



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

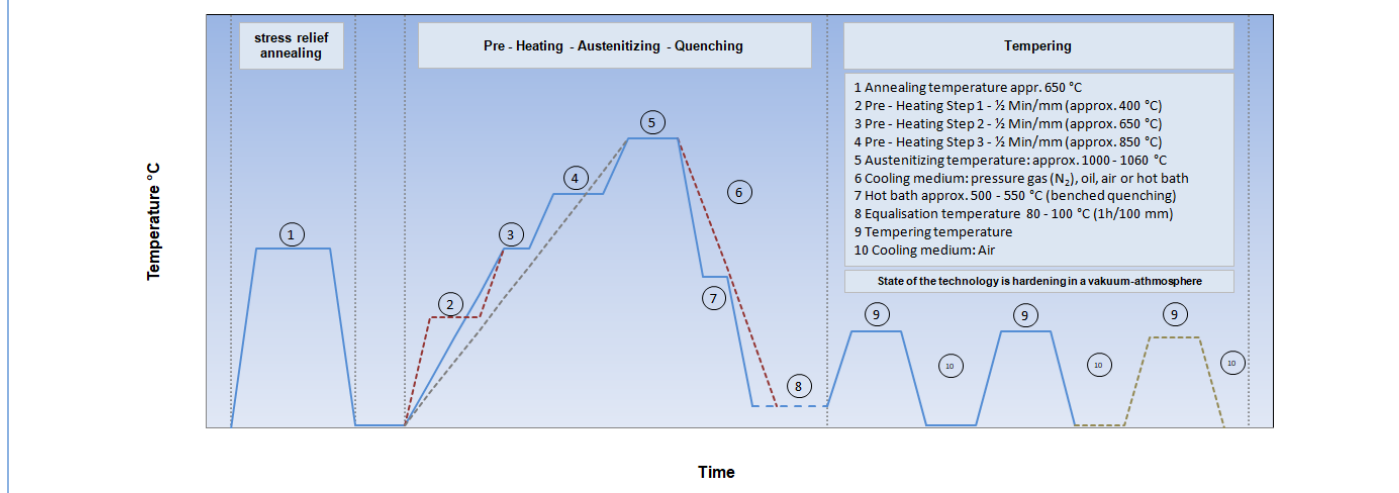
Standards	Steel properties
EN ISO 4957 X40CrMoV5-1	Chromium-Molybdenum-Vanadium-alloyed hot working tool steel with extra fine structure (EFS), very high hot-wear resistance and hot tensile strength as well as very good toughness, very high thermal conductivity and insusceptibility to hot cracking. Can be water-cooled to a limited extent.
AFNOR Z40CDV5	
BS BH 13	
UNE F.5318	
UNI X40CrMoV51.1KU	
AISI H 13	
GOST 4X5MΦ1C	
Suitable for:	
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	-	-	-

Melting	EAF + VOD	Remarks 1.2344 has in comparison a higher hot-wear resistance than 1.2343. For requirements concerning cleanness and better homogeneity we recommend the use of 1.2344 ESR. Preheating before use: 250 - 300 °C – is recommended.
Density (g/cm³)	7,80	
Supply condition	EFS - annealed	
Hardness (HB)	max. 229	
Tensile strength (N/mm²)	-	
Work hardness (HRC)	-	
Structure	SEP 1614	
Cleanness (DIN 50602)	-	

Physical properties		20 °C	100 °C	200 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C
Thermal expansion coefficient	10 ⁻⁶ * K (20 °C bis ...)	-	10,9	11,9	12,3	-	12,7	13,0	13,3	13,5
Thermal conductivity (W / m * K)	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
Soft annealing	750 - 800	Furnace	Controlled slow cooling in furnace
Stress-relief annealing	ca. 650	Furnace	Slow cooling in furnace. After extensive machining process or complex shapes
Hardening	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		
Quenching	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

Tempering – Hardness after tempering									
Temperature °C	100	200	300	400	500	550	600	650	700
HRC	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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