

material characteristics	material number / grade	SWG 2344 VICTORY ESR (SWG EX4 VICTORY ESR)					
	DIN standard	X40CrMoV5-1					
	comparable grade	AISI H13 ESR					
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Mo	V
		0.40	1.00	0.40	5.20	1.30	1.00
	production technology	EAF/LF/VD/ESR, (3D) forging, EFS annealing					
	service hardness / strength	HB		HRC		N/mm ²	
		-		36 - 52		-	
	delivery condition	annealed	≤ 229	-		-	
	maximum dimension	diameter			thickness		
≤ 600 mm			≤ 450 mm				
US-specification	EN 10228-3			SEP 1921			
	table 3 - type 1 - qual. class 4			group 3 - class E,e			
cleanliness	DIN 50602			ASTM E45 method A			
	K1 ≤ 10			A ≤ 0,5; B, C, D ≤ 1			
variation upon request							

technological properties		0	1	2	3	4	5	comment	
	toughness		■	■	■				in relation to service hardness 42 - 48 HRC
	hot strength at working temp.		■	■	■	■			
	wear resistance		■	■	■	■	■		
	corrosion resistance	■							
	machinability		■	■	■	■			annealed
	polishability		■	■	■	■			ISO/SPI: N0/A-1, 48 - 52 HRC
	weldability		■						CET = 0.83 % acc. DIN EN 1011-2
	texturability		■	■	■	■	■		
	nitridability		■	■	■	■	■		nitriding hardness 900 - 1250 HV1
chrome-platability		■	■	■	■	■		high cleanliness	

rating properties: 0 = not suitable; 1 = low; 2 = middle; 3 = good; 4 = very good; 5 = perfectly suitable

physical properties	thermal conductivity [W · m ⁻¹ · K ⁻¹]	20 °C	200 °C	300 °C	500 °C
		24.4	26.2	26.5	26.0
	coefficient of thermal expansion between 20 °C and ... [10 ⁻⁶ · K ⁻¹]	100 °C	200 °C	300 °C	500 °C
		10.9	11.9	12.3	13.0
elastic modulus [kN/mm ²]	20 °C	200 °C	300 °C	500 °C	
	212	199	192	175	

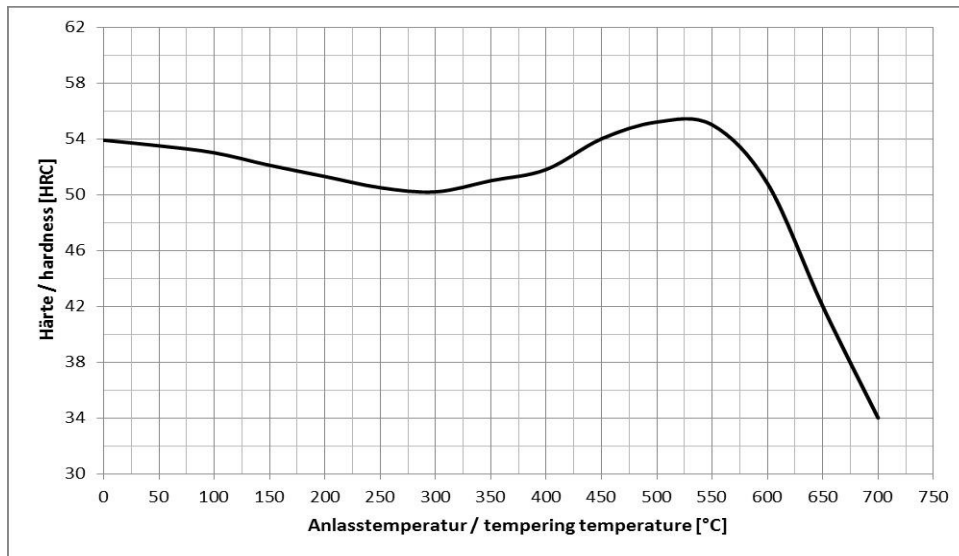
application	technology	mold making, injection molding, die-casting, hot forming
	tools	die-casting molds and inserts, extrusion tools, plastic injection molds high polished and wear resistant
	process temperature	< 600 °C
	tool size	small- and medium-sized tools
	final products	light metal, steel, plastic parts (reinforced, transparent, high gloss)
	features	-

