TOOLOX®
ENGINEERING & TOOL STEEL

MACHINING RECOMMENDATIONS FOR TOOLOX®

SSAB

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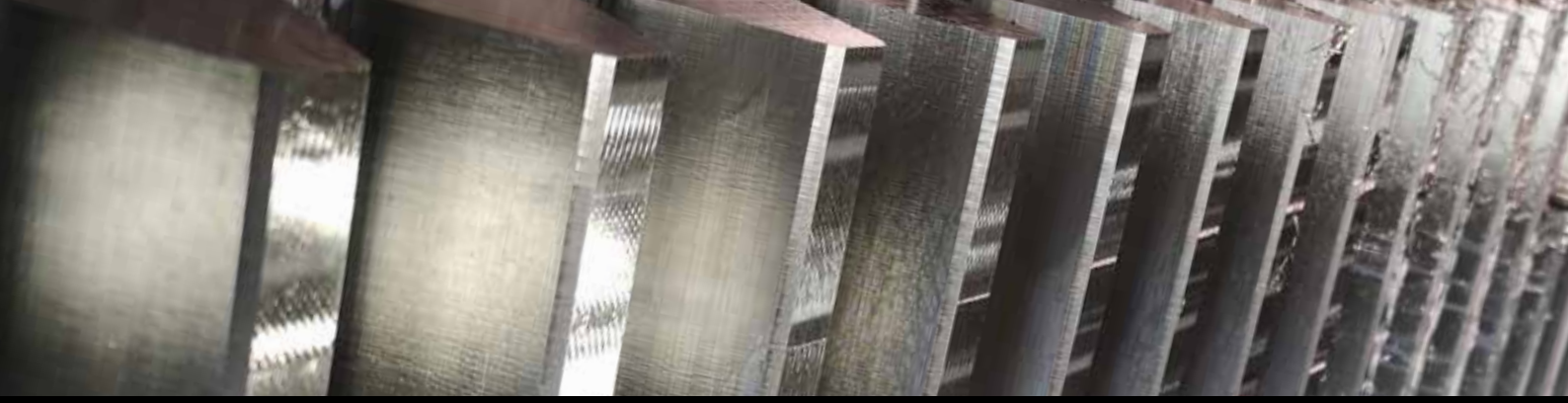


WHAT IS TOOLOX®?

Toolox® is a modern quenched and tempered prehardened engineering and tool steel, delivered with measured and guaranteed mechanical properties. The basic idea is to save you time by delivering Toolox heat treated and ready to use. It provides you with lower costs, reduced risks and saves you valuable time in your production process due to its excellent machinability. This combined with the benefit of working with the hardest prehardened tool steel in the world gives you a simple to use material with a wide variety of uses.

Toolox® is based on the same low carbon content as in Hardox® and Strenx®, but it is specially developed for tools and machine components working at high temperatures. It has excellent fatigue properties, and you can increase the surface hardness with nitriding or PVD coatings to gain more control over the service life of your tools or components.

In the information that follows, you will find our recommendations of tools to process Toolox®. Similar tools from other suppliers might work, but here are the ones we have tested so far.

All content in this brochure should be considered as recommendations. Machining contains many different parameters that can and will affect the end result. Optimization of cutting data hould always take place at the machine to be used for manufacturing.

SHORTER LEAD TIME FROM CONCEPT TO PRODUCTION

DRILLING RECOMMENDATIONS

It is recommended to use drills with an internal coolant supply when drilling Toolox®.

- Is always to be preferred to avoid chip jamming.
- Should always be used at hole depth above 3 times the drill diameter.
- Never use a HSS drill with external cooling in a horizontal drilling machine.
- Coolant mix 8 – 12%

To make a hole with a tight tolerance, a good surface finish and a long service life of the drill, the following is required.

- Make sure that the runout on the drill is as small as possible. For solid carbide drills, the runout should not exceed 0,02 mm.
- Use the shortest possible drill for maximum stability.
- Chip breaking and chip evacuation must always be good.
- Coolant supply and pressure need to be satisfactory.
- A collet and tool shank in bad condition will ruin an otherwise perfect setup.
- The machine should be in good condition.
- A good clamping of the workpiece is necessary.

Formulas and definition drilling

$$Vc = \frac{Dc \times \pi \times n}{1000}$$

$$n = \frac{Vc \times 1000}{\pi \times Dc}$$

$$Vf = fn \times n$$

Definitions

Vc= Cutting Speed (m/min)
n = Spindle Speed (rpm)
fn = Feed Per Revolution (mm/r)
Vf = Penetration Rate (mm/min)
Dc= Drill Diameter(mm)

SOLID CEMENTED CARBIDE DRILL

First choice for smaller diameter and when closer diameter is require. Works well for short or relatively deep holes. The drill is sensitive to vibrations and should be used together with high precision chucks.

