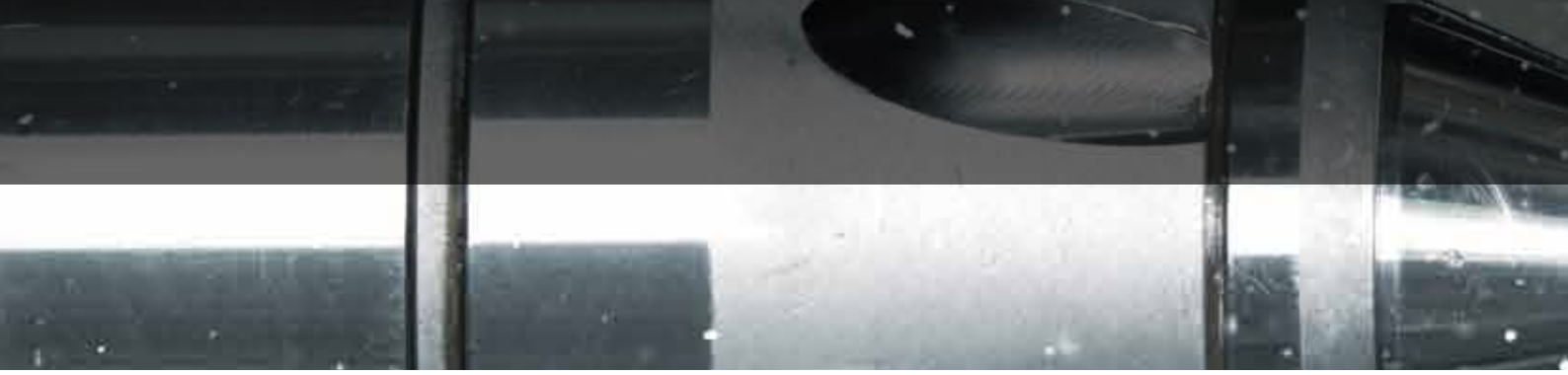
STARTEC

THE CNC GRINDING WHEEL PROGRAM FOR ROTATING CUTTING TOOLS

A Company of the SWAROVSKI Group

TYROLIT



STARTEC
THE CNC GRINDING WHEEL PROGRAM FOR ROTATING CUTTING TOOLS

Productivity requirements concerning the material removal of the most diverse materials are increasing constantly. At the same time, the quality demands are becoming ever more stringent. These demands can only be satisfied by using perfectly ground cutting tools manufactured with state-of-the-art CNC tool grinding machines.

TYROLIT offers a perfectly matched range for this purpose, allowing you to take full advantage of your CNC machines to manufacture your cutting tools. You not only increase your productivity, but also meet the high quality requirements.

In the following, you will find grinding tools that satisfy the demands of both tool manufacturers and tool regrinders.

TYROLIT – masters of the art of grinding

The enclosed application engineering offers advice on the optimal use of the grinding tools.
Drawing on their comprehensive process know-how, our application engineers develop sustainable solutions.

The STARTEC product line is synonymous with high quality grinding tools that guarantee maximum productivity.
The product benefits are striking during the production and servicing of rotating tools:

- Increased productivity through high traverse feeds
- Reduction of non-productive times due to reduced wear
- Perfect quality through innovative bond systems and adapted grain qualities
- Comprehensive range available from stock

STARTEC
PRODUCT OUTLINE

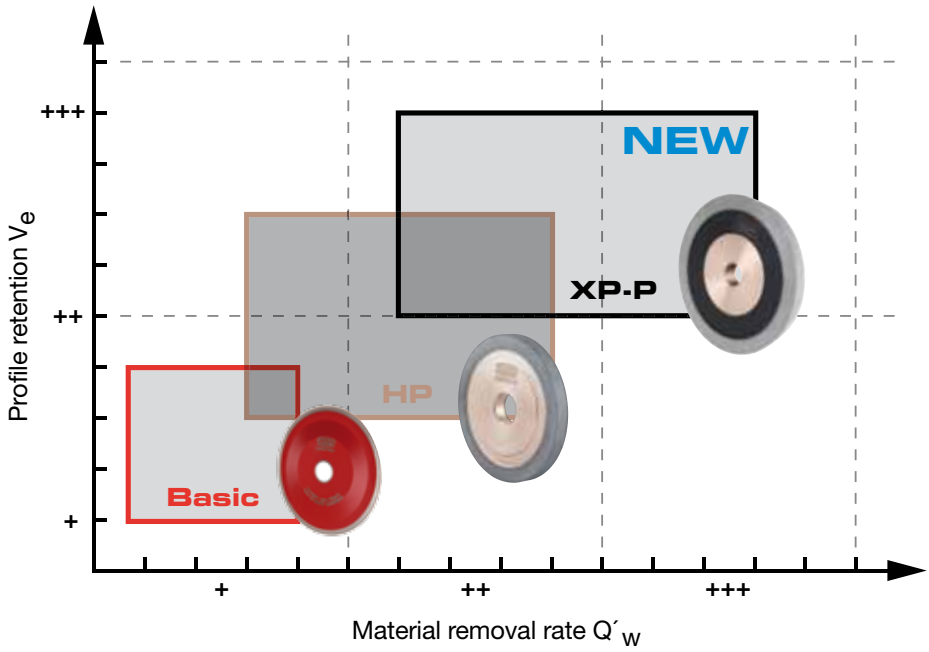
FLUTE GRINDING - SHAPE 1A1, 1V1,...

STARTEC XP-P NEW
Optimized profile retention together with a high material removal rate

STARTEC HP
Good cutting ability and profile retention together with a medium material removal rate

REGRINDING

STARTEC-BASIC
Standard grinding tools for regrinding and tool manufacturing
with balanced profile retention and material removal rate



