



STARTEC

THE CNC GRINDING WHEEL PROGRAM
FOR ROTATING CUTTING TOOLS



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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.

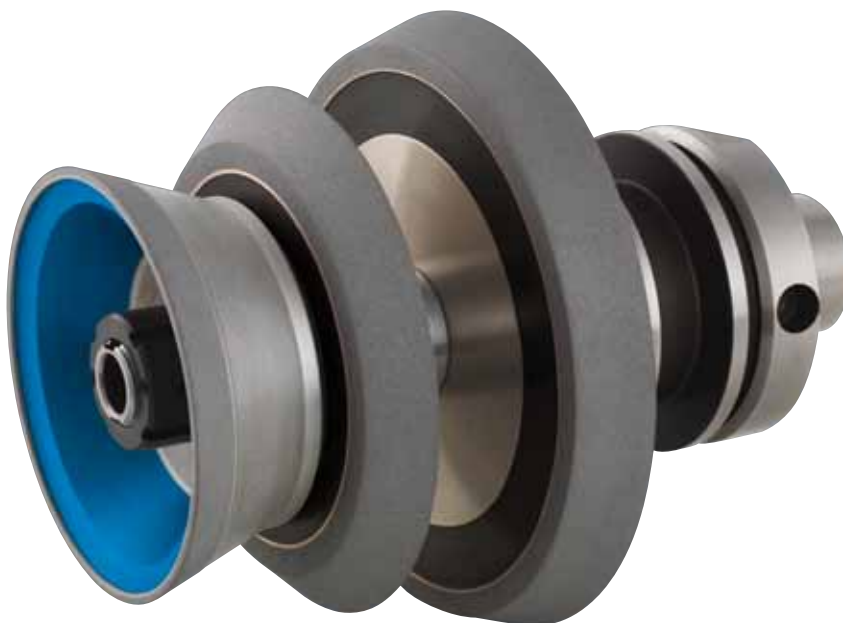
In the following, you will find grinding tools that satisfy the demands of both tool manufacturers and tool regrinders.

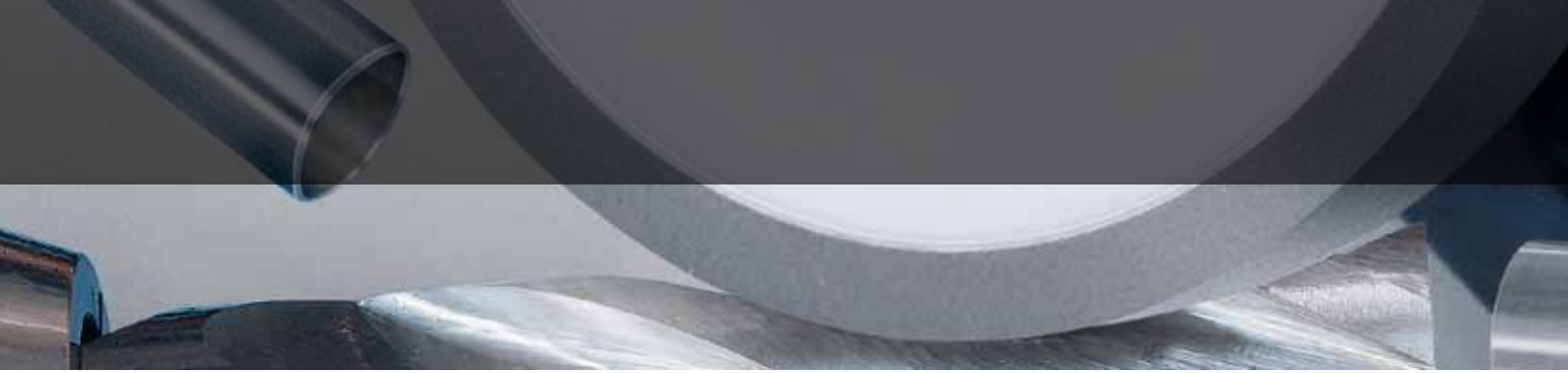
TYROLIT – masters of the art of grinding