Steel grade	Cutting speed (Vc), m/min	Drill diameter, (Dc), mm							
		Feed per revolution, (fn), mm/rev							
		Ø 3,0 – 5,0 mm		Ø 5,01 – 10,0 mm		Ø 10,01 – 15,0 mm		Ø 15,01 – 20,0 mm	
		Min - Max	Start value	Min - Max	Start value	Min - Max	Start value	Min - Max	Start value
Toolox® 33	65 – 90	0,08 – 0,15	0,10	0,09 – 0,16	0,12	0,16 – 0,22	0,18	0,22 – 0,28	0,25
Toolox® 40	50 – 65	0,06 – 0,12	0,08	0,08 – 0,15	0,11	0,16 – 0,20	0,16	0,16 – 0,24	0,20
Toolox® 44	40 – 60	0,06 – 0,11	0,07	0,08 – 0,13	0,10	0,12 – 0,18	0,15	0,16 – 0,20	0,18

Drilling 7 x Dc, reduce the feed ~20 %

SOLID CEMENTED CARBIDE DRILL
LONG HOLE DRILLING WITH 16 – 20 X DC

Clamping of this type of drill should be done with high precision chucks. Possible hole tolerance H8-H9. Cutting fluid pressure > 20 bar.

Steel grade	Cutting speed (Vc), m/min	Drill diameter, (Dc), mm							
		Feed per revolution, (fn), mm/rev							
		Ø 6,0 mm		Ø 8,0 mm		Ø 10,0 mm		Ø 12,0 mm	
		Min - Max	Start value	Min - Max	Start value	Min - Max	Start value	Min - Max	Start value
Toolox® 33	50 – 70	0,06 – 0,12	0,14	0,14 – 0,20	0,16	0,17 – 0,24	0,19	0,18 – 0,26	0,20
Toolox® 40	50 – 65	0,10 – 0,15	0,12	0,11 – 0,18	0,14	0,13 – 0,22	0,16	0,15 – 0,24	0,18
Toolox® 44	40 – 60	0,08 – 0,14	0,11	0,10 – 0,18	0,13	0,12 – 0,21	0,15	0,14 – 0,23	0,17

Drilling strategy.

- For drills >12 x Dc
- Pre-drill a hole 1,5-2 x Dc. Use a Solid cemented carbide drill with the same diameter, it is recommended to use a shallow point angle, 150°.
- When entering with the long drill, start the machine spindle at a low speed not higher than 500 rpm (No cooling).
- Insert the drill into the hole, stopping about 1 mm above the bottom of the pre-drilled hole.
- Start machine spindle and cooling, drill with recommended cutting data (No Peck Drilling).
- At full drilling depth, reduce the speed to 500 rpm and turn of the cutting fluid.
- Retract the drill by 4 times the machine feed to avoid re-scratching the surface of the hole.

EXCHANGEABLE TIP DRILLS

A good first choice when drilling medium-sized holes. The exchangeable tip provides for an economical solution.

- The drill has close hole tolerance.
- The steel-made drill body provide the drill with toughness.
- Used for short or relatively deep holes.

Steel grade	Cutting speed (Vc), m/min	Drill diameter, (Dc), mm			
		Feed per revolution, (fn), mm/rev			
		Ø 7,5 – 12,0 mm	Ø 12,01 – 20,0 mm	Ø 20,01 – 25,0 mm	Ø 25,01 – 30,0 mm
		Min - Max	Min - Max	Min - Max	Min - Max
Toolox® 33	50 – 80	0,10 – 0,16	0,15 – 0,23	0,18 – 0,27	0,20 – 0,30
Toolox® 40	50 – 65	0,08 – 0,15	0,12 – 0,22	0,15 – 0,25	0,17 – 0,27
Toolox® 44	40 – 60	0,08 – 0,14	0,12 – 0,20	0,14 – 0,22	0,16 – 0,25

INDEXABLE INSERT DRILL

This drill produces holes at a low cost, due to the fact that it is possible to use several sides on the inserts.

This drill has no tip that centers the drill, therefore use as short drills as possible to achieve good lateral stability, when used in Toolox®.

- Medium and large diameter holes.
- Medium tolerance demands.
- A drill suitable for boring operations.

The recommendations apply to a drill with a max drilling dept of 2 x Dc.

