

CUTTING TOOLOX[®] 44 WITH CIRCULAR SAWING

For both machine components and tools, there is a trend of loads to increase. Equipment needs to work faster and with a higher productivity. Special steel producer SSAB (www.ssab.com) can with the Toolox[®] 44 steel bars offer a perfect solution. Combining a ultra high yield strength of 1300 MPa with a guaranteed minimum toughness it can be used for the most demanding applications without risk for cracking. The product is excellent for surface hardening such as nitriding or induction. Giving the possibility to improve component performance even more.

Toolox[®] 44 is the perfect steel but of course it is crucial to be able to cut pieces from the bars in an efficient way. An excellent way is to use circular saw blades. In this way a precise cutting and good surfaces can be obtained at high speed and with an overall very good production economy.

Kinkelder being the perfect partner thanks to their international presence on different continents with production locations, sales and service subsidiaries and selected distributors. A strong focus on steel cutting leads to excellent cutting-edge products but also their technical approach in always trying to develop new technology. Below picture shows correct chipforming (tooth load 0.045 mm/tooth).



Case study cutting Toolox® 44 on a circular saw

Workpiece

Steel grade	SSAB Toolox® 44
Shape	Solid round
Diameter	150 mm
Cut-to-length	8 mm slices
Remark length workpiece	In daily production practice, product lengths are typically longer than 8 mm and show therefore less to no heat transfer from piece to piece.

Machine

Brand and type	Mega CS 150
Remarks machine	New brush fitted, mist spray lubrication. Usage of emulsion on shorter workpieces is advised to reduce workpiece temperature.

Sawblade

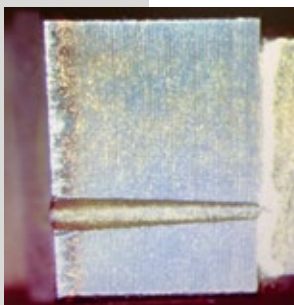
Brand and type	Kinkelder KINS' RED HT (Toolox® optimized version)
Blade diameter	460 mm
Number of teeth	Z=60

Cutting parameters trial

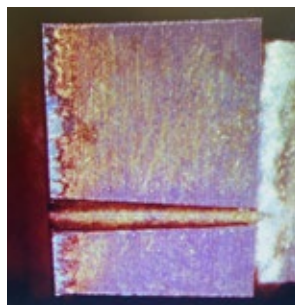
Cutting speed	80 m/min = 55 RPM
Tooth load/feed	0.045 mm/tooth (= 148,5 > 149,5 mm/min or 2,49 mm/sec)

Cutting results

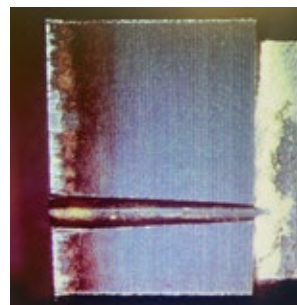
Cut-time	1 minute Faster cut-time is possible at the expense of blade life (see table on next page)
Squareness	From 0,0 mm at start up to 0,5 mm towards the end of blade life (common tolerance on 150 mm)
Blade life	Tested up to 5 m ²



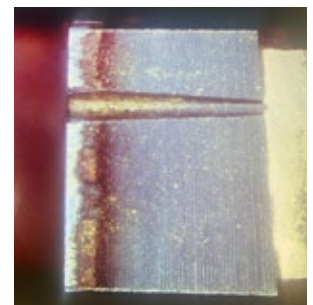
First cut



2 m²



3 m²



4 m²

Cutting recommendations Toolox® 44 on a circular saw

Important machine aspects

Clamping	Ensure sufficient clamping by avoiding excessive clamp wear and applying appropriate power to hold the material.
Drive	Sawblade drive (gearbox, belt and motor) must be in a good condition. Avoid introduction of vibrations caused by backlash or belt slippage.
Alignment	Conveyor support rolls, machine bed and clamps must be aligned. Poor alignment leads to pinching and may damage saw blade teeth.

Blade diameter and tooth number vs. workpiece diameter

The advised tooth number depends on dimension of the blade in combination with the dimension of the material to be cut.