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
With diamond or CBN available

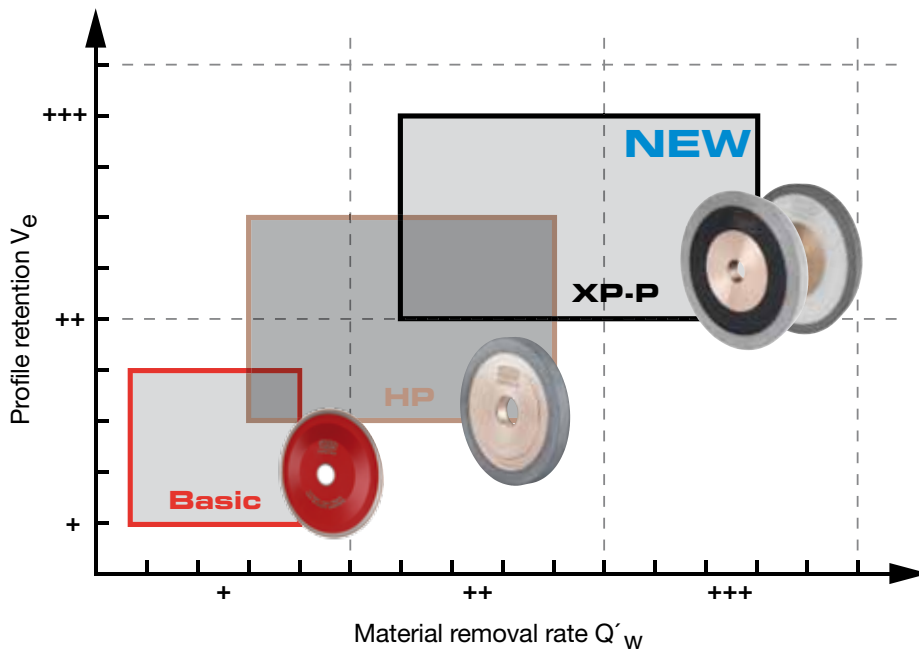
STARTEC HP

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

REGRINDING

STARTEC-BASIC

Standard grinding tools with diamond or CBN for regrinding and tool manufacturing
with balanced profile retention and material removal rate



GRINDING OF CLEARANCE ANGLES AND FACE GEOMETRIES

STARTEC HP NEW





Cup grinding wheels with optimum edge stability
With diamond or CBN available



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	$\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$	$\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$	-	-
	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	27 - 30 m/s	27 - 30 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	$\leq 250 \text{ mm/min}$	30 - 80 mm/min	30 - 50 mm/min
	Material removal rate Q'_W	See table page 7	$\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$	-	-
	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 depth of flute
	Traverse feed in the flute V_t^{***}	See table page 7	$\leq 300 \text{ mm/min}$	-	$\leq 60 \text{ mm/min}$
	Material removal rate Q'_W	See table page 7	$\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$	-	-
	Recommended specification	D54MXPP	1A1: D54MXPP	-	D46MXPP

* 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	$\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$	$\leq 2 \text{ mm}^3/\text{s} \cdot \text{mm}$	-
	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	$\leq 4 \text{ mm}^3/\text{s} \cdot \text{mm}$	-
	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	$\leq 5 \text{ mm}^3/\text{s} \cdot \text{mm}$	-
	Recommended specification	D54MXPP	D54MXPP	1A1 / 1V1: D54MXPP