Steel grade	Cutting speed (Vc), m/min	Drill diameter, (Dc), mm			
		Feed per revolution, (fn), mm/rev			
		Ø 12,0 – 20,0 mm	Ø 20,01 – 30,0 mm	Ø 30,01 – 40,0 mm	Ø 40,01 – 60,0 mm
		Min - Max	Min - Max	Min - Max	Min - Max
Toolox® 33	80 – 140	0,04 – 0,12	0,06 – 0,16	0,08 – 0,20	0,10 – 0,21
Toolox® 40	70 – 130	0,04 – 0,12	0,06 – 0,16	0,08 – 0,20	0,10 – 0,21
Toolox® 44	60 – 110	0,04 – 0,12	0,06 – 0,16	0,08 – 0,20	0,10 – 0,21

HSS DRILLS

Use only HSS drills when you have unstable machine conditions. If the machine conditions are good youcan use different solid cemented carbide drill or drills with exchangeable tip.

Use an HSS-Co Drill (8% Co) with a small helix angle and A robust core that Can withstand high Torques.

Individual holes can be drilled With an ordinary HSS drill.

Cutting data for HSS-Co DRILL

Steel grade	Cutting speed (Vc), m/min	Drill diameter, (Dc), mm					
		Feed per revolution, (fn), mm/rev					
		Ø 5 mm	Ø 10 mam	Ø 15 mm	Ø 20 mm	Ø 25 mm	Ø 30 mm
Toolox® 33	≈ 15	0,10	0,10	0,16	0,23	0,30	0,35
Toolox® 40	≈ 9	0,05	0,10	0,16	0,22	0,28	0,35
Toolox® 44	≈ 7	0,05	0,09	0,15	0,20	0,25	0,30

MILLING RECOMMENDATIONS

CLAMPING

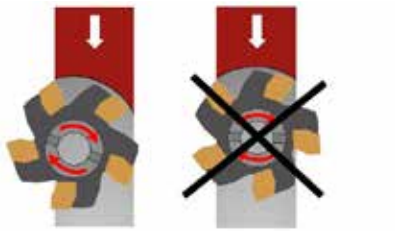
Toolox® has a very low level of residual stresses. To get the full effect make sure to use deformation-free clamping. If blanks are gas cut, mill off 5-10mm from the gas-cut edge to get a blank free from residual stresses.

The machinability of Toolox® has been improved. During milling you will notice it because the chips produced are very bluish. We have modified the carbide morphology as compared to traditional tool steels, using less carbon in Toolox®. Therefore, the heat generated during milling is transferred into the chip and not into the cutting edge/workpiece.

MILLING ADVICE

Image: Sandvik Coromant AB

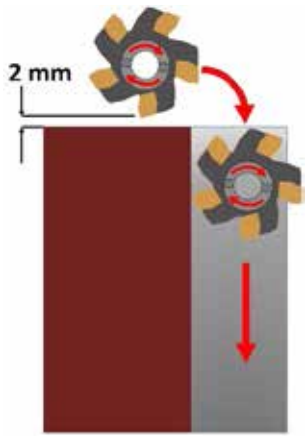
- Position the cutter off-center (to the left) to achieve a thicker chip at the entry and to avoid thick chip on the exit.
- Avoid cutting through the center line of the cutter, because this can generate vibration.
- Always use down milling (climb milllng).
- The recommendation is that the radial engagement of the cutter (ae) should be 25 or 75-80% of the diameter.



If you enter the workpiece with the roll-into-cut method, the chip thickness on the exit is always zero, and it will help to give a longer tool life.

Roll-into-cut method

Prog.rad.= $\frac{Dc}{2} + 2$



Roll-into-cut Method

Wear after 800 passes.

Straight into the workpiece

Wear after 390 passes.

INSERT GRADES FOR MILLING

	ISO	ANSI	
P	01	C8	▲
	10	C7	
	20	C6	
	30		
	40	C5	
	50		▼
M	10		▲
	20		
	30		
	40		▼
K	01	C4	▲
	10	C3	
	20	C2	
	30	C1	
	40		▼
H	01	C4	▲
	10	C3	
	20	C2	
	30	C1	▼

WORKPIECE MATERIAL

P	ISO P= Steel
M	ISO M = Stainless steel
K	ISO K = Cast iron
H	ISO H = Hardened steel

▲ = Wear resistance

▼ = Toughness

* Example insert grade 1030.

The last 2 numbers in the insert grade indicate the position of the insert in this scale, if the insert has wear or toughness resistance.