	285	315	360	425	460
Z80	20 – 45 mm	30 – 60 mm	40 – 70 mm	70 – 100 mm	90 – 120 mm
Z60	45 – 75 mm	60 – 90 mm	70 – 100 mm	100 – 130 mm	120 – 150 mm

Cutting speed

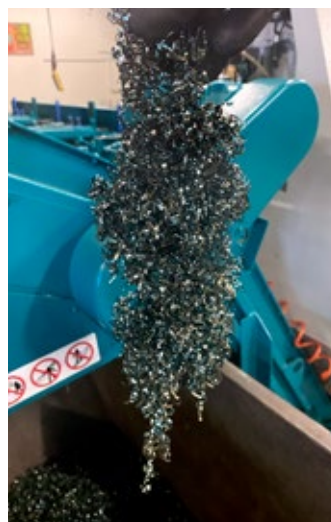
Recommended cutting speed range: 60 – 90m/min.

Conversion table 60 – 90m/min > RPM at different blade diameters.

	285	315	360	425	460
RPM	67 – 100	60 – 91	53 – 80	45 – 67	42 – 62

Birdnesting

Below pictures show examples of birdnesting. This refers to the accumulation of chips around the sawblade. This phenomenon is caused by applying too low feedrate which influences chip formation negatively, the formed chips will interlock. The accumulation of chips hinders appropriate chip evacuation and will be therefore be cut by the sawblade once again. The sawblade and its tips will get damaged quickly, affecting blade life, cut surface quality and straightness immediately. Besides, it creates clogging of the chips conveyor.



Tooth load/feed

Recommended tooth load range: 0.04 – 0.05 mm/tooth

Applying too low values such as 0.015 – 0.03 mm/tooth will impact chip forming negatively and leads to gullet blockage and 'birdnesting' problems. This causes additional heat development, resulting in poor blade life.

Conversion tooth load ξ cutting speed > mm/min and mm/sec per blade diameter and tooth count.

Blade size	Z	0.04 mm/tooth - 60 m/min	0.04 mm/tooth - 90 m/min	0.05 mm/tooth - 60 m/min	0.05 mm/tooth - 90 m/min
285	Z60	160 mm/min = 2.7 mm/sec	240 mm/min = 4 mm/sec	200 mm/min = 3.3 mm/sec	300 mm/min = 5 mm/sec
	Z80	214 mm/min = 3.6 mm/sec	320 mm/min = 5.3 mm/sec	268 mm/min = 4.4 mm/sec	400 mm/min = 6.6 mm/sec
315	Z60	144 mm/min = 2.4 mm/sec	218 mm/min = 3.6 mm/sec	180 mm/min = 3 mm/sec	272 mm/min = 4.5 mm/sec
	Z80	218 mm/min = 3.6 mm/sec	290 mm/min = 4.8 mm/sec	272 mm/min = 4.5 mm/sec	362 mm/min = 6 mm/sec
360	Z60	127 mm/min = 2.1 mm/sec	192 mm/min = 3.2 mm/sec	160 mm/min = 2.6 mm/sec	240 mm/min = 4 mm/sec
	Z80	192 mm/min = 3.2 mm/sec	256 mm/min = 4.3 mm/sec	240 mm/min = 4 mm/sec	320 mm/min = 5.3 mm/sec
425	Z60	108 mm/min = 1.8 mm/sec	160 mm/min = 2.7 mm/sec	136 mm/min = 2.3 mm/sec	200 mm/min = 3.3 mm/sec
	Z80	144 mm/min = 2.4 mm/sec	214 mm/min = 3.6 mm/sec	180 mm/min = 3 mm/sec	268 mm/min = 4.4 mm/sec
460	Z60	101 mm/min = 1.7 mm/sec	149 mm/min = 2.5 mm/sec	126 mm/min = 2.1 mm/sec	186 mm/min = 3.1 mm/sec
	Z80	134 mm/min = 2.2 mm/sec	198 mm/min = 3.3 mm/sec	168 mm/min = 2.8 mm/sec	248 mm/min = 4.1 mm/sec

Availability

Plates and square blocks from 6–320 mm. Bars between 21 and 405 mm with lengths up to 5000 mm. Toolox® is available from the local SSAB stock. Cut pieces of Toolox® can be obtained through the well-established global network of Approved Toolox® Distributors. Both SSAB and the distributors can provide you with good application support as well as technical guidelines.

Contact and more information

Contact your local sales representative to learn more, visit www.toolox.com or consult Tech Support at: help@ssab.com.