* 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 $\leq WS\varnothing 5$ mm 30 - 60 mm/min $> WS\varnothing 5$ mm	100 - 130 mm/min	30 - 35 mm/min	20 - 35 mm/min
	Material removal rate Q'_W	$\leq 5 \text{ mm}^3/\text{s} \cdot \text{mm}$	$\leq 5 \text{ mm}^3/\text{s} \cdot \text{mm}$	-	-
	Recommended specification	BL913PD WS $\varnothing \leq 10$ mm BL1263PD	BL1263PD BL763PD	BL1263PD BL763PD	BL1263PD BL763PD
STARTEC XP-P	Cutting speed v_C^*	25 - 40 m/s	25 - 40 m/s	-	25 - 40 m/s
	Infeed a_e^{**}	Full depth of flute	0,2 - 1 mm	-	Full cutting depth
	Traverse feed in the flute V_t^{***}	See table	≤ 250 mm/min	-	≤ 100 mm/min
	Material removal rate Q'_W	See table	$\leq 4 \text{ mm}^3/\text{s} \cdot \text{mm}$	-	-
	Recommended specification	B126MXPP	1A1: B126MXPP	-	B126MXPP

* 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) a_e . 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 DIAMOND	16 – 22 m/s
STARTEC XP-P CBN	25 – 40 m/s

Q'_w	
Standard range	3 – 6 mm ³ /s · mm
TOP PERFORMANCE range	7 – 15 mm ³ /s · mm

Q'_w table [mm³/s · mm]

Infeed a_e [mm]	Traverse feed v_t [mm/min]										
	50	60	70	80	100	120	140	160	180	200	220
2,6				3,5	4,3	5,2	6,1	6,9	7,8	8,7	9,5
2,8				3,7	4,7	5,6	6,5	7,5	8,4	9,3	10,3
3,0				4,0	5,0	6,0	7,0	8,0	9,0	10,0	11,0
3,2			3,2	4,3	5,3	6,4	7,5	8,5	9,6	10,7	11,7
3,4			4,0	4,5	5,7	6,8	7,9	9,1	10,2	11,3	12,5
3,6		3,6	4,2	4,8	6,0	7,2	8,4	9,6	10,8	12,0	
3,8		3,8	4,4	5,1	6,3	7,6	8,9	10,1	11,4	12,7	
4,0		4,0	4,5	5,3	6,7	8,0	9,3	10,7	12,0	13,3	
4,2	3,5	4,2	4,9	5,6	7,0	8,4	9,8	11,2	12,6		
4,4	3,7	4,4	5,1	5,9	7,3	8,8	10,3	11,7	13,2		
4,6			5,4	6,1	7,7	9,2	10,7	12,3			
4,8			5,6	6,4	8,0	9,6	11,2	12,8			
5,0			5,8	6,7	8,3	10,0	11,7	13,3			
5,5		5,5	6,4	7,3	9,2	11,0	12,8	14,6			
6,0		6,0	7,0	8,0	10,0	12,0	14,0	16,0			
6,5	5,4	6,5	7,6	8,7	10,8	13,0	15,2				
7,0	5,8	7,0	8,2	9,3	11,7	14,0	16,3				

Application area STARTEC HP

	v_t Initial value
	v_t Optimization potential

Application area STARTEC XP-P DIA

	v_t Initial value
	v_t Optimization potential

Application area STARTEC XP-P CBN

	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.

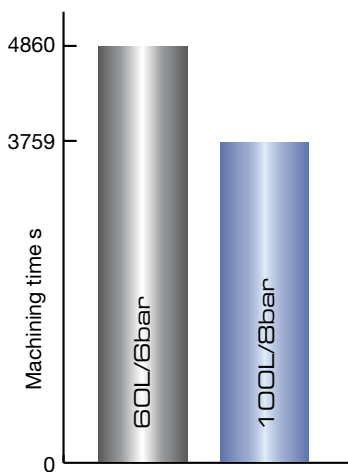


Fig. 1: 20% time saving due to optimized coolant supply

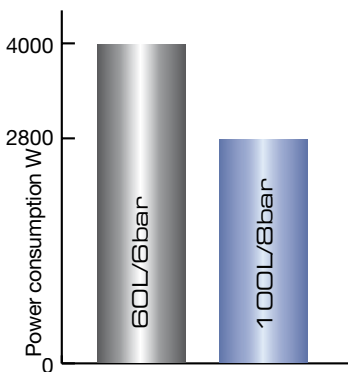


Fig. 2: 30% reduction of power consumption due to optimized coolant supply



Example:

