

<b>material characteristics</b>	material number / grade	<b>SWG 2311</b>				
	DIN standard	40CrMnMo7				
	comparable grade	AISI P20				
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Mo
		0.40	0.30	1.50	2.00	0.20
	production technology	EAF/LF/VD, forging, Q+T				
	service hardness / strength converted acc. to DIN EN ISO 18265 table B2		HB	HRC	N/mm <sup>2</sup>	
			280 - 325	28.3 - 34.2	890 - 1030	
	delivery condition	Q+T	280 - 325	28.3 - 34.2	890 - 1030	
	maximum dimension	diameter			thickness	
	≤ 600 mm			≤ 400 mm		
US-specification	EN 10228-3			SEP 1921		
	table 3 - type 1 - qual. class 3			group 3 - class D,d		
cleanliness	DIN 50602			ASTM E45 method A		
	K4 ≤ 20			A ≤ 1,5; B, C, D ≤ 2		

variation upon request

<b>technological properties</b>		0	1	2	3	4	5	comment	
	toughness		■	■					in relation to service hardness
	hot strength at working temp.		■	■	■				
	wear resistance		■	■					
	corrosion resistance	■							
	machinability		■	■	■				Q+T
	polishability		■	■					ISO/SPI: N3/A-3
	weldability		■	■	■				CET = 0.65 % acc. DIN EN 1011-2
	texturability		■	■					for high texturing reliability: XPM
	nitridability		■	■	■				nitriding hardness 700 - 850 HV1
chrome-platability		■	■						

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

<b>physical properties</b>	thermal conductivity [W · m <sup>-1</sup> · K <sup>-1</sup> ]	20 °C	200 °C	300 °C	500 °C
		34.2	33.8	32.0	27.5
	coefficient of thermal expansion between 20 °C and ... [10 <sup>-6</sup> · K <sup>-1</sup> ]	100 °C	200 °C	300 °C	500 °C
		12.6	12.9	13.4	14.2
	elastic modulus [kN/mm <sup>2</sup> ]	20 °C	200 °C	300 °C	500 °C
		212	207	192	175

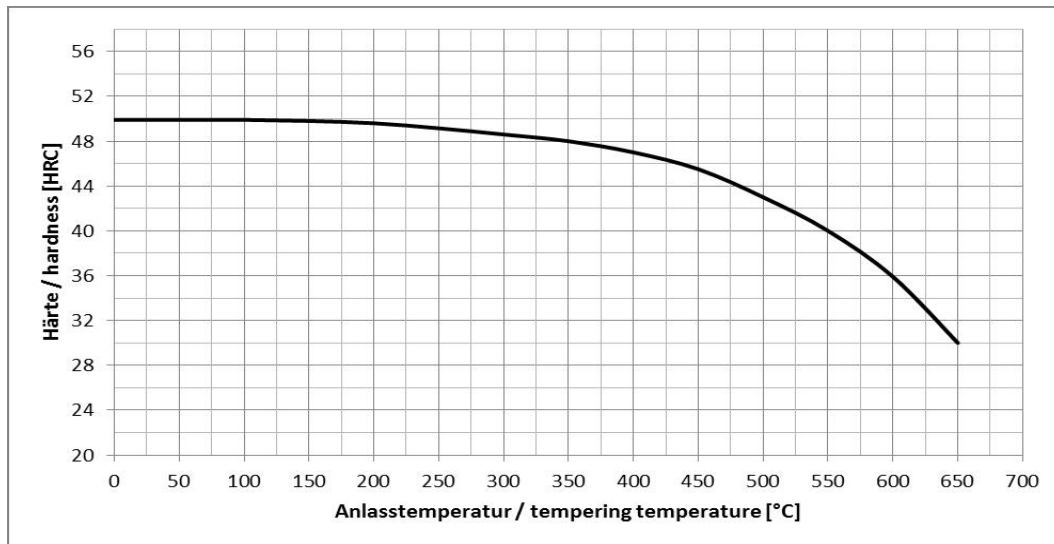
application	technology	mold making, injection molding
	tools	plastic molds, mold frames, mold base, casting tools
	process temperature	< 250 °C
	tool size	small- and medium-sized molds up to 400 mm thickness
	final products	plastic parts without special requirements
	features	quenched and tempered

SWG processing instructions	welding, texturing
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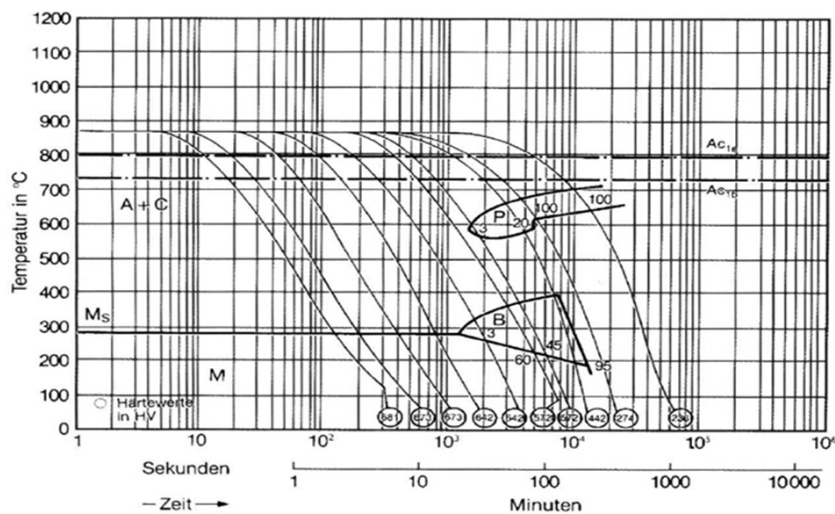
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	720	750	air
	hardening	840	870	oil, polymer
	tempering	550	680	air
	stress relieving	500	550	max. 30 °C below tempering temp.
	pre-heating before welding	320	350	
	nitriding	400	550	max. 30 °C below tempering temp.
	PVD-treating	400	550	

diagrams/ structure	TTT-diagram	yes
	tempering diagram	yes
	advice on heat treatment	pre-hardened
	microstructure	mainly bainitic

**Tempering diagram:** Average values on samples dia 25 mm x length 50 mm; hardened at 850 °C in oil



**TTT-diagram (continuous)**



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