SWG processing instructions	welding, texturing, vacuum hardening
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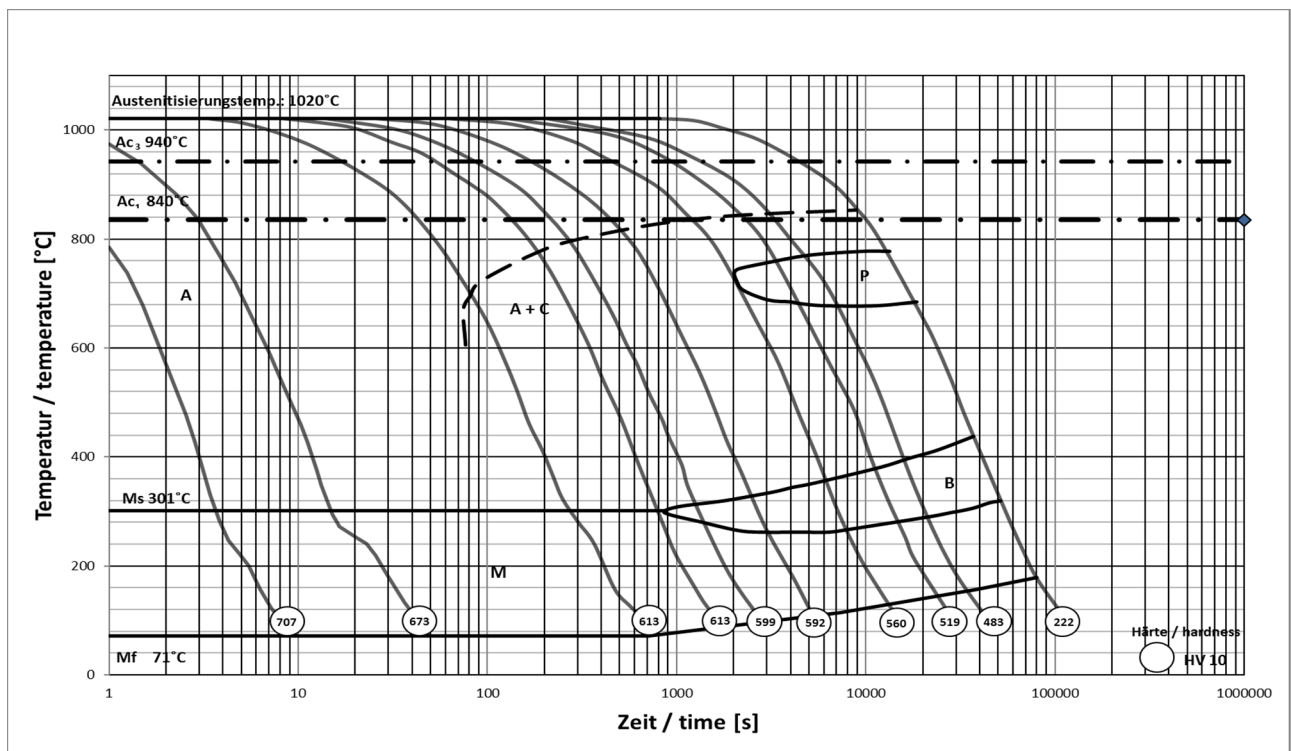
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	820	840	furnace until 650 °C, air
	hardening	1010	1030	vacuum, oil
	tempering	530	650	air, protective gas
	stress relieving	500	550	min. 30 °C below tempering temp.
	pre-heating before welding	300	320	
	nitriding	480	550	min. 30 °C below tempering temp.
	PVD-treating	480	550	

diagrams/ structure	CCT-diagram	yes
	tempering diagram	yes
	advice on heat treatment	vacuum hardening after pre-machining or warmbath
	microstructure	martensitic

Tempering diagram: Average values on samples dia 25 mm x length 50 mm; hardened at 1030 °C in oil



CCT-diagram



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