

Use of Toolox in engineering applications



Toolox in engineering applications

Toolox is a modern quenched and tempered (Q & T) engineering and tool steel, delivered with measured and guaranteed hardness and impact toughness. The basic idea is to enable faster component manufacturing by delivering Toolox as heat treated and ready to use, i.e. no need for further heat treatment.

Toolox is based on the low carbon metallurgical concept of Hardox and Weldox, the well known quenched and tempered abrasion resistant and structural steels from SSAB.

TOOLOX IS AVAILABLE IN THREE STRENGTH LEVELS;

Toolox 33 with a typical tensile strength of 980 MPa, Toolox 40 with 1260 MPa and Toolox 44 with 1450 MPa. All grades are characterized by low carbon contents, which result in very good machining properties. Thanks to the low carbon and alloy content, all Toolox grades can also be oxycut, welded and bent with good result with use of conventional methods.

Thanks to the extremely high steel cleanliness of the Toolox grades will the surface roughness of a component govern its fatigue life length.

When subject to elevated temperature will the Toolox grades start to back-temper when above 590 °C. Thereby are these grades possible to use in abrasive wear applications at elevated temperatures below 590 °C. Please contact SSAB for further information.

TYPICAL VALUES

TOOLOX 33

The current data sheet is valid – www.toolox.com

Chemical Composition		Mechanical Properties							
			-40 °C	-20 °C	+20 °C	+200 °C	+300 °C	+400 °C	+500 °C
C	0.22–0.24 %								
Si	0.6–1.1 %	Tensile Strength, R_m [MPa]			980	900			
Mn	0.8 %	Yield Strength, $R_{p0.2}$ [MPa]			850	800			
P	max. 0.010 %	Elongation, A_5 [%]			16	12			
S	max. 0.003 %	Compressive Yield Strength, $R_{c0.2}$ [MPa]			800	750	700	590	560
Cr	1.0–1.2 %	Impact toughness, Charpy-V, [J]	27	45	100	170	180	180	
Mo	0.30 %	Hardness, [HBW]			310				
V	0.10–0.11 %	Hardness, [HRC]			29				
Ni	max. 1 %								
CE_{IIW}	0.62–0.71	The Young's Modulus, [GPa]			210				
CET	0.40–0.44								
Physical Properties									
					+20 °C	+200 °C	+400 °C	+600 °C	
		Thermal conductivity [W/m * K]			35	35	30	23	
		Thermal expansion coefficient [$10^{-6}/K$]			13.1	13.1			

TYPICAL VALUES

TOOLOX 40

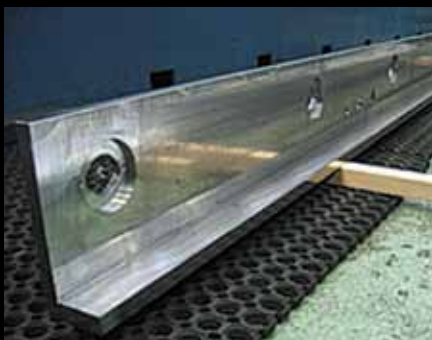
Chemical Composition		Mechanical Properties								
			-40 °C	-20 °C	+20 °C	+200 °C	+300 °C	+400 °C	+500 °C	+550 °C
C	0.28-0.30%									
Si	0.6-1.2%	Tensile Strength, R_m [MPa]			1260	1170	1160	1060	900	790
Mn	0.6%	Yield Strength, $R_{p0.2}$ [MPa]			1150	1010	990	900	780	660
P	max 0.010%	Elongation, A_5 [%]			14	14	14	15	16	19
S	max 0.003%	Impact toughness, Charpy-V, [J]			38					
Cr	1.1-1.3%	Hardness [HBW]			390					
Ni	max 1%									
Mo	0.5%	The Young's Modulus, [GPa]			210					
V	0.12%									
CE _{HW}	0.76-0.82%									
CET	0.45-0.50									
Physical Properties										
					+20 °C	+200 °C	+400 °C	+600 °C		
Thermal expansion coefficient [$10^{-6}/K$]					13.1	13.1				



Toolox 44
Hot slag bucket



Toolox 44
Recycling at high temperature (400°C)



Toolox 44
Knife seat



Toolox 33
Press brake tools



Toolox 44
Piston rods

TYPICAL VALUES

TOOLOX 44

Chemical Composition		Mechanical Properties							
			-40 °C	-20 °C	+20 °C	+200 °C	+300 °C	+400 °C	+500 °C
C	0.32 %								
Si	0.6–1.1 %	Tensile Strength, R_m [MPa]			1450	1380			
Mn	0.8 %	Yield Strength, $R_{p0.2}$ [MPa]			1300	1200			
P	max. 0.010 %	Elongation, A_5 [%]			13	10			
S	max. 0.003 %	Compressive Yield Strength, $R_{c0.2}$ [MPa] after 170 hrs soaking time			1250	1120	1120	1060	930
Cr	1.35 %							1060	910
Mo	0.80 %	Impact toughness, Charpy-V, [J]	14	19	30	60	180	180	
V	0.14 %	Hardness, [HBW]			450				
Ni	max. 1 %	Hardness, [HRC]			45				
CE_{Mn}	0.92–0.96								
CET	0.55–0.57	The Young's Modulus, [GPa]			210				
Physical Properties									
					+20 °C	+200 °C	+400 °C	+600 °C	
					28	32	29	21	
Thermal expansion coefficient [$10^{-6}/K$]					13.5	13.5	13.5		

