

# Product sheet: Toolox<sup>®</sup> 33, 300 HBW with ESR properties

## Specification

<b>Hardness</b>	HBW 275 - 325		
<b>Impact toughness</b>	Test temperature 20 °C	Impact energy, Charpy-V-test for plate, transverse direction; min J ≤ 130 mm 35	Impact energy, Charpy-V-test for forged bar, thickness direction; min J > 130 mm 35
<b>Ultrasonic inspection</b>	Ultrasonic inspection is carried out according to: EN 10 160 (rolled plates) EN 10228-3 (forged bars) with extra demands according to specification SSAB V6.		
<b>Etching</b>	Toolox 33 fulfils the etching requirements of NADCA # 207-2006.		
<b>Dimensions</b>	Toolox 33 is supplied as plate in thicknesses between 5 - 130 mm, or as forged bars in thicknesses between 150 - 300 mm.		
<b>Delivery condition</b>	Quenched and tempered at a minimum temperature of 590 °C.		
<b>Heat treatment</b>	Toolox 33 is not intended for further heat treatment. If Toolox 33 is heated above 590 °C after delivery from SSAB Plate no guarantees for the properties of the steel are given.		
<b>Nitriding/coating</b>	Nitriding or surface coating may be carried out if the temperature is below 590 °C.		
<b>Testing</b>	Testing according to EN 10 025 and EN ISO 6506-1. Hardness is measured on a milled surface 0.5 - 2 mm below the original surface.		
<b>Tolerances</b>	Thickness, length, width and flatness tolerances according to "Dimension program and tolerances for new rolling of tool steel plates from SSAB Plate". Forged bars: According to DIN 7527.		
<b>Surface finish</b>	On delivery from SSAB Plate the plate meets the following specifications: - free from mill scale - not repair welded - surface defects below the nominal ordered thickness are not permitted. Forged bars according to DIN 7527.		

**SSAB Oxelösund AB**  
SE-613 80 Oxelösund  
Sweden

Tel: +46 155 25 40 00  
Fax: +46 155 25 55 34  
contact@ssab.com

[www.toolox.com](http://www.toolox.com)

# Technical information

## Toolox<sup>®</sup> 33

### Usage

Toolox 33 is a new steel delivered quenched and tempered with high impact toughness and very low residual stresses to get good dimensional stability. Toolox 33 has a low carbide content, and is therefore excellent to machine. Toolox 33 is suitable for plastic moulding, for rubber moulding and machine components. With proper surface treatment, the service life of the tool/component can be prolonged.

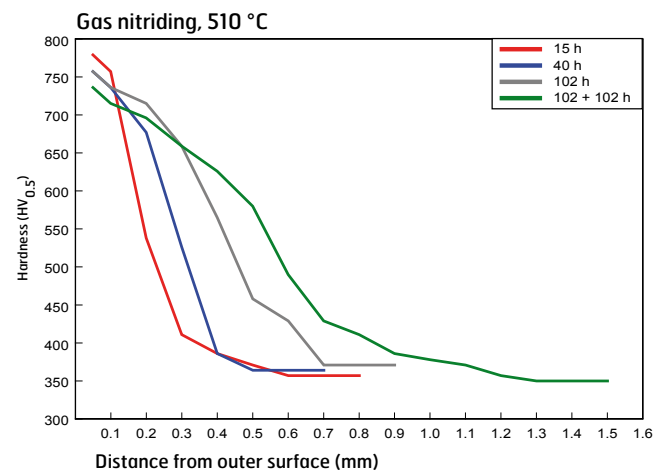
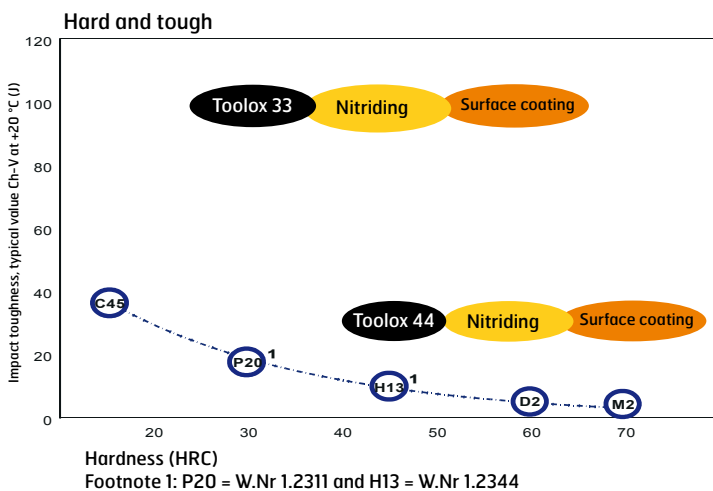
### Typical Values