INSERT GEOMETRY

The macro geometry affects many parameters in the cutting process. An insert with strong cutting edge can work at higher loads, but it will also generate higher cutting forces, consume more power and generate more heat.

Parameter	L	M	H
Edge strength			
Cutting forces			
Power consumption			
Max chip thickness			
Heat generated			

Use inserts grade P30-50 with light cutting geometry and a coarse-pitch cutter if the machine power is low and with unstable machine conditions.

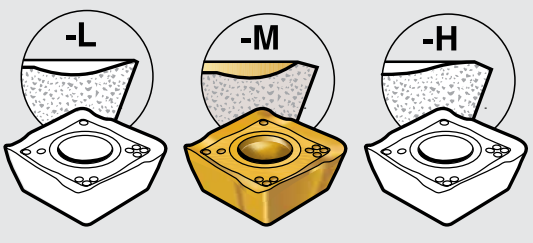


Image: Sandvik Coromant AB

FACE MILLING RECOMMENDATIONS

Formulas and definition drilling

$$Vc = \frac{Dc \times \pi \times n}{1000}$$

$$n = \frac{Vc \times 1000}{\pi \times Dc}$$

$$fz = \frac{vf}{n \times zc}$$

$$Vf = fz \times n \times zc$$

Definitions

Vc= Cutting Speed (m/min)
n = Spindle Speed (rpm)
fz = Feed Per Tooth (mm/r)
Vf = Table Feed (mm/min)
Dc= Tool Diameter (mm)
Zc= Number of effective teeth (pcs)
π= 3,14
ap= Axial depth of cut (mm)
ae= Radial depth of cut (mm)

Face milling recommendation with round inserts

Round inserts have strong cutting edges and are good to use when the surface has holes and cavities. Well suited for face milling roughing.
Benefits:

- Process security and reliability.
- High metal removal rate.
- Face milling, roughing.
- Profile milling, roughing.

Recommendations for average machine conditions.

Metric	Toolox® 33		Toolox® 40		Toolox® 44	
V_c m/min	180 – 220		160 – 200		140 – 180	
Feed per tooth	Feed per tooth, (fz) mm/t					
	Min-max	Start value	Min-max	Start value	Min-max	Start value
Insert grade P30	0.10 – 0.25	0.15	0.10 – 0.25	0.15	0.10 – 0.25	0.15

Face milling recommendation with a 45° entering angle

45° cutters Is usually a first choice when face milling.
Benefits:

- Reduce vibrations on long overhangs and weak setups.
- Smaller chip thickness enables higher feed/tooth.
- A high surface finishes can be achieved with standard inserts in combination with one or more wiper inserts.

Recommendations for average machine conditions.

Metric	Toolox® 33		Toolox® 40		Toolox® 44	
V_c m/min	180 – 220		120 – 170		100 – 150	
Feed per tooth	Feed per tooth, (fz) mm/t					
	Min-max	Start value	Min-max	Start value	Min-max	Start value
Insert grade P30	0.15 – 0.35	0.25	0.15 – 0.35	0.25	0.15 – 0.35	0.25

High feed face milling

High feed face milling is a very productive roughing concept to use when high metal removal rate Is prioritized. The small setting angle allows extreme feed rates during face milling.
Benefits:

- High table feed equal - high productivity at maximum cutting depth recommended by the manufacturer.
- Good choice when face milling with long overhang, Cutting data according to manufacturer
- Multi-function tool. Face milling, boring possibilities, ramping and plunge milling, for boring,ramping and plunge milling use cutting data according to manufacturer.

Recommendations for average machine conditions.

Metric	Toolox® 33		Toolox® 40		Toolox® 44	
V_c m/min	160 - 230		120 - 180		110 - 170	
Feed per tooth	Feed per tooth, (fz) mm/t					
	Min-max	Start value	Min-max	Start value	Min-max	Start value
Insert grade P30	0,4 – 1,30	0.85	0,4 – 1,30	0.85	0,4 – 1,30	0.85

Adjust the cutting feed, speed and cutting depth to the insert, entering angel.
Do not exceed the manufacturer's recommended cutting depth (ap).