Milling cutter $d=20\text{mm}$, 4 cutting edges $l=68\text{mm}$, $dk=10\text{mm}$, $ae=5\text{mm}$, 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

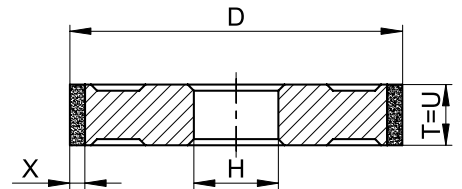
With their expertise and know-how our application engineers will gladly support you in optimizing the coolant supply.



STARTEC XP-P PRODUCTION OF ROTATING CUTTING TOOLS

FLUTE GRINDING SHAPE 1A1

NEW



D	T	H	U	X
75	6	20	6	6
75	6	20	6	10
75	10	20	10	6
75	10	20	10	10
100	6	20	6	6
100	6	20	6	10
100	6	31,75	6	6
100	6	31,75	6	10
100	10	20	10	6
100	10	20	10	10
100	10	20	10	15
100	10	31,75	10	6
100	10	31,75	10	10
100	10	31,75	10	15
100	12	20	12	6
100	12	20	12	10
100	12	20	12	15
100	12	31,75	12	6
100	12	31,75	12	10
100	12	31,75	12	15
100	15	20	15	6
100	15	20	15	10
100	15	20	15	15
100	15	31,75	15	6
100	15	31,75	15	10
125	6	20	6	6
125	6	20	6	10
125	6	31,75	6	6
125	10	20	10	6
125	10	20	10	10
125	10	20	10	15
125	10	31,75	10	6
125	10	31,75	10	10
125	10	31,75	10	15
125	12	20	12	6
125	12	20	12	10
125	12	20	12	15
125	12	31,75	12	6
125	12	31,75	12	10
125	12	31,75	12	15
125	15	20	15	6
125	15	20	15	10
125	15	20	15	15
125	15	31,75	15	6
125	15	31,75	15	10
125	15	31,75	15	15
150	8	20	8	10
150	10	20	10	10
150	12	20	12	10
150	12	31,75	12	10
150	15	20	15	10
150	15	31,75	15	10

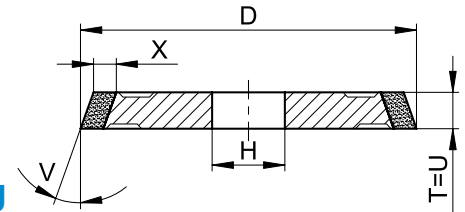
Specification for tungsten carbide	TN	Stock
STARTEC XP-P D54MXPP	679931	X
	662236	X
	679936	X
	742939	X
	679938	X
	695084	X
	704697	
	721063	
	679939	X
	682530	X
STARTEC XP-P D54MXPP	760405	
	694995	X
	711619	X
	760408	
	679940	X
	700297	X
	760411	
	685346	X
	724476	X
	749835	
	679942	X
	675436	X
	760416	
	702676	
	756459	
	679945	X
	686906	X
	702621	
	679947	X
	682527	X
753463		
702678	X	
685975	X	
760422		
679948	X	
682529	X	
721382		
712482	X	
711866	X	
715926		
679949	X	
683963	X	
743210		
702683		
730248		
760511		
684827	X	
679951	X	
679952	X	
716183		
679953	X	
713310		