300 HBW Steel						
	Impact toughness [Typical J at 20°C]	Machining	Low internal stress	Yield strength [Typical, MPa]	Tensile strength [Typical, Mpa]	
1.7218 25 CrMo 4	45	+	++	600	650–1100	
1.6582 36CrNiMo 6	35–45	+	++	700	900–1400	
1.7225 42 CrMo 4	30–35	+	+	675	900–1300	
Toolox 33	~100	+++	+++	850	~980	



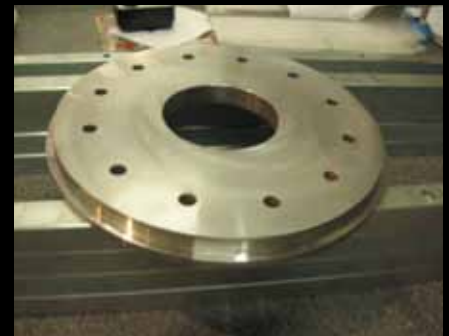
Toolox 44

Nitrided as shear blade – 8000 cuts up to 35 mm 960 MPa



Toolox 33

Machine parts



Hydraulic component made in

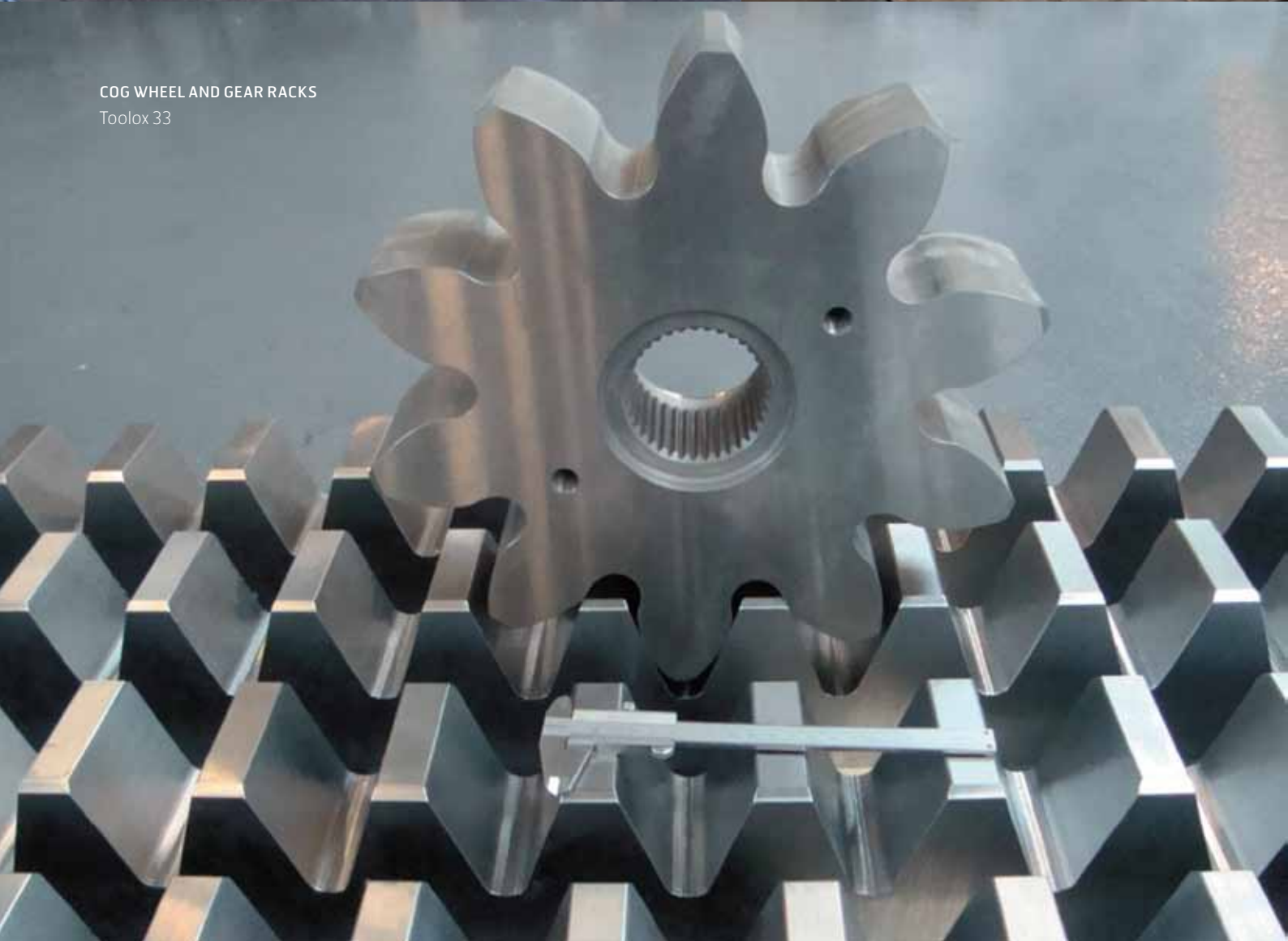
Toolox 33 previously made made in P20 or 4140



Machine component
Toolox 33, dimensional stable
after the mechanical processing.



TOOLOX-tubes
for high temperature applications



COG WHEEL AND GEAR RACKS
Toolox 33

SSAB is a global leader in value added, high strength steel. SSAB offers products developed in close cooperation with its customers to reach a stronger, lighter and more sustainable world.

SSAB employs over 8 700 people in over 45 countries around the world and operates production facilities in Sweden and the US. SSAB is listed on the NASDAQ OMX Nordic Exchange, Stockholm.

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