Shoulder milling recommendations

Recommendations for average machine conditions with a 90° entering angle

Metric	Toolox® 33		Toolox® 40		Toolox® 44	
V_c m/min	180 – 270		130 – 170		110 – 150	
Feed per tooth	Feed per tooth, (fz) mm/t					
	Min-max	Start value	Min-max	Start value	Min-max	Start value
Insert grade P30	0.12 – 0.25	0.17	0.12 – 0.25	0.17	0.12 – 0.25	0.17

End milling recommendation for Solid cemented carbide tool

Metric		Slot milling recommendation			Slot milling recommendation		
		Toolox® 33	Toolox® 40	Toolox® 44	Toolox® 33	Toolox® 40	Toolox® 44
V_c m/min		85 – 110	75 – 100	70 – 95	200 – 230	180 – 210	160 – 190
Feed per tooth (fz)		Min-max	Min-max	Min-max	Min-max	Min-max	Min-max
Diameter	3.0 – 6.0	0.01 – 0.03	0.01 – 0.03	0.01 – 0.03	0.02 – 0.05	0.02 – 0.04	0.02 – 0.04
	8.0 – 12.0	0.04 – 0.07	0.03 – 0.06	0.03 – 0.06	0.07 – 0.10	0.06 – 0.09	0.06 – 0.09
	14.0 – 20.0	0.07 – 0.10	0.06 – 0.09	0.06 – 0.08	0.10 – 0.14	0.10 – 0.13	0.10 – 0.12

Slot milling advice
ap (dept of cut) max 0,5 x D

Image: Sandvik Coromant AB

Shoulder milling advice ap (use the cutting length) ae (radial depth of cut) max 0,1 x D

Image: Sandvik Coromant AB

TURNING RECOMMENTATIONS, TOOLOX® ROUND BARS

To achieve a controlled chip breaking in Toolox®, It is recommended to use a turning tool with precision cooling above and below the insert. The coolant above helping to break the chip. Coolant below will increase the life time of the insert. The minimum pressure of the emulsion should be about 10bar.

In order to get a good chip control, it is important to choose the right cutting geometry, nose radius together with the right feed.

- Select the largest possible nose radius for insert strength.
- Select a smaller nose radius if there is a tendency for vibration.

Rule of thumb

The depth of cut Should be no less then the nose radius.

Formulas for turning

$$Vc = \frac{Dc \times \pi \times n}{1000}$$

$$n = \frac{Vc \times 1000}{\pi \times Dc}$$

Definitions

Vc= Cutting Speed (m/min)
n = Spindle Speed (rpm)
fn = Feed Per Revolution (mm/r)
Dm= Machined Diameter (mm)
π= 3,14
ap= Cutting depth (mm)

Roughing, ap 3 (mm)			
Vc (m/min)	Toolox® 33 150 – 220	Toolox® 40 90 – 150	Toolox® 44 80 – 130
Cutting feed (fn) (mm/r)	Min – Max	Min – Max	Min – Max
Insert grade, P15-P25	0,20 – 0,50	0,20 – 0,50	0,20 – 0,50

Finishing, ap 1 (mm)			
Vc (m/min)	Toolox® 33 170 - 250	Toolox® 40 120 – 180	Toolox® 44 100 - 160
Cutting feed (fn) (mm/r)	Min – Max	Min – Max	Min – Max
Insert grade, P15-P25	0,10 – 0,30	0,10 – 0,30	0,10 – 0,30

Most CNC lathes today are equipped with a diameter controlled spindle speed.This means that when parting off, the spindle speed increases until the machine has reached its maximum revolution. It is therefore important to go down in cutting feed when the cutting tip approaches the center of the bar. When the remaining diameter is between 5-7 mm, the feed should be reduced by 70%.

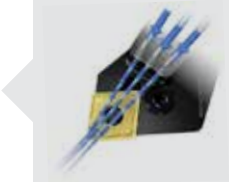


Image: Sandvik Coromant AB

Parting off			
Vc (m/min)	Toolox® 33 100 - 120	Toolox® 40 90 - 110	Toolox® 44 60 – 80
Cutting feed (fn) (mm/r)	Min – Max	Min – Max	Min – Max
Insert grade, P15-P25	0,05 – 0,20	0,05 – 0,20	0,05 – 0,20

For more accurate cutting data that suits the inserts you use, consult your tool supplier.

THREADING RECOMMENTATIONS

With the correct tools you can preform tapping and thread milling operations using all Toolox® grades. When preform tapping we recommend to use four-flute taps, which can withstand the very high torque that occurs during tapping in hard materials. If the thread tolerance is not critical, it is possible to drill the hole 3% larger than standard. This will increase the life time of the tap.

- It is recommended to use freshly sharpened or a new drill when pre-drilling the hole. If a worn drill is used surface hardening can occur. It can significantly reduce the tool life of the threading tool.
- A Spiral flute tap generate a high torque and are not recommended to use in Toolox® 40 - 44.
- A good thread oil or thread paste is recommended as lubricant when preform threading with a tap.
- Thread milling would be the first choice when making threads in Toolox® 44.
- We recommend to use thread milling for thread below M5 especially in Toolox® 40 and 44.
- To manage thread milling, a CNC machine is necessary and the thread should be made in 2 passes. The mix of the emulsion should be 8 – 12%.

