



material characteristics	material number / grade	SWG 2344mod PM VICTORY ESR					
	short designation	X38CrMoV5-1					
	comparable grade	AISI H13mod ESR					
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Mo	V
		0.36	0.25	0.30	4.80	1.20	0.45
	production technology	EAF/LF/VD/ESR, forging, EFS annealing					
	service hardness / strength		HB	HRC	N/mm ²		
			-	48 - 53	-		
	delivery condition	annealed	≤ 229				
	maximum dimension	diameter		thickness			
	≤ 800 mm		≤ 600 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 ≤ 1,0				
				variation upon request			

technological properties		0	1	2	3	4	5	comment	
	toughness		■	■	■				in relation to service hardness 48 - 52 HRC
	hot strength at working temp.		■	■	■	■			
	wear resistance		■	■	■	■			
	corrosion resistance	■							
	machinability		■	■	■	■			annealed
	polishability		■	■	■	■			ISO/SPI: N0/A-1
	weldability		■						CET = 0.74 % acc. DIN EN 1011-2
	texturability		■	■	■	■	■		hardened
	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
		11.8	12.4	12.6	12.8
	elastic modulus [kN/mm ²]	20 °C	200 °C	300 °C	500 °C
		212	199	192	175



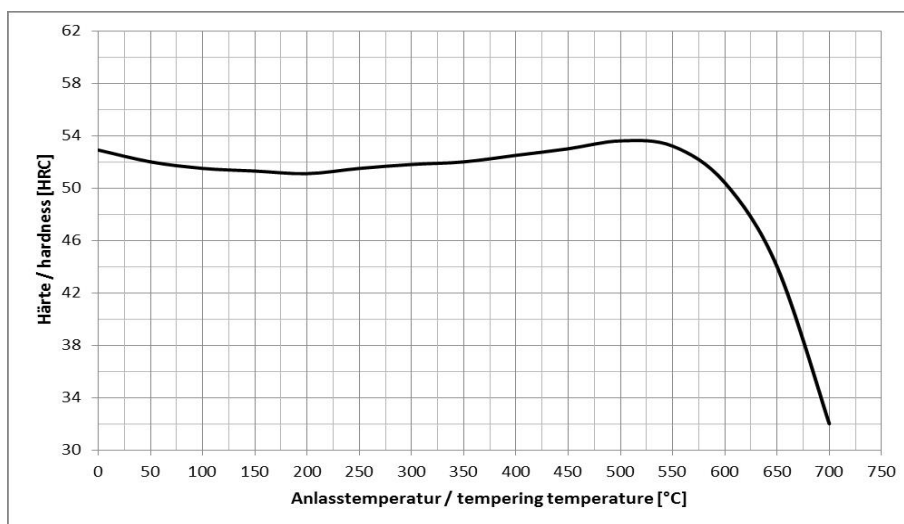
application	technology	mold making, injection molding
	tools	plastic injection molds, high polished and wear resistant
	process temperature	< 300 °C
	tool size	small- and medium-sized molds
	final products	plastic parts, reinforced, high gloss

SWG processing instructions	welding, texturing, vacuum hardening, polishing
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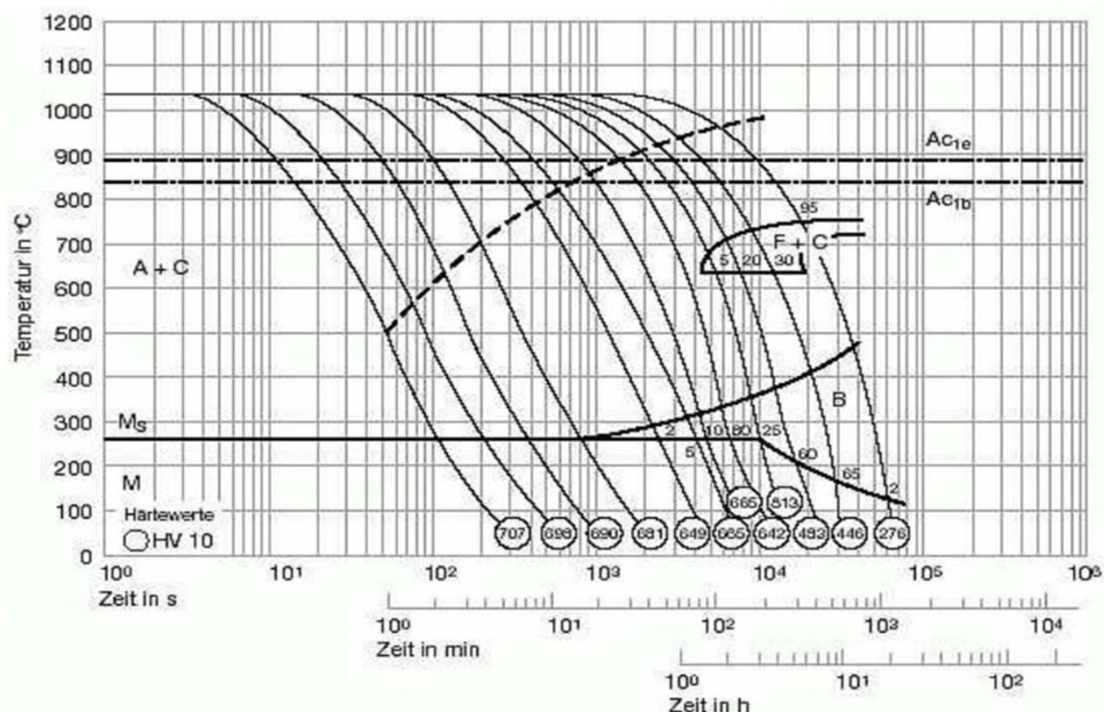
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	820	840	furnace until 650 °C, air
	hardening	990	1010	oil, warmbath, vacuum
	tempering	530	650	air, protective gas
	stress relieving	500	550	max. 30 °C below tempering temp.
	pre-heating before welding	300	320	
	nitriding	480	550	max. 30 °C below tempering temp.
	PVD-treating	480	550	

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

Tempering diagram: Average values on samples dia 25 mm x length 50 mm; hardened at 1020 °C in oil



TTT-diagram (continuous)



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