GRINDING OF CLEARANCE ANGLES AND FACE GEOMETRIES

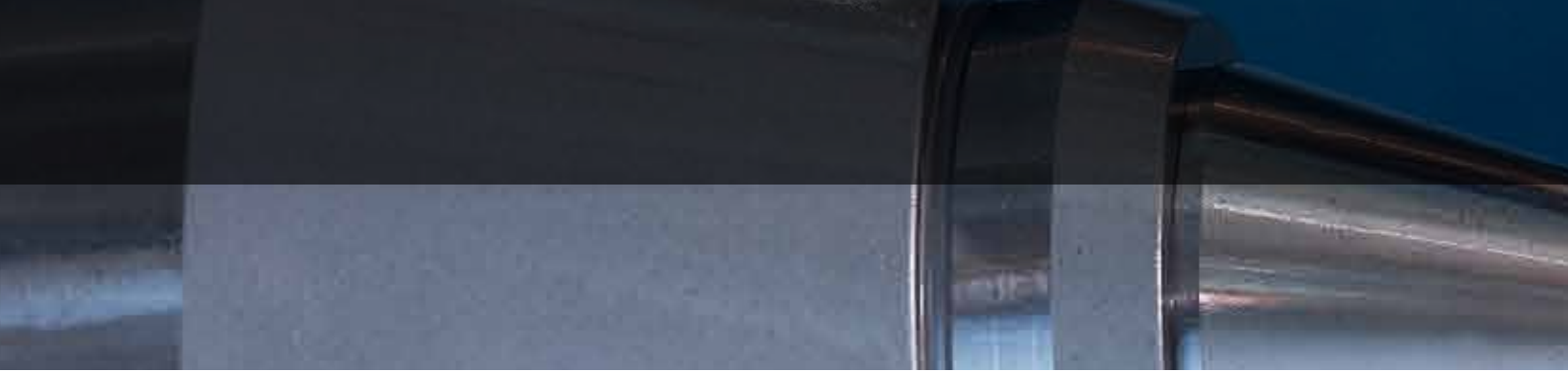
STARTEC HP
Cup grinding wheels with optimum edge stability

TUNGSTEN CARBIDE MILLING CUTTERS
APPLICATION ENGINEERING

Product line	Parameters	Flute grinding 	Clearance grinding 	Face grinding 	Gashing 
STARTEC-BASIC	Cutting speed v_c*	20 - 24 m/s	20 - 24 m/s	20 - 24 m/s	20 - 24 m/s
	Infeed a_e**	Full depth of flute	0,3 - 1 mm	Depends on the face geometry	Full cutting depth
	Traverse feed in the flute V_t***	50 - 80 mm/min	100 - 200 mm/min	30 - 35 mm/min	20 - 35 mm/min
	Material removal rate Q'_w	≤ 3 $mm^3/s \cdot mm$	≤ 3 $mm^3/s \cdot mm$	-	-
	Recommended specification	DE643BS	1A1: DE643BS 11V9: DE643BS	DE643BS	12V9: DE643BS 1V1: DE64BS
STARTEC HP	Cutting speed v_c*	16 - 18 m/s	16 - 18 m/s	18 - 24 m/s	18 - 24 m/s
	Infeed a_e**	Full depth of flute	0,3 - 1 mm	Depends on the face geometry	Full cutting depth
	Traverse feed in the flute V_t***	See table page 7	≤ 250 mm/min	30 - 80 mm/min	30 - 50 mm/min
	Material removal rate Q'_w	See table page 7	≤ 3 $mm^3/s \cdot mm$	-	-
	Recommended specification	DN54MH	1A1: DN543MH 11V9: DN643MC	DN643MC	12V9: DN643MC 1V1: DN543MH
NEW **STARTEC XP-P**	Cutting speed v_c*	16 - 22 m/s	16 - 22 m/s	-	16 - 22 m/s
	Infeed a_e**	Full depth of flute	0,5 - 1 mm	-	Full cutting depth
	Traverse feed in the flute V_t***	See table page 7	≤ 300 mm/min	-	≤ 60 mm/min
	Material removal rate Q'_w	See table page 7	≤ 3 $mm^3/s \cdot mm$	-	-
	Recommended specification	D54MXPP	1A1: D54MXPP	-	1V1: D46MXPP

Please turn over for further information

* The greater the wheel width, the lower the cutting speed
** Depends on the power potential of the machine
*** Depends on the depth, length and spiral angle of the flute



TUNGSTEN CARBIDE DRILL BITS
APPLICATION ENGINEERING

Product line	Parameters	Flute grinding 	Back grinding 	Point grinding 
STARTEC-BASIC	Cutting speed v_c*	20 - 24 m/s	20 - 24 m/s	20 - 24 m/s
	Infeed a_e**	Full depth of flute	0,3 - 1 mm	Depends on the face geometry
	Traverse feed in the flute V_t***	40 - 60 mm/min ≤5 mm depth 20 - 50 mm/min ≤ 5 mm depth	100 - 125 mm/min	10 - 15 mm/min
	Material removal rate Q'_w	≤ 3 $mm^3/s \cdot mm$	≤ 2 $mm^3/s \cdot mm$	-
	Recommended specification	DE643BS	DE643BS	1A1 / 1V1: DE643PD 6A2: D54C75B
STARTEC HP	Cutting speed v_c*	16 - 18 m/s	16 - 18 m/s	16 - 20 m/s
	Infeed a_e**	Full depth of flute	0,3 - 1 mm	Depends on the face geometry
	Traverse feed in the flute V_t***	See table page 7	≤ 250 mm/min	15 - 25 mm/min
	Material removal rate Q'_w	See table page 7	≤ 4 $mm^3/s \cdot mm$	-
	Recommended specification	DN54MH	DN543MH	1A1 / 1V1: DN543MH
NEW **STARTEC XP-P**	Cutting speed v_c*	16 - 22 m/s	16 - 22 m/s	16 - 22 m/s
	Infeed a_e**	Full depth of flute	0,5 - 1 mm	Full cutting depth
	Traverse feed in the flute V_t***	See table page 7	≤ 300 mm/min	-
	Material removal rate Q'_w	See table page 7	≤ 5 $mm^3/s \cdot mm$	-
	Recommended specification	D54MXPP	D54MXPP	1A1 / 1V1: DN54MXPP

* The greater the wheel width, the lower the cutting speed
** Depends on the power potential of the machine
*** Depends on the depth, length and spiral angle of the flute

HSS MILLING CUTTERS
APPLICATION ENGINEERING

Product line	Parameters	Flute grinding 	Clearance grinding 	Face grinding 	Gashing 
STARTEC-BASIC	Cutting speed v_c*	22 - 40 m/s	22 - 40 m/s	22 - 40 m/s	22 - 40 m/s
	Infeed a_e**	Full depth of flute	0,3 - 1,5 mm	Depends on the face geometry	Full cutting depth
	Traverse feed in the flute V_t***	60 - 100 mm/min ≤ WSØ 5 mm 30 - 60 mm/min > WSØ 5 mm	100 - 130 mm/min	30 - 35 mm/min	20 - 35 mm/min
	Material removal rate Q'_w	≤ 5 $mm^3/s \cdot mm$	≤ 5 $mm^3/s \cdot mm$	-	-
	Recommended specification	BL913PD WS Ø ≤10 mm BL1263PD	BL1263PD BL763PD	BL1263PD BL763PD	BL1263PD BL763PD

* The greater the wheel width, the lower the cutting speed
** Depends on the power potential of the machine
*** Depends on the depth, length and spiral angle of the flute

RECOMEMENDED PROCESS PARAMETERS
APPLICATION ENGINEERING

The values in this table are an indication of the grinding process (MRR) Q'w. The optimum traverse feed v_t for your application with STARTEC HP or XP-P can be determined via the infeed (profile depth) ae. The feed values that can be achieved depend on the workpiece diameter, the coolant/ lubricant used and the available machine power.