CHEMICAL COMPOSITION		MECHANICAL PROPERTIES					
C	0.22-0.24%		+20 °C	+200 °C	+300 °C	+400 °C	+500 °C
Si	0.6-1.1%	Tensile strength, R <sub>m</sub> [MPa]	980	900			
Mn	0.8%	Yield strength, R <sub>p0.2</sub> [MPa]	850	800			
P	max 0.010%	Elongation, A <sub>5</sub> [%]	16	12			
S	max 0.003%	Compressive yield strength, R <sub>c0.2</sub> [MPa]	800	750	700	590	560
Cr	1.0-1.2%	Impact toughness [J]	100	170	180	180	
Mo	0.30%	Hardness [HBW]	300				
V	0.10-0.11%	Hardness [HRC]	29				
Ni	max 1%						
CE <sub>IIW</sub>	0.62-0.71						
CET	0.40-0.44						

INCLUSIONS		PHYSICAL PROPERTIES			
Inclusion size (equiv. diam)	6 μm		+20 °C	+200 °C	+400 °C
Area fraction	0.015%	Heat conductivity [W/m • K]	35	35	30
Aspect ratio	1.2	Thermal expansion coefficient, [10 <sup>-6</sup> /K]	13.1	13.1	

### Surface technology



# Machining Toolox<sup>®</sup> 33

Toolox 33 can be machined using conventional machines. It is important that sharp tools are used, with a positive cutting angle and that vibration is avoided. Use the following recommendations as guidelines and the starting point for your own evaluation of best practice.

## Milling

### Cemented carbide cutter ISO class P 20

Always use a positive cutting angle

Cutting speed  $V_c = 150-250$  m/min

Feed  $f = 0.10-0.20$  mm/tooth

Speed (rpm)  $n = \frac{V_c \times 1000}{\pi \times D}$



### Roughing

Use milling cutters with circular inserts



### Finishing

Use milling cutters with a 45° setting angle

## Drilling

### Carbide

Cutting speed  $V_c = 40-50$  m/min

$f = 0.10-0.18$  mm/revolution

Feed (f) and speed (rpm) (n)

are dependent on the drill bit

diameter D

Use coolant



### High speed steel HSS-Co

Cutting speed  $V_c = 13-15$  m/min

Speed (rpm)

$n = \frac{V_c \times 1000}{\pi \times D}$

Use coolant



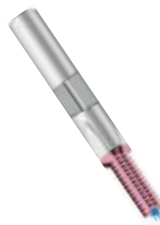
D [mm]	FEED, f [mm/rev]
5	0.10
10	0.10
15	0.16
20	0.23
25	0.30
30	0.35

## Threading

### Thread milling

Cutting speed  $V_c = 30$  m/min

Feed (f) = 0.03 mm/tooth



### Threading HSS-Co

Cutting speed

$V_c = 7-9$  m/min



DIMENSION	SPEED
M6	450
M8	300
M10	250
M12	200
M16	150

## Gas cutting / Welding

Recommended preheat temperature when gas cutting and welding. **Min. 175 °C**

Recommended stress relief annealing (after slow cooling to room temperature).

after gas cutting and welding. **580 °C**

For further information see Best Practice or please contact SSAB Plate.

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# Dimensional range

## Standard stock dimensions

	TOOLOX 33 / 44	TOOLOX 33 / 44	SM 100 / 140 <sup>2</sup>	TOOLOX 33 / 44
Thickness (mm)	5 - <104	≥104 - 130	>130 - 165	>165 - 320 <sup>3</sup>
Width <sup>1</sup> (mm)	1050 - 2100	850 - 1700	850 - 1700	700 - 1150
Length <sup>1</sup> (mm)	up to 5800	up to 5800	up to 5800	up to 5600

<sup>1</sup> The possible width and length is depending on the thickness.

<sup>2</sup> **SM 100/140 is inspected and tested as Toolox 33/44 and has the same properties except:**  
- in the centre of the plate thickness, approximately ±5% of the actual plate thickness, the polishing properties may not fulfil the requirements of high demands. The explanation for these abbreviations is a risk for small porosities in the plate centre.

<sup>3</sup> Material above 165 mm in thickness will be supplied as forged blocks.

## New Rolling

	TOOLOX 33	TOOLOX 44	SM 100 <sup>2</sup>	SM 140 <sup>2</sup>
Thickness (mm)	5 - 130	5 - 130	>130 - 165	>130 - 165
Width <sup>1</sup> (mm)	1680 - 3000	1680 - 3000	1680 - 2400	1680 - 2400
Length <sup>1</sup> (mm)	4100 - 12000	4100 - 12000	4100 - 5700	4100 - 5700

<sup>1</sup> The width and length is depending on the thickness.

<sup>2</sup> **SM 100/140 is inspected and tested as Toolox 33/44 and has the same properties except:**  
- in the centre of the plate thickness, approximately ±5% of the actual plate thickness, the polishing properties may not fulfil the requirements of high demands. The explanation for these abbreviations is a risk for small porosities in the plate centre.

If you require smaller sizes than those offered in the stock list please contact your Approved Toolox Dealer.

If larger formats are required, please contact SSAB Plate.

Toolox is the registered trademark for tool steels produced by SSAB Plate.

For more information about Toolox, contact SSAB Plate.

### SSAB Oxelösund AB

SE-613 80 Oxelösund  
Sweden

Tel: +46 155 25 40 00

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