



Technical Data Sheet	Grade	Code (SEL)	Cold work tool steel
	1.2316+QT	X38CrMo16	

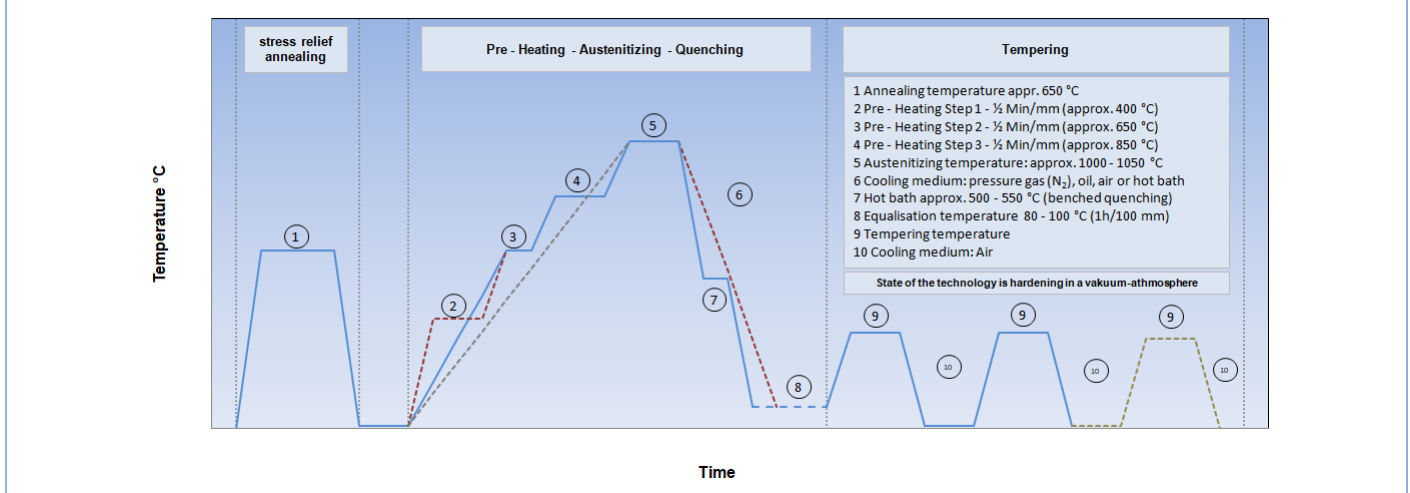
Standards	Steel properties
<b>EN ISO 4957</b> X38CrMo16 <b>AFNOR</b> Z35CD17 <b>BS</b> - <b>UNE</b> - <b>UNI</b> - <b>AISI</b> - <b>GOST</b> 4X16M	Pre – hardened, corrosion resistant martensitic tool steel with increased Cr-content. Good polishable, good heat- and wear resistance.  <b>Suitable for:</b> Tools and moulds for processing plastics with corrosive reactions, food industry.

C	Si	Mn	Cr	Mo	Ni	V	W	Co	Sonst.
0,37	< 1,00	< 1,50	16,00	1,10	< 1,00	-	-	-	-

<b>Melting</b>	EAF + VOD	<b>Remarks</b> Tensile strength converted acc. DIN EN ISO 18265 Tab. A.1 Enhanced corrosion resistance in comparison to 1.2083
<b>Density (g/cm³)</b>	7,7	
<b>Supply condition</b>	quenched+tempered	
<b>Hardness (HB)</b>	280 - 325	
<b>Tensile strength (N/mm²)</b>	950 - 1100	
<b>Work hardness (HRC)</b>	appr. 300	
<b>Structure</b>	-	
<b>Cleanness (DIN 50602)</b>	-	

Physical properties		20 °C	100 °C	200 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C
<b>Thermal expansion coefficient</b>	10 <sup>-6</sup> * K (20 °C bis ...)	-	10,4	10,8	11,2	-	11,6	11,9	-	-
<b>Thermal conductivity (W / m * K)</b>	annealed	20				-				-
	quenched + tempered	-				24,4				-

**Thermal Cycle Diagram (Heat treatment)**



Hinweis: Die in diesem Datenblatt enthaltenen Angaben dienen der Beschreibung, eine Haftung ist ausgeschlossen.



Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
<b>Soft annealing</b>	760 - 820	Furnace	Controlled slow cooling in furnace
<b>Stress-relief annealing</b>	ca. 650	Furnace	The recommended temperature of 500 - 550 °C is valid for the quenched and tempered condition.
<b>Hardening</b>	1000 - 1050		After through-heating hold for 15-30 minutes
Pre – heating Step 1	appr. 400		If subsequent QT - process required. Time in furnace 1 hour for each 20 mm of workpiece thickness but at least 2 hours. Cooling in air.
Pre – heating Step 2	appr. 650		
Pre – heating Step 3	appr. 850		
<b>Quenching</b>	500 - 550	hot bath	Enhanced stress corrosion cracking susceptibility in case of oil hardening; interrupt at appr. 120 - 150 °C
	appr. 80	Oil	To reduce as possible thermal stress, size alteration and distorsion it is recommended to use the softest quenching medium.
	appr. 80	Air	
	appr. 80	pressure gas	Oftentimes a hot bath hardening with the advantage of less thermal stress. To avoid stress corrosion cracks the steel has to be carried out immediately after hardening and when the steel is at appr. 80 °C. Cooling down to RT has to be disabled.

Tempering Chart		Tempering – Hardness after tempering									
	Temperature °C	100	200	300	400	500	550	600	650	700	
	HRC	49	47	46	46	47	-	32	-	-	
<b>Remarks for tempering</b>											
Slow heating to tempering temperature immediately after hardening. Time in furnace 1 hour for each 20 mm of workpiece thickness but at least 2 hours. Tempering must be repeated at least twice at a temperature 30 °C lower than the previous.											