Calculation Formula

$$Q'_w = \frac{a_e \cdot v_t}{60}$$

$$v_t = \frac{Q'_w \cdot 60}{a_e}$$

Standard values

V_c	
STARTEC HP	16 – 24 m/s
STARTEC XP-P	16 – 22 m/s

Q'_w	
Standard range	3 – 6 mm³/s · mm
TOP PERFORMANCE range	7 – 10 mm³/s · mm

Q'_w table [mm³/s · mm]

	Traverse feed v_t [mm/min]									
Infeed a_e [mm]	**50**	**60**	**70**	**80**	**100**	**120**	**140**	**160**	**180**	**200**
2,6				3,5	4,3	5,2	6,1	6,9	7,8	8,7
2,8				3,7	4,7	5,6	6,5	7,5	8,4	9,3
3,0				4,0	5,0	6,0	7,0	8,0	9,0	10,0
3,2			3,2	4,3	5,3	6,4	7,5	8,5	9,6	10,7
3,4			4,0	4,5	5,7	6,8	7,9	9,1	10,2	11,3
3,6		3,6	4,2	4,8	6,0	7,2	8,4	9,6	10,8	
3,8		3,8	4,4	5,1	6,3	7,6	8,9	10,1	11,4	
4,0		4,0	4,5	5,3	6,7	8,0	9,3	10,7	12,0	
4,2	3,5	4,2	4,9	5,6	7,0	8,4	9,8	11,2		
4,4	3,7	4,4	5,1	5,9	7,3	8,8	10,3	11,7		
4,6		4,6	5,4	6,1	7,7	9,2	10,7			
4,8		4,8	5,6	6,4	8,0	9,6	11,2			
5,0		5,0	5,8	6,7	8,3	10,0	11,7			
5,5	4,6	5,5	6,4	7,3	9,2	11,0	12,8			
6,0	5,0	6,0	7,0	8,0	10,0	12,0	14,0			
6,5	5,4	6,5	7,6	8,7	10,8	13,0				
7,0	5,8	7,0	8,2	9,3	11,7	14,0				

Application area STARTEC HP

v_t Initial value
v_t Optimization potential

Application area STARTEC XP-P

v_t Initial value
v_t Optimization potential

Reading direction

INCREASED GRINDING PERFORMANCE THANKS TO OPTIMIZED COOLANT SUPPLY

APPLICATION ENGINEERING

The productivity of a grinding process is basically influenced by the choice of suitable grinding wheel and an optimum coolant set up. This means ensuring that the correct amount of coolant is available in the grinding zone. The great impact of the coolant pressure, the design of the coolant nozzles and their position is therefore not to be underestimated.

Significant improvements in grinding efficiency (fig. 1) or a reduction of the motor power consumption (fig. 2) can be achieved by optimizing the coolant supply.

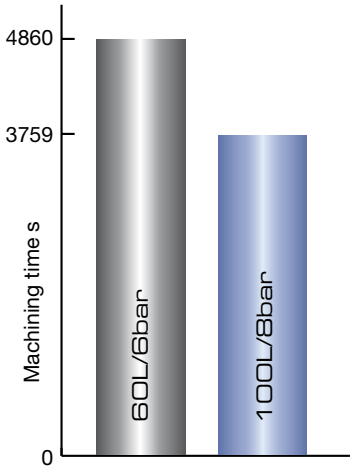


Fig. 1: 20% time saving due to optimized coolant supply

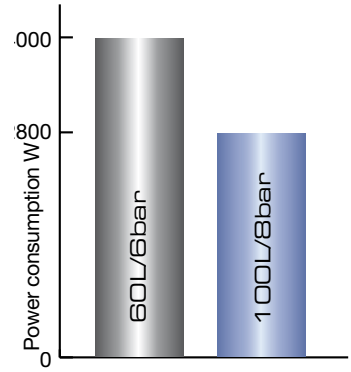


Fig. 2: 30% reduction of power consumption due to optimized coolant supply

Example:

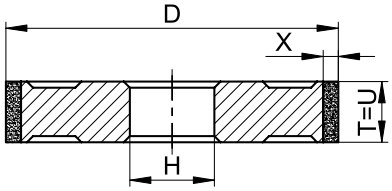
Milling cutter d=20mm, 4 cutting edges l=68mm, dk=10mm, ae=5mm, lot size 30 pc

With 60L / 6bar max. material removal rate Q'w=9 – traverse feed while flute grinding 108mm/min

With 100L / 8bar max. material removal rate Q'w=12 – traverse feed while flute grinding 144mm/min

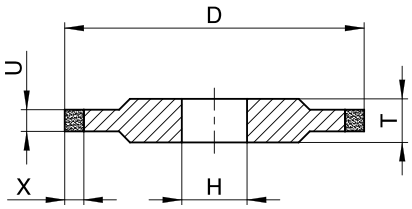
With their expertise and know-how our application engineers will gladly support you in optimizing the coolant supply.

STARTEC XP-P
PRODUCTION OF ROTATING CUTTING TOOLS



FLUTE GRINDING SHAPE 1A1 NEW

D	T	H	U	X	Specification for tungsten carbide	TN	Stock
75	6	20	6	6	STARTEC XP-P D54MXPP	679931	x
75	10	20	10	6		679936	x
100	6	20	6	6		679938	x
100	6	31,75	6	6		704697	
100	6	32	6	6		711963	
100	10	20	10	6		679939	x
100	10	31,75	10	6		694995	
100	10	32	10	6	STARTEC XP-P D54MXPP	724650	
100	12	20	12	6		679940	x
100	12	31,75	12	6		685346	
100	12	32	12	6		724653	
100	15	20	15	6		679942	x
100	15	31,75	15	6		702676	
125	6	20	6	6		679945	x
125	6	31,75	6	6		702621	
125	6	32	6	6		724655	
125	10	20	10	6		679947	x
125	10	31,75	10	6		702678	
125	12	20	12	6	STARTEC XP-P D54MXPP	679948	x
125	12	31,75	12	6		712482	
125	12	32	12	6		724656	
125	15	20	15	6		679949	x
125	15	31,75	15	6		702683	
150	10	20	10	10		679951	x
150	12	20	12	10		679952	x
150	12	31,75	12	10		716183	
150	12	32	12	10	STARTEC XP-P D54MXPP	710248	
150	15	20	15	10		679953	x
150	15	31,75	15	10		713310	
150	15	32	15	10		724658	

