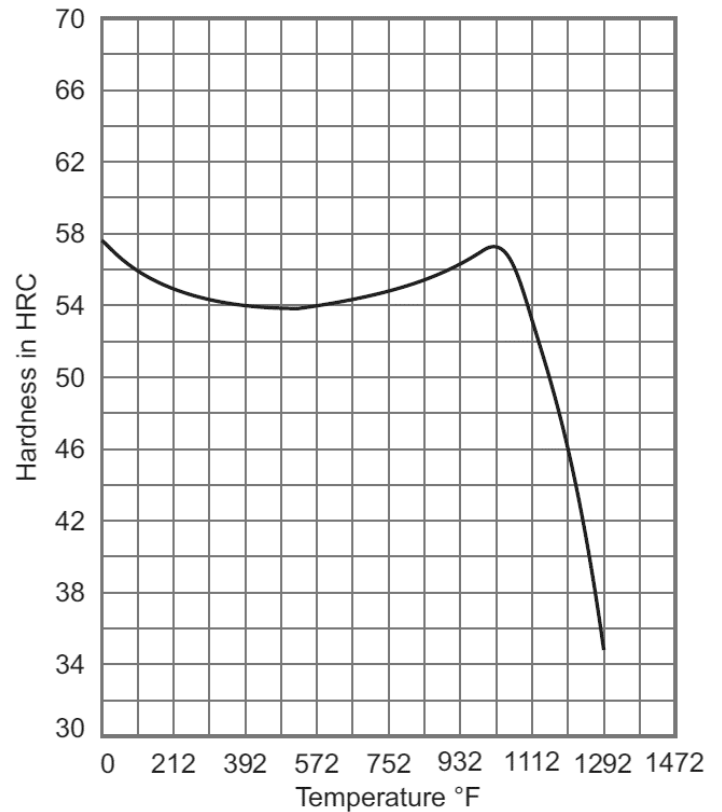
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Cooling Curve Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hardness (HV 10)	606	594	591	563	518	465	386	300	229	177	176	173	162	161	157
Hardness (HRc approx.)	55.5	55	55	53	50	46.5	39	30	19	17	17	17	16	16	15

Time-Temperature-Transformation Diagram



Tempering Diagram



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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