



material characteristics	material number / grade	SWG CRMHP VICTORY ESR					
	short designation	X28CrNi13					
	comparable grade	1.4021mod ESR, AISI 420mod ESR					
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Ni	N
		0.25	0.30	0.40	14.00	0.60	alloyed
	production technology	EAF/LF/VD/ESR, forging, annealing					
	service hardness / strength	HB		HRC		N/mm <sup>2</sup>	
		-		50 - 52		-	
	delivery condition	annealed	≤ 250				
	maximum dimension	diameter			thickness		
-			≤ 500 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 Methode 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
	hot strength at working temp.		■	■	■				
	wear resistance		■	■	■	■			
	corrosion resistance		■	■	■	■	■		polished surface for best corrosion resistance
	machinability		■	■	■				annealed
	polishability		■	■	■	■	■		ISO/SPI: N0/A-1
	weldability		■						CET = 1.00 % acc. DIN EN 1011-2
	texturability		■	■	■	■			
	nitridability		■	■	■	■			nitriding hardness 900 - 1200 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 <sup>-1</sup> · K <sup>-1</sup> ]	20 °C	200 °C	300 °C	500 °C
		20.0	21.0	-	-
	coefficient of thermal expansion between 20 °C and ... [10 <sup>-6</sup> · K <sup>-1</sup> ]	100 °C	200 °C	300 °C	500 °C
		10.5	11.0	11.0	-
elastic modulus [kN/mm <sup>2</sup> ]	20 °C	200 °C	300 °C	500 °C	
	218	206	198	180	

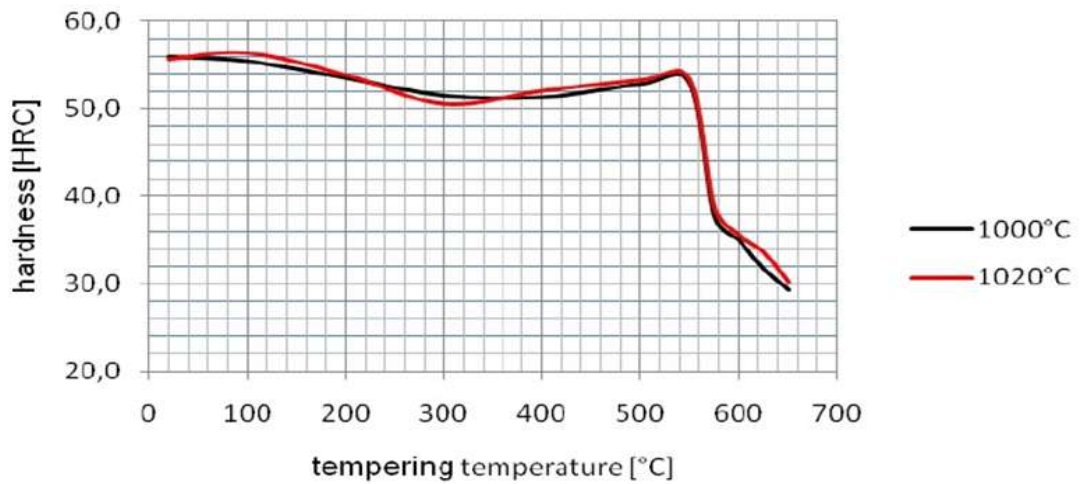
application	technology	mold making, corrosion resistant
	tools	corrosion resistant plastic molds with high requirements on surface quality
	process temperature	< 300 °C
	tool size	small- and medium-sized molds
	final products	transparent plastic parts, high gloss parts, lenses, optical parts, electronic covers
	features	for very high surface quality

SWG processing instructions	welding, texturing, polishing, vacuum hardening
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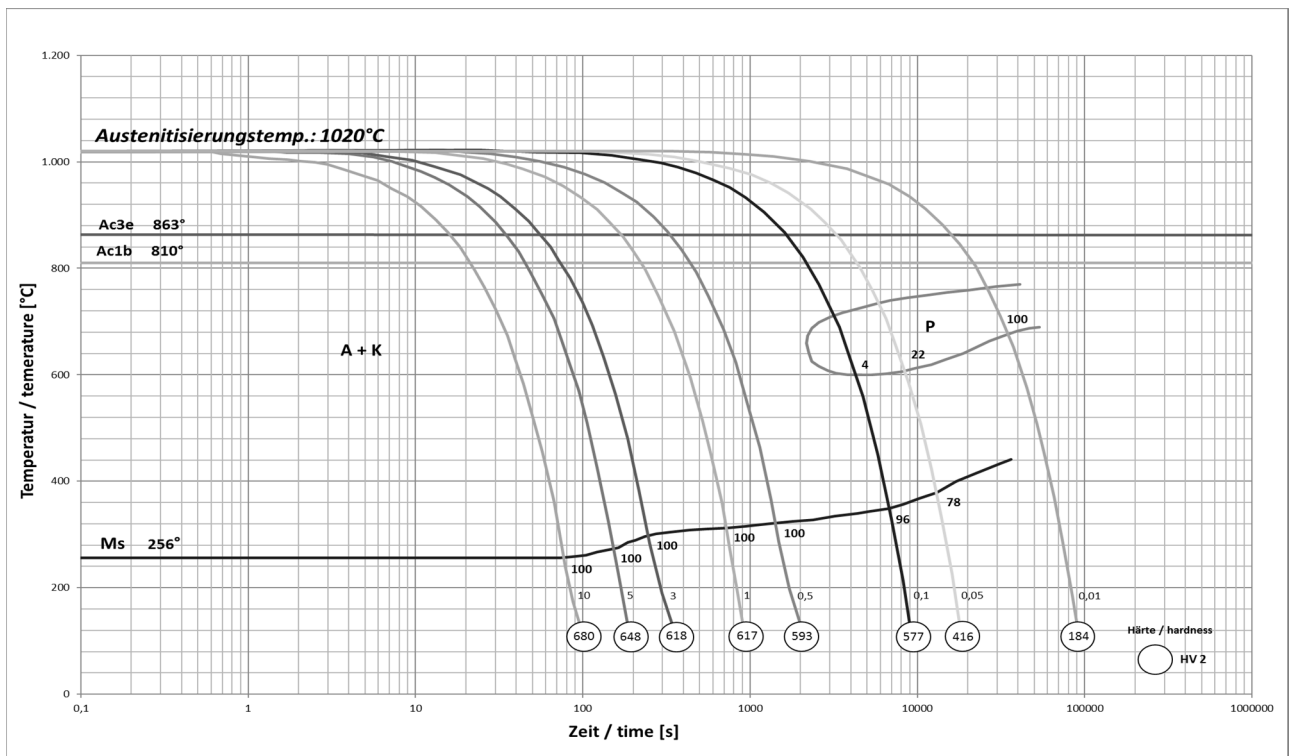
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	760	800	furnace
	hardening	1000	1030	vacuum, oil
	tempering	250	600	furnace
	stress relieving	450	500	min. 30 °C below tempering temp.
	pre-heating before welding	320	350	
	nitriding	400	500	min. 30 °C below tempering temp.
	PVD-treating	400	500	

diagrams/ structure	CCT-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 1000 °C and 1020 °C in oil



**CCT-diagram**



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