Material data sheet
SWG OPTI N+

Schmiedewerke Gröditz
GMH GRUPPE

material characteristics

material number / grade	SWG OPTI N+						
short designation	X15CrNi13						
comparable grade	1.4024mod PESR, AISI 420mod PESR						
chemical composition - reference analysis [%]	C	Si	Mn	Cr	Ni	N	
	0.15	0.30	0.40	14.00	0.60	alloyed	
production technology	EAF/LF/VD/PESR, forging, annealing						
service hardness / strength		HB	HRC	N/mm²			
		-	50 - 57	-			
delivery condition	annealed	≤ 260					variation upon request
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			

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		■	■				Q+T
polishability		■	■	■	■	■	ISO/SPI: N0/A-1
weldability		■					CET = 0.91 % 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^{-1} · K^{-1}]	20 °C	200 °C	300 °C	500 °C	-	
	19.9	23.5	24.4	25.1	-	
coefficient of thermal expansion between 20 °C and ... [10^{-6} · K^{-1}]	20 °C	50 °C	100 °C	120 °C	140 °C	150 °C
	10.356	10.434	10.584	10.644	10.704	10.734
	160 °C	180 °C	200 °C	220 °C	240 °C	260 °C
	10.764	10.824	10.884	10.944	11.004	11.064
	280 °C	300 °C	400 °C	-	-	-
	11.124	11.184	11.484	-	-	-
elastic modulus [kN/mm^2]	20 °C	200 °C	300 °C	500 °C	-	
	218	206	198	180	-	

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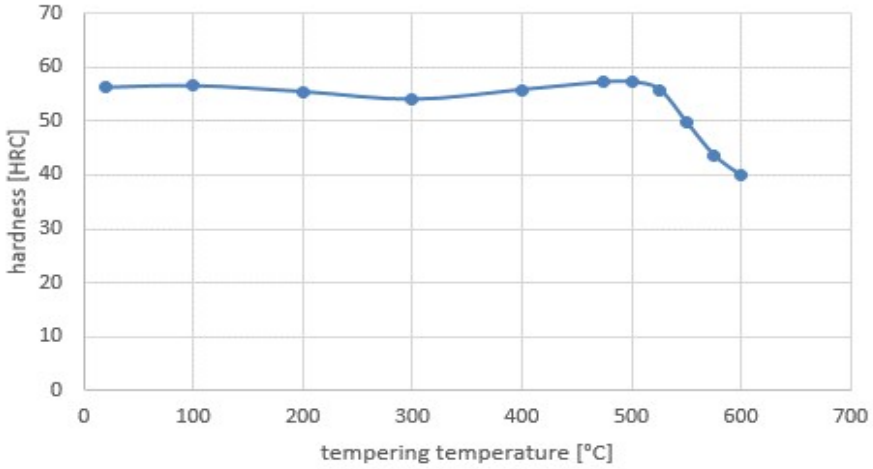
application	technology	mold making, corrosion resistant
	tools	corrosion resistant plastic molds with high requirements on surface quality
	process temperature	< 300 °C
	tool size	small- and medium-sized molds
	final products	transparent plastic parts, high gloss parts, lenses, optical parts, electronic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

SWG processing instructions	welding, texturing, polishing, vacuum hardening

		T min [°C]	T max [°C]	medium / comment
heat treatment	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 1020 °C in oil



CCT-diagram