Formulas and definition tapping

$$Vc = \frac{Dc \times \pi \times n}{1000}$$

$$n = \frac{Vc \times 1000}{\pi \times Dc}$$

Definitions

Vc= Cutting Speed (m/min)
n = Spindle Speed (rpm)
Dc= Major Diameter of thread (mm)

Dc

Spiral point tap

Spiral flute tap

	Tapping		
	Toolox® 33	**Toolox® 40**	**Toolox® 44**
V_c (m/min)	**7 – 10**	**4 – 9**	**3 – 5**
Size	**Speed (rpm)**	**Speed (rpm)**	**Speed (rpm)**
M5	445 – 635	255 – 570	190 – 320
M6	370 – 530	210 – 475	160 – 265
M8	270 – 400	160 – 360	120 – 200
M10	220 – 320	125 – 285	95 – 160
M12	185 – 265	105 – 240	80 – 130
M16	140 – 200	80 – 180	60 – 100
M20	110 – 160	60 – 140	45 – 80

	Cold forming tap
	Toolox® 33
V_c (m/min)	5 – 20
Size (mm)	M6 – M12

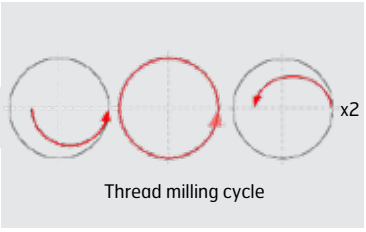
Cold forming involves creation of a thread by deforming material rather than cutting. When using this type of thread tool, it is very important to choose the right drill diameter in relation to the type of thread to be manufactured. Get information on correct drill diameter from the manufacturer.

- Works great to use in Toolox® 33.
- You can use a higher cutting speed compared to a ordinary chip-cutting tap.
- Usually has a longer lifespan.
- No chips during manufacturing threads.
- The better the lubrication, the higher the cutting speed can be used. (Cutting oil instead of emulsion)
- Can be used in both through and blind holes.
- Usually gives better surfaces compared to a chip-cutting tap.
- Uses a higher torque compared to a chip-cutting tap.

	Thread milling		
	Toolox® 33	Toolox® 40	Toolox® 44
V_c (m/min)	80 – 110	60 – 80	50 – 70
	fz (mm/t)	fz (mm/t)	fz (mm/t)
Feed per tooth	0.03 – 0.06	0.02 – 0.05	0.02 – 0.05

Thread milling is, a highly recommendable alternative to tapping or cold-forming of threads in all Toolox grades with the following advantages.

- Works great to use in Toolox® 44.
- Short production time.
- High degree of manufacturing safety of threads.
- No chip problems, since only short milling chips are created.
- Low cutting forces.
- Can be used in steel with a hardness up to 60 HRC.
- Blind holes and through holes threads produced with one tool.
- One tool for right-hand and left-hand threads.

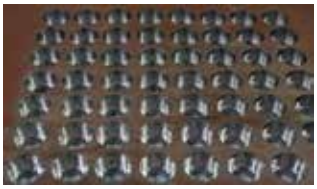


Thread milling cycle

RECOMMENDATION COUNTERBORING/COUNTERSINKING

Countersinking and counterboring are best performed using tools that have replaceable carbide inserts. Always use a revolving pilot and use coolant. The cutting data applies to Granlund counterboring tool.

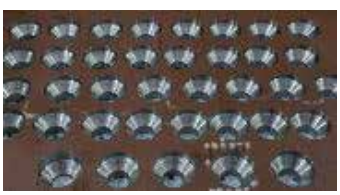
	Toolox® 33	Toolox® 40	Toolox® 44
V_c (m/min) (ft/min)	40 – 80	25 – 70	20 – 50
	fn (mm/r)	fn (mm/r)	fn (mm/r)
Feed per revolution	0.10 – 0.20	0.10 – 0.20	0.10 – 0.20
Dc, mm	Spindle speed, (n) rpm		
19 mm	670 – 1340	420 – 1175	335 – 840
24 mm	530 – 1060	330 – 930	265 – 665
34 mm	375 – 750	235 – 655	185 – 470
42 mm	300 – 600	190 – 530	150 – 380
57 mm	225 – 440	140 – 390	110 – 280



RECOMMENDATION COUNTERSINKING

The cutting data applies to Granlund countersinking tool.