Specification for HSS	TN	Stock
STARTEC XP-P B126MXPP	34358	
	759826	X
	34383	
	740383	X
	34391	
	751424	X
	34398	
	34401	
	34402	
	34403	
STARTEC XP-P B126MXPP	740382	X
	34403	
	34404	
	34406	
	34407	
	34410	
	772440	X
	744238	
	34465	
	34539	
	34548	
	34554	
	763854	X
	34560	
	34561	
	34562	
	34680	
	772442	X
	34702	
	763855	
772443	X	
34714		
34726		
34732		
34733		
34737		
772444	X	
34742		
34749		
34754		
34755		
21253		
772446	X	
34756		
34776		
34782		
34787		
772447	X	
763857		
772448	X	
34793		
21575		
34798		

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

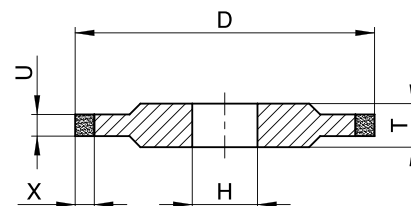
NEU

D	T	H	U	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock		
75	6	20	6	6	15	STARTEC XP-P D54MXPP	680097	x	STARTEC XP-P B126MXPP	34809			
75	8	20	8	10	15		680098	x		34810			
75	10	20	10	10	15		680099	x		772453	x		
100	6	20	6	10	15		680100	x		34823			
100	10	20	10	10	15		680102	x		34846			
100	10	31,75	10	10	15		702686			34847			
100	10	32	10	10	15		724672			34851			
100	12	20	12	10	15		680104	x		34853			
100	12	31,75	12	10	15		712500			34856			
100	12	32	12	10	15		724674			34858			
100	12	20	12	10	45	STARTEC XP-P D54MXPP	680107	x	STARTEC XP-P B126MXPP	772455	x		
100	12	31,75	12	10	45		724675			34859			
100	12	32	12	10	45		724676			34860			
100	15	20	15	10	15		680110	x		34861			
100	15	31,75	15	10	15		702690			34862			
125	6	20	6	10	15		STARTEC XP-P D54MXPP	680112		x	STARTEC XP-P B126MXPP	34870	
125	6	31,75	6	10	15			724677				34891	
125	10	20	10	10	15			680114		x		772458	x
125	10	31,75	10	10	15			702693				34920	
125	10	32	10	10	15			695063				34921	
125	10	20	10	10	45	680115		x	772461	x			
125	10	31,75	10	10	45	703409			34926				
125	10	32	10	10	45	724679			34933				
125	12	20	12	10	15	680116		x	34939				
125	12	31,75	12	10	15	700882			34948				
125	12	32	12	10	15	724680		34954					
125	12	20	12	10	45	STARTEC XP-P D54MXPP	680118	x	STARTEC XP-P B126MXPP	34962			
125	12	31,75	12	10	45		708987			34963			
125	12	32	12	10	45		724681			34968			
125	15	20	15	10	15		680120	x		772462	x		
125	15	31,75	15	10	15		702694			34969			
150	10	20	10	10	10		STARTEC XP-P D54MXPP	680123		x	STARTEC XP-P B126MXPP	34971	
150	10	31,75	10	10	10			714967				34981	
150	10	32	10	10	10			724683				34986	
150	12	20	12	10	10			680124		x		772465	x
150	12	31,75	12	10	10			724684				35005	
150	12	32	12	10	10	724685			35033				

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



STARTEC XP-P PRODUCTION OF ROTATING CUTTING TOOLS



FLUTE GRINDING SHAPE 14A1

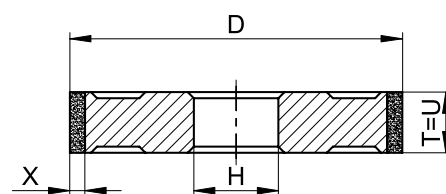
NEU

D	T	H	U	X
75	6	20	4	6
75	8	20	4	6
100	6	20	4	6
100	6	31,75	4	6
100	6	32	4	6
125	6	20	4	6
125	6	31,75	4	6
125	6	32	4	6
150	10	20	6	10