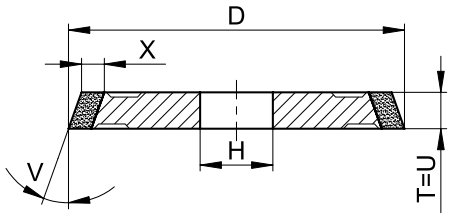


FLUTE GRINDING SHAPE 14A1 NEW

D	T	H	U	X	Specification for tungsten carbide	TN	Stock
75	6	20	4	6	STARTEC XP-P D54MXPP	655674	
75	8	20	4	6		680140	x
100	6	20	4	6		680138	x
100	6	31,75	4	6	STARTEC XP-P D54MXPP	723430	
100	6	32	4	6		724660	
125	6	20	4	6		680137	x
125	6	31,75	4	6	STARTEC XP-P D54MXPP	704589	
125	6	32	4	6		724661	

The STARTEC XP-P grinding tools are delivered unsharpened. For detailed information please see page 21.
x ... available from stock | Customised grinding tools can be manufactured on request.

STARTEC XP-P
PRODUCTION OF ROTATING CUTTING TOOLS



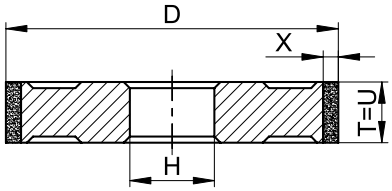
FLUTE GRINDING SHAPE 1V1

NEW

D	T	H	U	X	V°	Specification for tungsten carbide	TN	Stock
75	6	20	6	6	15	STARTEC XP-P D54MXPP	680097	x
75	8	20	8	10	15		680098	x
75	10	20	10	10	15		680099	x
100	6	20	6	10	15	STARTEC XP-P D54MXPP	680100	x
100	10	20	10	10	15		680102	x
100	10	31,75	10	10	15		702686	
100	10	32	10	10	15		724672	
100	12	20	12	10	15		680104	x
100	12	31,75	12	10	15		712500	
100	12	32	12	10	15		724674	
100	12	20	12	10	45		680107	x
100	12	31,75	12	10	45		724675	
100	12	32	12	10	45		724676	
100	15	20	15	10	15		680110	x
100	15	31,75	15	10	15		702690	
125	6	20	6	10	15	STARTEC XP-P D54MXPP	680112	x
125	6	31,75	6	10	15		724677	
125	10	20	10	10	15		680114	x
125	10	31,75	10	10	15		702693	
125	10	32	10	10	15		695063	
125	10	20	10	10	45		680115	x
125	10	31,75	10	10	45		703409	
125	10	32	10	10	45		724679	
125	12	20	12	10	15		680116	x
125	12	31,75	12	10	15		700882	
125	12	32	12	10	15		724680	
125	12	20	12	10	45		680118	x
125	12	31,75	12	10	45		708987	
125	12	32	12	10	45		724681	
125	15	20	15	10	15		680120	x
125	15	31,75	15	10	15		702694	
150	10	20	10	10	10	STARTEC XP-P D54MXPP	680123	x
150	10	31,75	10	10	10		714967	
150	10	32	10	10	10		724683	
150	12	20	12	10	10		680124	x
150	12	31,75	12	10	10		724684	
150	12	32	12	10	10		724685	

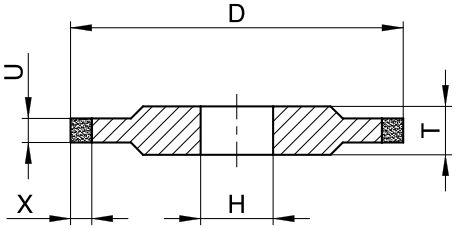
The STARTEC XP-P grinding tools are delivered unsharpened. For detailed information please see page 21.
x ... available from stock | Customised grinding tools can be manufactured on request.

STARTEC HP
PRODUCTION OF ROTATING CUTTING TOOLS



FLUTE GRINDING SHAPE 1A1

D	T	H	U	X	Specification for tungsten carbide	TN	Stock
75	6	20	6	6	STARTEC HP DN543MH	572731	x
100	6	20	6	6	STARTEC HP DN543MH	474444	x
100	6	31,75	6	6		572732	
100	10	20	10	6		408972	x
100	10	31,75	10	6		572734	
100	12	20	12	6		556715	x
100	15	20	15	6		490259	x
100	15	31,75	15	6		572739	
125	10	20	10	6	STARTEC HP DN543MH	572741	x
125	10	31,75	15	6		698108	

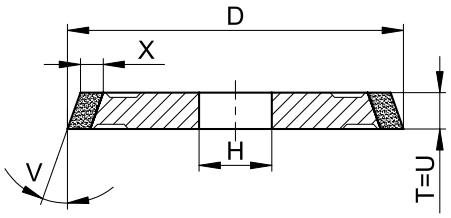


FLUTE GRINDING SHAPE 14A1

D	T	H	U	X	Specification for tungsten carbide	TN	Stock
75	8	20	4	6	STARTEC HP DN543MH	572880	
75	8	20	6	6		572882	x
100	6	20	4	6	STARTEC HP DN543MH	572888	x

x ... available from stock | Customised grinding tools can be manufactured on request.

STARTEC HP
PRODUCTION OF ROTATING CUTTING TOOLS



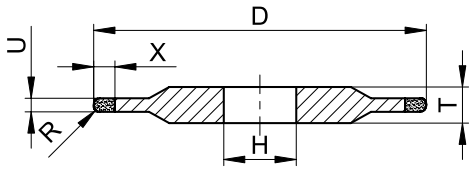
FLUTE GRINDING SHAPE 1V1

D	T	H	U	X	V°	Specification for tungsten carbide	TN	Stock
75	6	20	6	6	15	STARTEC HP DN543MH	572845	x
75	10	20	10	10	15		572847	x
100	10	20	10	6	15	STARTEC HP DN543MH	490141	x
100	10	31,75	10	6	15		572854	
100	12	20	12	6	45		572859	x
125	10	20	10	6	15	STARTEC HP DN543MH	572867	x
125	10	31,75	10	6	15		572868	x
125	12	20	12	6	15		556731	x
125	12	20	12	6	45		560672	x

x ... available from stock | Customised grinding tools can be manufactured on request.