	Toolox® 33	Toolox® 40	Toolox® 44
V_c (m/min) (ft/min)	28 – 56	18 – 49	14 – 35
	fn (mm/r)	fn (mm/r)	fn (mm/r)
Feed per revolution	0.10 – 0.20	0.10 – 0.20	0.10 – 0.20
Dc, mm	Spindle speed, (n) rpm		
19 mm	469 – 938	302 – 821	235 – 586
24 mm	371 – 743	239 – 650	186 – 464
34 mm	262 – 524	169 – 459	131 – 328
42 mm	212 – 424	136 – 371	106 – 265
57 mm	156 – 313	101 – 274	78 – 195



TOOL RECOMMENDATIONS FOR TOOLOX®

The below recommendations on tool selection are based on our own tests and tests carried out together with tool manufacturers. There are of course more tool manufacturers that have tools that work very well in Toolox®. To name a few: Emuge Franken, Guhring, Iscar, Kennametal, Kyocera, Mitsubishi, Sandvik Coromant, Seco Tools, Tungalloy, etc.

Contact your own tool supplier, they will usually be able to help with tool selection that is suitable for use in Toolox®.

HIGH SPEED STEEL DRILL

Description:	High speed steel drill alloyed with 8% cobalt (HSS-Co 8%)
Supplier:	Alpen-MayKestag, Austria
Tool name:	HSS-E Co 8 Taper Shank Drills, WN 103
Article nr:	832xxxxx
Web:	https://www.maykestag.com/en/

Description:	High speed steel drill alloyed with 8% cobalt (HSS-Co 8%)
Supplier:	Witec, Germany
Tool name:	TYPE WITEC MN
Article nr:	2-135 15 VAP
Web:	http://witec-tools.de/index.php?content=produkte&lang=en

Description:	High.speed steel drill standard. Only for Toolox® 33
Supplier:	Dormer Pramet
Tool name:	HSS A100
Article nr:	A100xx.xx
Web:	https://www.dormerpramet.com/en-gb/pages/default.aspx?country=gb

Description:	High speed steel drill alloyed with cobalt (DRILL BIT COBALT"S"+X-ALCR DIN1897N HARDOX STUB)
Supplier:	Izar, Spain
Tool name:	Ref 1054
Article nr:	Article nr: 32xxx
Web:	https://www.izartool.com/

Description:	High speed steel drill alloyed with cobalt (DRILL BIT COBALT"S"+X-ALCR TAPER STUB)
Supplier:	Izar, Spain
Tool name:	Ref 1154
Article nr:	xxxxx
Web:	https://www.izartool.com/

SOLID CEMENTED CARBIDE DRILL

Description:	Solid cemented carbide drill
Supplier:	SECO TOOLS, Sweden
Tool name:	Seco Feedmax
Article nr:	SD203A-xx.xx-xx-xxxx-x
Web:	https://www.secotools.com/

Description:	Solid cemented carbide drill
Supplier:	Sandvik Coromant AB, Sweden
Tool name:	Corodrill® Delta-C
Article nr:	R840-xxxx-30-A1A
Web:	https://www.sandvik.coromant.com/

Description:	Solid cemented carbide drill. Long hole drilling with 16 – 20xD
Supplier:	SECO TOOLS, Sweden
Tool name:	Seco Feedmax
Article nr:	SD216A-xx.xx-xx-xxxx-x
Web:	https://www.secotools.com/

Description:	Solid cemented carbide drill. Long hole drilling with 16 – 20xD
Supplier:	Sandvik Coromant AB, Sweden
Tool name:	CoroDrill 861
Article nr:	861.1-xxxx-xxxxxx-xx
Web:	https://www.sandvik.coromant.com/

INDEXABLE INSERT DRILL

Description:	Indexable insert drill
Supplier:	Sandvik Coromant AB, Sweden
Tool name:	Corodrill 880
Article nr:	880-xxxxxxxx-xx
Web:	https://www.secotools.com/

DRILLS WITH EXCHANGEABLE DRILL TIP

Description:	Drill with exchangable drill tip. Drill tip grade: IC908
Supplier:	Iscar, Israel
Tool name:	Chamdrill
Article nr:	DCM xxx-xxx-xxA-xx
Web:	https://www.iscar.com/

Description:	Drill with exchangable drill tip. Drill tip grade: IC908
Supplier:	Iscar, Israel
Tool name:	SumoCham
Article nr:	DCN xxx-xxx-xxA-xx
Web:	https://www.iscar.com/

