

material characteristics	material number / grade	SWG 2347						
	DIN standard	X40CrMoVS5-1						
	comparable grade	AISI H13+S						
	chemical composition - reference analysis [%]	C	Si	Mn	S	Cr	Mo	V
		0.40	1.00	0.40	0.09	5.00	1.30	0.95
	production technology	EAF/LF/VD, forging, Q+T (annealing)						
	service hardness / strength <small>converted acc. to DIN EN ISO 18265 table G.1</small>	HB		HRC	N/mm <sup>2</sup>			
		358 - 411		37 - 42	1157 - 1337			
	delivery condition	Q+T	358 - 411	37 - 42	1157 - 1337			
		annealed	≤ 229	-	-			
	maximum dimension	diameter			thickness			
		≤ 750 mm			≤ 500 mm			
US-specification	EN 10228-3			SEP 1921				
	table 3 - type 1 - qual. class 2			group 3 - class C,c				
cleanliness	DIN 50602			ASTM E45 method A				
	K4 ≤ 20 (oxides)			B, C, D ≤ 2				
							variation upon request	

technological properties		0	1	2	3	4	5	comment	
	toughness		■						in relation to service hardness
	hot strength at working temp.		■	■	■	■	■		
	wear resistance		■	■	■	■	■		
	corrosion resistance	■							
	machinability		■	■	■	■	■		annealed, higher than 2344
	polishability	■							sulphur alloyed
	weldability		■						CET = 0.83 % acc. DIN EN 1011-2
	texturability	■							sulphur alloyed
	nitridability		■	■	■	■	■		nitriding hardness 900 - 1250 HV1
	chrome-platability	■							sulphur alloyed

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

physical properties	thermal conductivity [W · m <sup>-1</sup> · K <sup>-1</sup> ]	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 <sup>-6</sup> · K <sup>-1</sup> ]	100 °C	200 °C	300 °C	500 °C
		10.9	11.9	12.3	13.0
elastic modulus [kN/mm <sup>2</sup> ]	20 °C	200 °C	300 °C	500 °C	
	212	199	192	175	

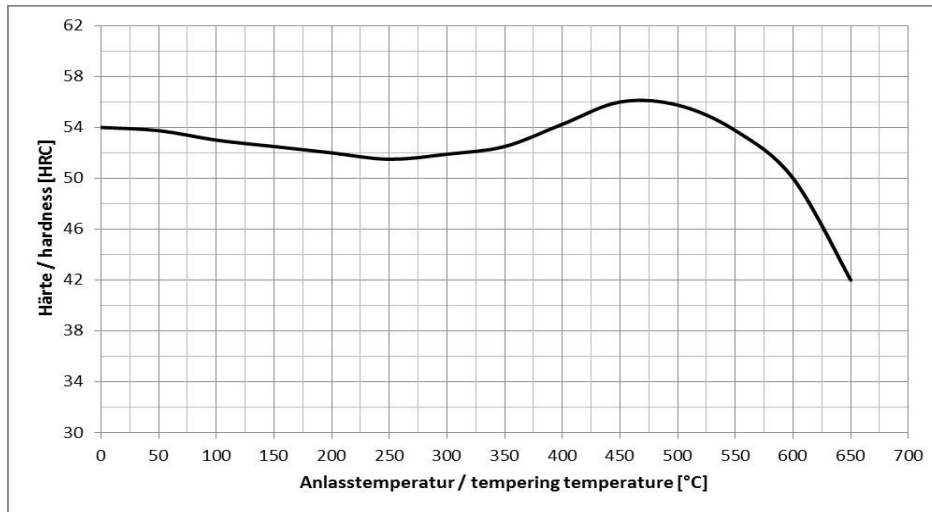
application	technology	mold making, injection molding
	tools	core parts for plastic injection molding
	process temperature	< 600 °C
	tool size	small- and medium-sized tools
	final products	light metal, steel, plastic parts
	features	not suitable for cavities with high requirements on the surface

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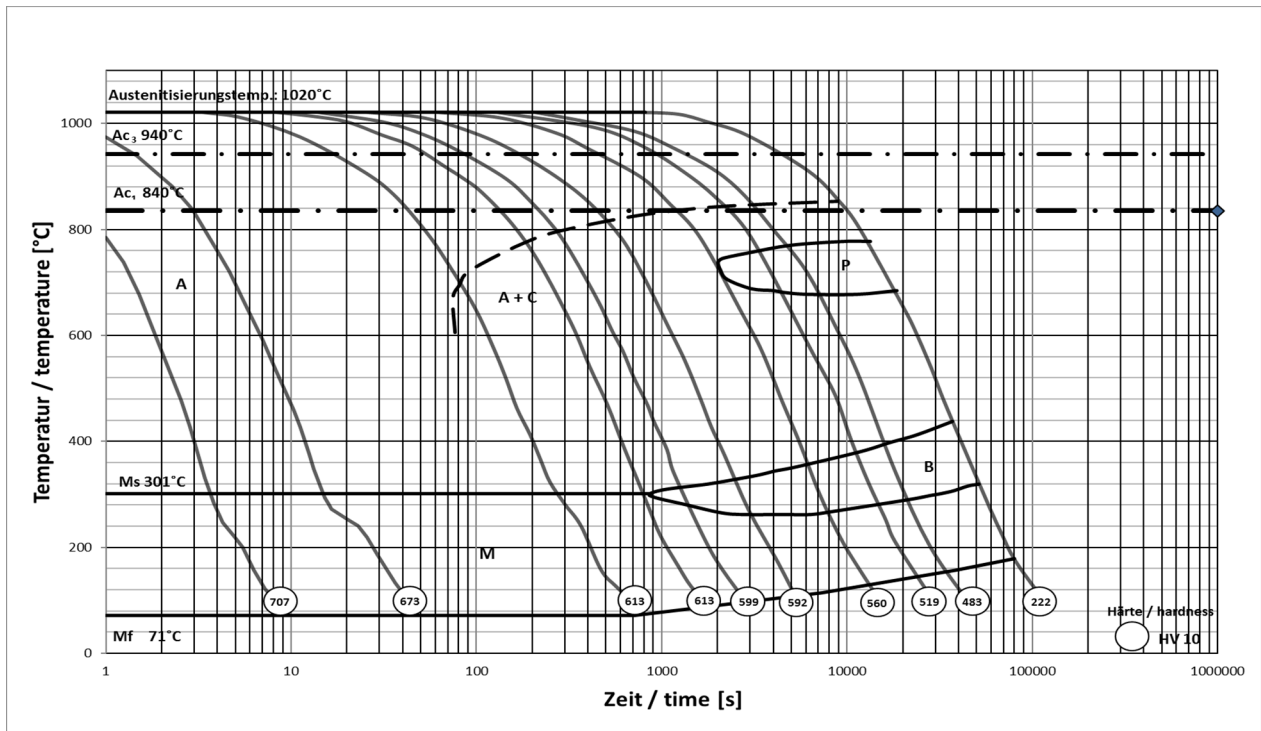
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	820	840	furnace until 650 °C, air
	hardening	1010	1030	vacuum, oil
	tempering	530	650	air, protective gas
	stress relieving	500	550	min. 30 °C below tempering temp.
	pre-heating before welding	300	320	
	nitriding	480	550	min. 30 °C below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

diagrams/ structure	CCT-diagram	yes
	tempering diagram	yes
	advice on heat treatment	vacuum hardening after pre-machining
	microstructure	martensitic + manganese sulfides

**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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