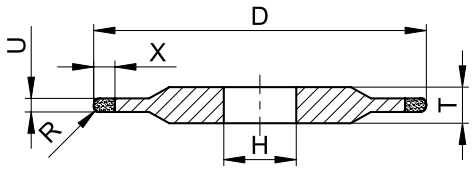
STARTEC BASIC
UNIVERSAL APPLICATION

SHAPE 14F1R



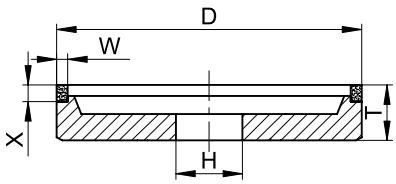
						Tungsten Carbide			HSS		
D	T	H	U	X	R	Specification	TN	Stock	Specification	TN	Stock
100	10	20	3	5	1,5	STARTEC-BASIC DE643BS	494480		STARTEC-BASIC BL1263PD	494528	
150	10	20	1,2	5	0,6	STARTEC-BASIC DE643BS	494485	x	STARTEC-BASIC BL1263PD	494529	
150	10	20	2	5	1	STARTEC-BASIC DE643BS	494491	x	STARTEC-BASIC BL1263PD	494530	

SHAPE 14F1



						Tungsten Carbide			HSS		
D	T	H	U	X	R	Specification	TN	Stock	Specification	TN	Stock
100	10	20	4	6	2	STARTEC-BASIC DE643BS	494495		STARTEC-BASIC BL1263PD	494531	
125	10	20	4	6	2	STARTEC-BASIC DE643BS	494506	x	STARTEC-BASIC BL1263PD	494535	
125	10	20	8	10	4	STARTEC-BASIC DE643BX	494491		STARTEC-BASIC BL1263PD	494536	x
150	10	20	4	6	2	STARTEC-BASIC DE643BS	494515		STARTEC-BASIC BL1263PD	494538	
150	10	20	5	6	2,5	STARTEC-BASIC DE643BS	494525		STARTEC-BASIC BL1263PD	494540	

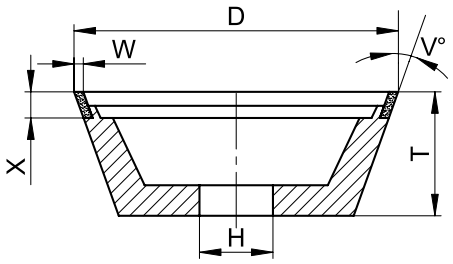
SHAPE 6A9



					Tungsten Carbide			HSS		
D	T	H	U	X	Specification	TN	Stock	Specification	TN	Stock
75	30	20	3	10	STARTEC-BASIC DE643BS	494675		STARTEC-BASIC BL1263PD	494677	
100	30	20	3	10	STARTEC-BASIC DE643BS	403512	x	STARTEC-BASIC BL1263PD	494678	
125	30	20	3	10	STARTEC-BASIC DE643BS	494676		STARTEC-BASIC BL1263PD	337974	

x ... available from stock | Customised grinding tools can be manufactured on request.

STARTEC HP
GRINDING OF CLEARANCE ANGLES AND FACE GEOMETRIES



SHAPE 11V9

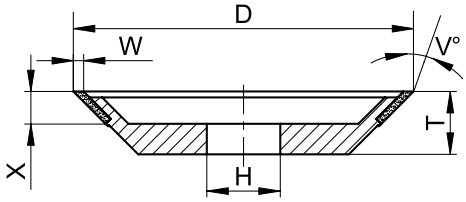
D	T	H	W	X	V°
75	30	20	2	10	20
100	35	20	2	10	20
100	35	20	3	10	20
125	40	20	2	10	20
125	40	20	3	10	20

Tungsten Carbide NEW

Specification	TN	Stock
STARTEC HP DN463MC	626754	x
STARTEC HP DN643MC	529895	x
STARTEC HP DN643MC	530074	x
STARTEC HP DN463MC	667542	x
STARTEC HP DN643MC	478973	x
STARTEC HP DN643MC	530077	x
STARTEC HP DN463MC	649099	x
STARTEC HP DN643MC	580760	x

HSS

Specification	TN	Stock
STARTEC-BASIC BL763PD	494983	x
STARTEC-BASIC BL1263PD	75669	x
STARTEC-BASIC BL1263PD	949953	x
STARTEC-BASIC BL763PD	532564	x
STARTEC-BASIC BL1263PD	50786	
STARTEC-BASIC BL1263PD	494643	x
STARTEC-BASIC BL1263PD	947117	x



SHAPE 12V9

D	T	H	W	X	V°
100	20	20	2	10	45
100	20	20	3	10	45
125	25	20	2	10	45
125	25	20	3	10	45
150	25	20	2	10	45

Tungsten Carbide NEW

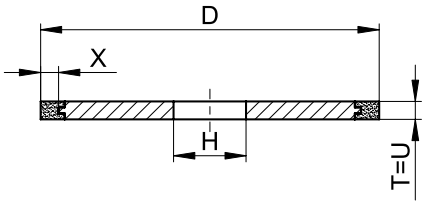
Specification	TN	Stock
STARTEC HP DN643MC	530078	x
STARTEC HP DN643MC	580769	x
STARTEC HP DN643MC	530079	x
STARTEC HP DN463MC	672678	x
STARTEC HP DN643MC	641156	x
STARTEC-BASIC DE643BS	494650	

HSS

Specification	TN	Stock
STARTEC-BASIC BL763PD	532571	x
STARTEC-BASIC BL1263PD	75679	x
STARTEC-BASIC BL1263PD	556486	
STARTEC-BASIC BL763PD	495027	x
STARTEC-BASIC BL1263PD	75685	x
STARTEC-BASIC BL763PD	532579	x
STARTEC-BASIC BL1263PD	75697	x
STARTEC-BASIC BL1263PD	494652	

x ... available from stock | Customised grinding tools can be manufactured on request.

