



Technical Data Sheet	Grade	Code (SEL)	Hot work tool steel
	1.2344 ESR	X40CrMoV5-1	

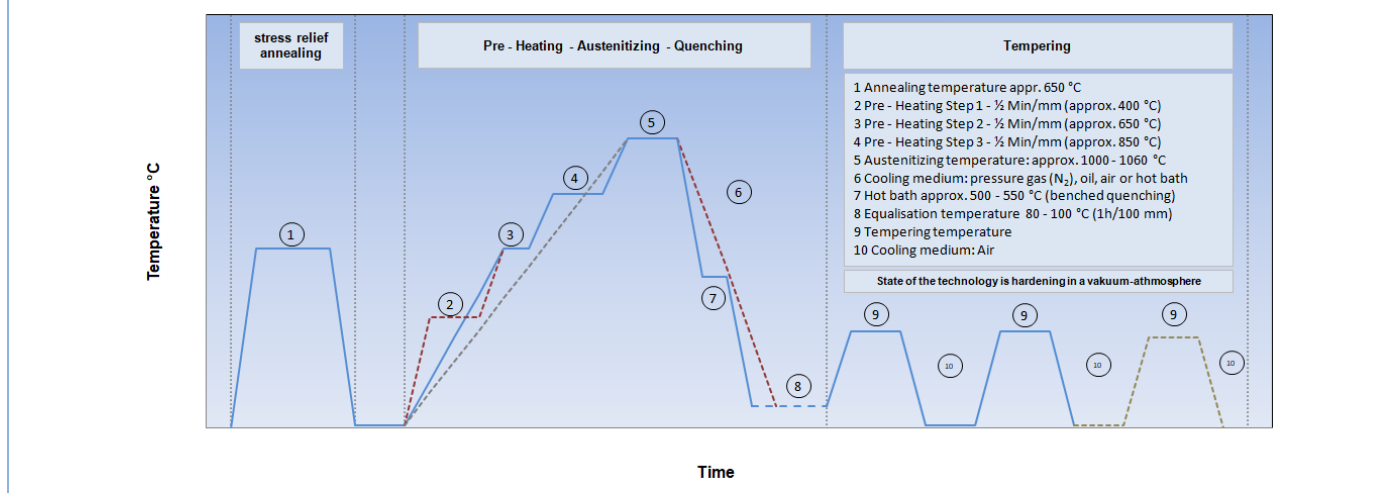
Standards	Steel properties
<b>EN ISO 4957</b> X40CrMoV5-1	Chromium-Molybdenum-Vanadium-alloyed hot working tool steel with extra fine structure (EFS), very high hot-wear resistance and hot tensile strength as well as very good toughness, very high thermal conductivity and insusceptibility to hot cracking. Can be water-cooled to a limited extent.
<b>AFNOR</b> Z40CDV5	
<b>BS</b> BH 13	
<b>UNE</b> F.5318	
<b>UNI</b> X40CrMoV51.1KU	
<b>AISI</b> H 13	
<b>GOST</b> 4X5MΦ1C	
	<b>Suitable for:</b>
	Dies and die inserts, tools for forging machines, pressure casting dies for light metals, highly stressed tools for extrusion of light metals, particularly mandrels for extrusion of tubes, hot shear knives, part dies. Hot extrusion tools, forging dies, casting- and pressure tools, ejector pins, hot shear knives, tool holders and shrink fit chucks, tool holders and shrink fit chucks.

C	Si	Mn	Cr	Mo	Ni	V	W	Co	Sonst.
0,40	1,00	0,40	5,20	1,35	-	1,00	-	-	-

<b>Melting</b>	ESR	<b>Remarks</b> 1.2344 has in comparison a higher hot-wear resistance than 1.2343.  Enhanced cleanness and homogeneity in comparison to conventional melted 1.2344.  Preheating before use: 250 - 300 °C – is recommended.
<b>Density (g/cm³)</b>	7,80	
<b>Supply condition</b>	EFS - annealed	
<b>Hardness (HB)</b>	max. 229	
<b>Tensile strength (N/mm²)</b>	-	
<b>Work hardness (HRC)</b>	-	
<b>Structure</b>	SEP 1614	
<b>Cleanness (DIN 50602)</b>	K1 < 15	

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 ...)	-	10,9	11,9	12,3	-	12,7	13,0	13,3	13,5
<b>Thermal conductivity (W / m * K)</b>	annealed	27,2				30,5				33,4
	quenched + tempered	25,5				27,6				30,3

**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>	750 - 800	Furnace	Controlled slow cooling in furnace
<b>Stress-relief annealing</b>	ca. 650	Furnace	Slow cooling in furnace. After extensive machining process or complex shapes
<b>Hardening</b>	1000 - 1060		After through-heating hold for 15-30 minutes
Pre – heating Step 1	appr. 400		
Pre – heating Step 2	appr. 650		
Pre – heating Step 3	appr. 850		
<b>Quenching</b>	500 - 550	hot bath	In case of oil or polymer hardening interrupt at appr. 250 °C; or vacuum hardening
	appr. 80	Oil	
	appr. 80	Air	
	appr. 80	pressure gas	

### Tempering Chart

Temperature °C	100	200	300	400	500	550	600	650	700
<b>HRC</b>	53	52	52	54	56	54	50	42	32

**Remarks for tempering**

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.

A third tempering cycle for the purpose of a best possible ductility and stress relieving may be advantageous.

### Continuous Cooling Transformation Chart

### Heat resistance chart

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