Description:	Drill with exchangable drill tip. Drill tip grade: IC908
Supplier:	Seco Tool AB, Sweden
Tool name:	Crownloc
Article nr:	SD103-xx.xx-xx-xxxx
Web:	https://www.secotools.com/

THREADING IN TOOLOX

Tap for blind holes

Description:	HSSE tap with TiCN coating
Supplier:	Emuge Franken, Germany
Tool name:	Rekord 1D-TI-TiCn, Rekord 2D-TI-TiCN
Article nr:	B0459601.xxxx, C0459601.xxxx
Web:	https://www.emuge-franken.se/en/

Description:	HSSE-PM tap with TiCN coating
Supplier:	Manigley, Swizerland
Tool name:	131/3 DUO
Article nr:	433xx
Web:	http://manigley.ch/

Tap for through holes

Description:	HSSE tap with TiCN coating
Supplier:	Emuge Franken, Germany
Tool name:	Rekord 1C-TI-TiCn, Rekord 2C-TI-TiCN
Article nr:	B0309601.xxxx, C0309601.xxxx
Web:	https://www.emuge-franken.se/en/

Description:	HSSE-PM tap with TiCN coating
Supplier:	Manigley, Swizerland
Tool name:	105/4 DUO
Article nr:	433xx
Web:	http://manigley.ch/

COLD FORMING TAP

Description:	HSSE-PM tap with TiN coating
Supplier:	Emuge Franken, Germany
Tool name:	InnoForm2-Steel
Article nr:	C5267F00.xxxx
Web:	https://www.emuge-franken.se/en/

THREAD MILLING IN TOOLOX

Description:	Solid carbide thread milling cutter with TiCN coating
Supplier:	Emuge Franken, Germany
Tool name:	GSF-1,5xD-IKZ-HB-TiCN
Article nr:	GF333106xxxx
Web:	https://www.emuge-franken.se/en/

Description:	Solid carbide thread milling cutter with TiAlCN coating
Supplier:	Smicut, Sweden
Tool name:	Solid Carbide Thread Mill
Article nr:	NBxxxxCxxx.xISO AC
Web:	https://smicut.com/en/

COUNTERBORING IN TOOLOX

Description:	Use counterbore with indexable inserts that always have a grade number ending in U
Supplier:	Granlund Tool AB, Sweden
Tool name:	WHV Counterbore
Article nr:	xWHV-xx.x
Web:	http://www.granlund.com/

COUNTERSINKING IN TOOLOX

Description:	Use countersink with indexable inserts that always have a grade number ending in U
Supplier:	Granlund Tool AB, Sweden
Tool name:	KV Countersink
Article nr:	xKV9-xx.x
Web:	http://www.granlund.com/

END MILLING IN TOOLOX

Description:	Solid end milling cutter with Siron-A coating
Supplier:	Seco Tool AB, Sweden
Tool name:	JS 554 Siron-A
Article nr:	JS 554 xxxx
Web:	https://www.secotools.com/

MILLING WITH INSERT IN TOOLOX

Description:	Face milling with Coromill 345		
Supplier:	Sandvik Coromant AB, Sweden		
Tool name:	Coromill 345	**Insert Grade:**	1030
Article nr:	345-xxxxxx-13x		
Web:	https://www.sandvik.coromant.com/		

FACE MILLING, 45° ENTERING ANGEL

Description:	Face milling with Coromill 300		
Supplier:	Sandvik Coromant AB, Sweden		
Tool name:	Coromill 300	**Insert Grade:**	1030
Article nr:	R300-xxxxxx-xxx		
Web:	https://www.sandvik.coromant.com/		

FACE MILLING, ROUND INSERT

Description:	Shoulder/Face milling with Coromill 490		
Supplier:	Sandvik Coromant AB, Sweden		
Tool name:	Coromill 490	**Insert Grade:**	1030
Article nr:	490-xxxxxx-xxx		
Web:	https://www.sandvik.coromant.com/		

HIGH FEED FACE MILLING

Description:	Face milling with Mill4Feed		
Supplier:	Iscar, Israel		
Tool name:	Mill4Feed	**Insert Grade:**	IC808
Article nr:	FFQ4 xxxx-x-xxx-xx		
Web:	https://www.iscar.com/		

Description:	Face milling with Coromill 210		
Supplier:	Sandvik Coromant AB, Sweden		
Tool name:	Coromill 210	**Insert Grade:**	1030
Article nr:	210-xxxxxx-xxx		
Web:	https://www.sandvik.coromant.com/		

APPLICATION AREAS

MOULDS



COLD WORK


HOT WORK


MACHINE COMPONENTS

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