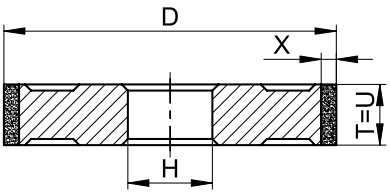
STARTEC BASIC
REGRINDING OF ROTATING CUTTING TOOLS



CUT-OFF GRINDING SHAPE 1A1R

					Tungsten Carbide			HSS		
D	T	H	U	X	Specification	TN	Stock	Specification	TN	Stock
100	1	20	1	5	D126C100B	100660	x	B151C100B	881767	
125	1	20	1	5	D126C100B	101000	x	B151C100B	164485	x
150	1	20	1	5	D126C100B	148132	x	B151C100B	513947	
				7	D151C100B	175978	x	B151C100B	494701	x
200	1,2	20	1,2	7	D126C100B	858531	x	B151C100B	39880	
		30			D151C100B	603284*	x	B151C100B	708158*	x
250	1,2	20	1,2	5	D126C100B	412224		B151C100B	494715	
		30			D151C100B	708153*	x	B151C100B	708159*	x
300	1,5	20	1,5	5	D126C100B	403700		B151C100B	494716	

* for Wimmer cut.off machines

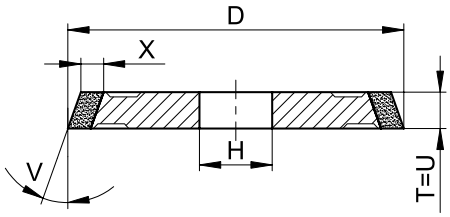


UNIVERSAL APPLICATION SHAPE 1A1

					Tungsten Carbide			HSS		
D	T	H	U	X	Specification	TN	Stock	Specification	TN	Stock
75	4	20	4	6	STARTEC-BASIC DE643BS	494719		STARTEC-BASIC BL913PD	28511	
75	6	20	6	6	STARTEC-BASIC DE643BS	494721		STARTEC-BASIC BL913PD	494749	
75	10	20	10	6	STARTEC-BASIC DE643BS	494722		STARTEC-BASIC BL913PD	210642	
100	6	20	6	6	STARTEC-BASIC DE643BS	494723		STARTEC-BASIC BL913PD	263583	x
100	6	31,75	6	6	STARTEC-BASIC DE643BS	494724		STARTEC-BASIC BL913PD	494750	
100	10	20	10	6	STARTEC-BASIC DE643BS	437298	x	STARTEC-BASIC BL913PD	36247	x
100	10	31,75	10	6	STARTEC-BASIC DE643BS	494725		STARTEC-BASIC BL913PD	494753	
100	12	20	12	6	STARTEC-BASIC DE643BS	494728		STARTEC-BASIC BL913PD	348111	
100	15	20	15	6	STARTEC-BASIC DE643BS	437299		STARTEC-BASIC BL913PD	217036	
100	15	31,75	15	6	STARTEC-BASIC DE643BS	494729		STARTEC-BASIC BL913PD	494755	
125	6	20	6	6	STARTEC-BASIC DE643BS	494730		STARTEC-BASIC BL913PD	494757	
125	10	20	10	6	STARTEC-BASIC DE643BS	494732		STARTEC-BASIC BL913PD	315	x
125	15	20	15	6	STARTEC-BASIC DE643BS	494734		STARTEC-BASIC BL913PD	126471	
125	15	31,75	15	6	STARTEC-BASIC DE643BS	494735		STARTEC-BASIC BL913PD	494758	
150	6	20	6	6	STARTEC-BASIC DE643BS	494737		STARTEC-BASIC BL913PD	494759	
150	10	20	10	6	STARTEC-BASIC DE643BS	494747		STARTEC-BASIC BL913PD	308441	x
150	15	20	15	6	STARTEC-BASIC DE643BS	494748		STARTEC-BASIC BL913PD	405183	

x ... available from stock | Customised grinding tools can be manufactured on request.

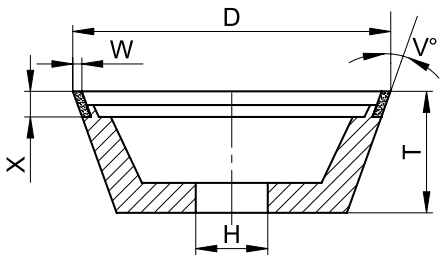
STARTEC BASIC
REGRINDING OF ROTATING CUTTING TOOLS



SHAPE 1V1

						Tungsten Carbide			HSS		
D	T	H	W	X	V°	Specification	TN	Stock	Specification	TN	Stock
75	6	20	6	6	15	STARTEC-BASIC DE643BS	494766		STARTEC-BASIC BL913PD	494798	
100	6	20	6	6	15	STARTEC-BASIC DE643BS	494768		STARTEC-BASIC BL913PD	403134	
100	6	31,75	6	6	15	STARTEC-BASIC DE643BS	494770		STARTEC-BASIC BL913PD	403294	
100	10	20	10	6	15	STARTEC-BASIC DE643BS	494771		STARTEC-BASIC BL913PD	194953	
100	10	31,75	10	6	15	STARTEC-BASIC DE643BS	494773		STARTEC-BASIC BL913PD	494800	
100	12	20	12	6	15	STARTEC-BASIC DE643BS	494774		STARTEC-BASIC BL913PD	494801	
100	12	20	12	6	45	STARTEC-BASIC DE643BS	494775		STARTEC-BASIC BL913PD	451899	
100	15	20	15	6	15	STARTEC-BASIC DE643BS	494776		STARTEC-BASIC BL913PD	287127	
100	15	31,75	15	6	15	STARTEC-BASIC DE643BS	494777		STARTEC-BASIC BL913PD	494802	
125	6	20	6	6	15	STARTEC-BASIC DE643BS	494782		STARTEC-BASIC BL913PD	494810	
125	6	31,75	6	6	15	STARTEC-BASIC DE643BS	494784		STARTEC-BASIC BL913PD	494805	
125	10	20	10	6	15	STARTEC-BASIC DE643BS	494786		STARTEC-BASIC BL913PD	494811	
125	10	31,75	10	6	15	STARTEC-BASIC DE643BS	494788		STARTEC-BASIC BL913PD	494812	
125	12	20	12	6	15	STARTEC-BASIC DE643BS	494789		STARTEC-BASIC BL913PD	494813	
125	12	20	12	6	45	STARTEC-BASIC DE643BS	494791		STARTEC-BASIC BL913PD	297867	x
125	15	20	15	6	15	STARTEC-BASIC DE643BS	494795		STARTEC-BASIC BL913PD	494815	
125	15	31,75	15	6	15	STARTEC-BASIC DE643BS	494797		STARTEC-BASIC BL913PD	494816	

AMIGO | DIAGO
DRY REGRINDING

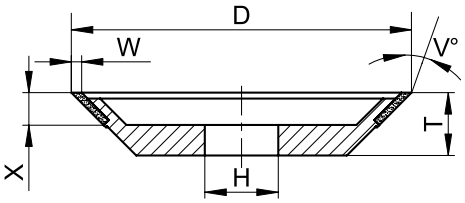


SHAPE 11V9

						Tungsten Carbide						HSS		
D	T	H	W	X	V°	Specification 1	TN	Stock	Specification 2	TN	Stock	Specification	TN	Stock
75	30	20	2	10	20	DIAGO D126C75B	679634	x	DIAGO D64C50B	721301	x	AMIGO B126C75B	640777	x
100	35	20	2	10	20	DIAGO D126C75B	675309	x	DIAGO D64C50B	675272	x	AMIGO B126C75B	617388	x
100	35	31,75	2	10	20	DIAGO D126C75B	335803	x	DIAGO D64C50B	919374		AMIGO B126C75B	638087	
100	35	20	3	10	20	DIAGO D126C75B	675318	x	DIAGO D64C50B	721303	x	AMIGO B126C75B	636398	x
125	40	20	2	10	20	DIAGO D126C75B	688808		DIAGO D64C50B	436496		AMIGO B126C75B	641854	x
125	40	20	3	10	20	DIAGO D126C75B	679946	x	DIAGO D64C50B	813512		AMIGO B126C75B	871544	

x ... available from stock | Customised grinding tools can be manufactured on request.

AMIGO | DIAGO
DRY REGRINDING



SHAPE 12V9

D	T	H	W	X	V°
75	20	20	2	6	45
100	20	20	2	10	45
125	25	20	2	10	45
150	25	20	2	10	45

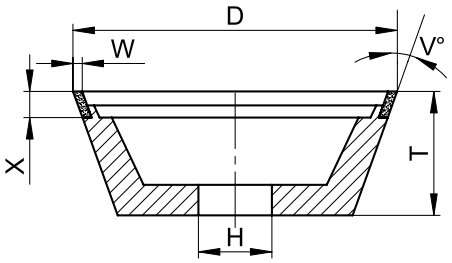
Tungsten Carbide

Specification 1	TN	Stock	Specification 2	TN	Stock
DIAGO D126C75B	696324	x	DIAGO D64C50B	721319	x
DIAGO D126C75B	689930	x			
DIAGO D126C75B	311250	x	DIAGO D54C65B	90998	x
DIAGO D126C75B	494994		DIAGO D64C50B	268823	

HSS

Specification	TN	Stock
AMIGO B126C75	703242	x
AMIGO B126C75	636658	x
AMIGO B126C75	840506	x
AMIGO B126C75	917415	

STARTEC-BASIC
WET REGRINDING (WITH COOLANT)



SHAPE 11V9

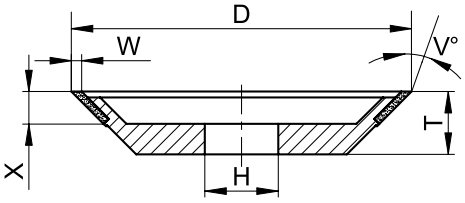
D	T	H	W	X	V°
75	30	20	2	10	20
100	35	20	2	10	20
100	35	31,75	2	10	20
100	35	20	3	10	20
125	40	20	2	10	20
125	40	20	3	10	20

Tungsten Carbide

Specification	TN	Stock
STARTEC-BASIC DE643BS	390970	x
STARTEC-BASIC DE643BS	357223	x
STARTEC-BASIC DE643BS	494972	
STARTEC-BASIC DE643BS	532514	x
STARTEC-BASIC DE643BS	494978	x
STARTEC-BASIC DE643BS	494976	

HSS

Specification	TN	Stock
STARTEC-BASIC BL763PD	494983	x
STARTEC-BASIC BL763PD	494985	x
STARTEC-BASIC BL763PD	901440	
STARTEC-BASIC BL763PD	532564	x
STARTEC-BASIC BL763PD	494987	x
STARTEC-BASIC BL763PD	494988	



SHAPE 12V9

D	T	H	W	X	V°
75	20	20	2	6	45
100	20	20	2	10	45
100	20	20	3	10	45
125	25	20	2	10	45
125	25	20	3	10	45
150	25	20	2	10	45

Tungsten Carbide

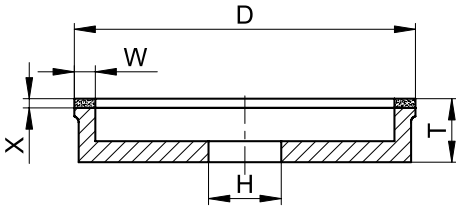
Specification	TN	Stock
STARTEC-BASIC DE643BS	495020	x
STARTEC-BASIC DE643BS	532510	x
STARTEC-BASIC DE643BS	532529	x
STARTEC-BASIC DE643BS	363993	x
STARTEC-BASIC DE643BS	532540	x
STARTEC-BASIC DE643BS	495025	

HSS

Specification	TN	Stock
STARTEC-BASIC BL763PD	495030	
STARTEC-BASIC BL763PD	532571	x
STARTEC-BASIC BL763PD	532576	
STARTEC-BASIC BL763PD	495027	x
STARTEC-BASIC BL763PD	532579	
STARTEC-BASIC BL763PD	495026	

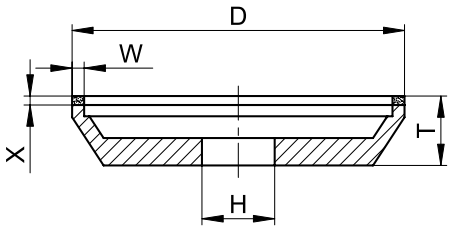
x ... available from stock | Customised grinding tools can be manufactured on request.

UNIVERSAL TOOL GRINDING
WET REGRINDING



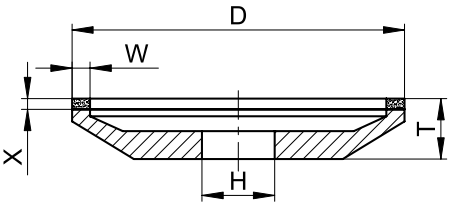
SHAPE 6A2

					Tungsten Carbide			HSS		
D	T	H	W	X	Specification	TN	Stock	Specification	TN	Stock
125	30	20	5	3	D54C75B	495034		STARTEC-BASIC BL913PD	495038	x
150	35	20	5	3	D54C75B	495035		STARTEC-BASIC BL913PD	495037	x



SHAPE 12A2D

					Tungsten Carbide			HSS		
D	T	H	W	X	Specification	TN	Stock	Specification	TN	Stock
100	25	20	5	3	D54C75B	495041		B91C100B	495046	x
125	25	20	15	3	D54C75B	495044	x	B91C100B	173085	x

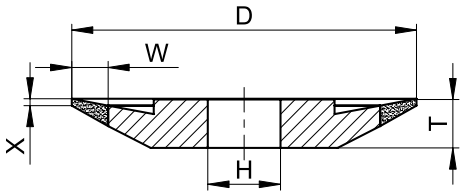


SHAPE 12A2

					Tungsten Carbide			HSS		
D	T	H	W	X	Specification	TN	Stock	Specification	TN	Stock
125	16	20	6	2	D126C75B	19220	x	B91C100B	715765	
150	18	20	5	3	D91C75B	291603	x	B91C100B	495047	

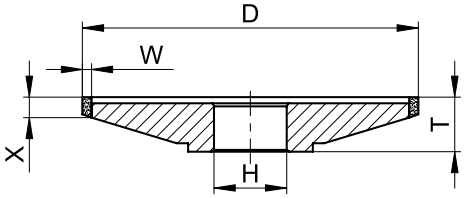
x ... available from stock | Customised grinding tools can be manufactured on request.

UNIVERSAL TOOL GRINDING
WET REGRINDING



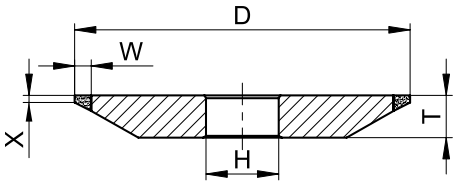
SHAPE 4BT9

D	T	H	W	X	Tungsten Carbide Specification	TN	Stock	HSS Specification	TN	Stock
75	8	20	6	1	D126C75B	495049		STARTEC-BASIC BL1263PD	495055	
100	10	20	10	1	D91C75B	255835	x			
					D126C75B	495051		B126 C75 B	119325	x
125	10	20	10	1	D126C75B	495053		STARTEC-BASIC BL1263PD	495058	x



SHAPE 4B2

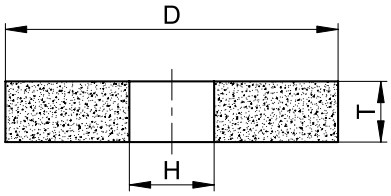
D	T	H	W	X	Tungsten Carbide Specification	TN	Stock	HSS Specification	TN	Stock
150	18	20	2	2	STARTEC-BASIC DE643BX	665141	x	B126C100B	667930	x



SHAPE 4ET9

D	T	H	W	X	Tungsten Carbide Specification	TN	Stock	HSS Specification	TN	Stock
150	14	32	10	1	D126C100B	897024	x	B126C75B	440322	

DRESSING AND SHARPENING
ASSORTMENT OVERVIEW

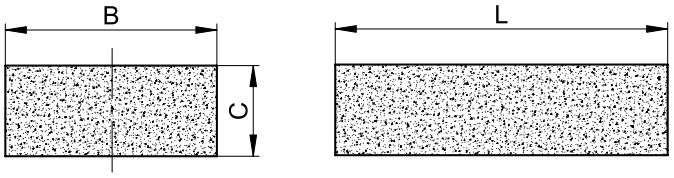


SHAPE 1

D	T	H	Specification	TN	Stock	Notes
250	12	51	C80H8V15	250491	x	Standard hardness, for grit sizes 151 - 64
250	12	51	C80J5V15	619701	x	Harder than standard, for grit sizes 151 - 64
250	12	51	C120H5AV18	413027	x	For grit sizes < 64
250	12	51	89A 120 M5 AV217	708196	x	Alternative to SiC for grit sizes < 64

REDUCING RING

D	T	H	Specification	TN	Stock	Notes
51	9	32	Reducing ring	911408	x	Available free of charge
32	6	20	Reducing ring	111434	x	Available free of charge



SHAPE 90AS

B	C	L	Specification	TN	Stock	Notes
24	13	100	A240 STARTEC	678952	x	For STARTEC XP-C and XP-P
24	13	200	A240 STARTEC	678953	x	For STARTEC XP-C and XP-P
25	13	200	89A240H5AV83	932780	x	For grit sizes > 46
24	13	200	89A600J5AV83	577953	x	For grit sizes <= 46
50	25	200	89A240 J7 AV17	464290	x	For grit sizes > 46
50	25	200	89A600-25V83	251584	x	For grit sizes <=46

L... Length

x ... available from stock | Customised grinding tools can be manufactured on request.

SHARPENING
APPLICATION TIPS

In the production of tungsten carbide cutting tools the requirements on the edge radius of the grinding wheel are very high. These can be defined during the sharpening process.
The aim of sharpening is to produce a process-oriented micro geometry for the grinding tool contact area. Sufficient grain protrusion and chip space have to be created (fig. 2)

The optimum cutting ability of the grinding tool can only be achieved with a correct sharpening procedure.

By following the 3 steps to correct sharpening the grinding tools can be finely customized to attain maximum grinding results.

Fig. 1: Non-sharpened abrasive layer

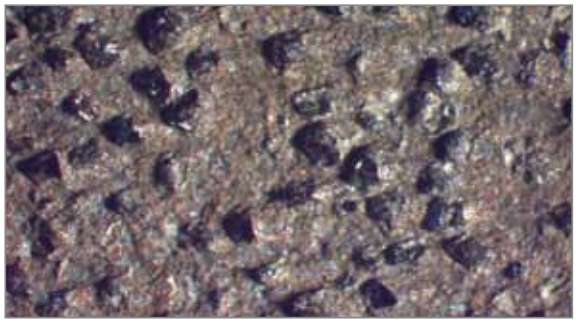
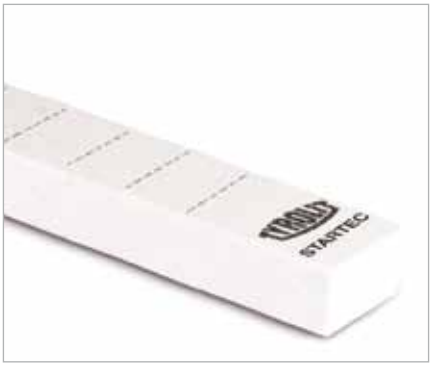


Fig. 2: Sharpened abrasive layer

The 3 steps of sharpening

- Soak the sharpening stick with coolant
- Select the same rotational direction and cutting speed as for grinding
- Feed the sharpening stick radially against the rotating wheel. Supporting the sharpening stick is recommended.



The STARTEC XP-P grinding wheels are supplied with the appropriate grinding stick for perfect preparation of the tool. Detailed information on the sharpening procedure is also included.

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