Specification for tungsten carbide	TN	Stock
STARTEC XP-P D54MXPP	655674	
	680140	x
STARTEC XP-P D54MXPP	680138	x
	723430	
	724660	
STARTEC XP-P D54MXPP	680137	x
	704589	
	724661	
STARTEC XP-P D54MXPP	714347	

Specification for HSS	TN	Stock
STARTEC XP-P B126MXPP	35039	
	35041	
STARTEC XP-P B126MXPP	35042	
	35056	
	35057	
STARTEC XP-P B126MXPP	35058	
	35059	
	35067	
STARTEC XP-P B126MXPP	772466	x

STARTEC HP PRODUCTION OF ROTATING CUTTING TOOLS



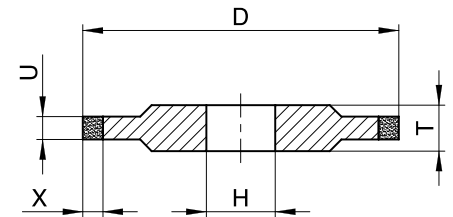
FLUTE GRINDING SHAPE 1A1

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		474444	x
100	6	31,75	6	6	STARTEC HP DN543MH	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	
100	15	20	15	6		572741	x
125	10	20	10	6	STARTEC HP DN543MH	698108	
125	10	31,75	15	6			

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

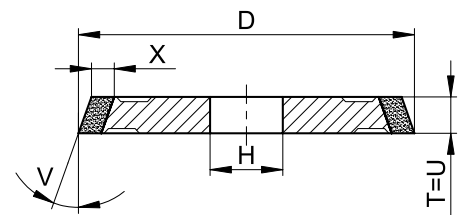


STARTEC HP PRODUCTION OF ROTATING CUTTING TOOLS



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



FLUTE GRINDING SHAPE 1V1

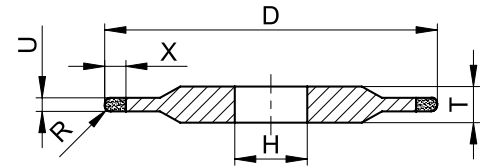
D	T	H	U	X	V°	Specification for tungsten carbide	TN	Stock
75	6	20	6	6	15	STARTEC HP DN543MH	572845	x
75	10	20	10	10	15		572847	x
100	10	20	10	6	15	STARTEC HP DN543MH	490141	x
100	10	31,75	10	6	15		572854	
100	12	20	12	6	45		572859	x
125	10	20	10	6	15	STARTEC HP DN543MH	572867	x
125	10	31,75	10	6	15		572868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

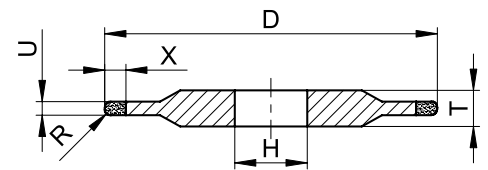


SHAPE 14F1R

D	T	H	U	X	R
100	10	20	3	5	1,5
150	10	20	1,2	5	0,6
150	10	20	2	5	1

Specification for tungsten carbide	TN	Stock
STARTEC-BASIC DE643BS	494480	
STARTEC-BASIC DE643BS	494485	x
STARTEC-BASIC DE643BS	494491	x

Specification for HSS	TN	Stock
STARTEC-BASIC BL1263PD	494528	
STARTEC-BASIC BL1263PD	494529	
STARTEC-BASIC BL1263PD	494530	

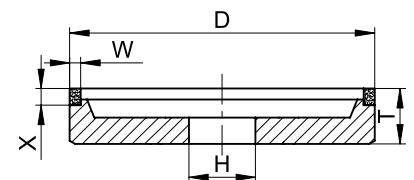


SHAPE 14F1

D	T	H	U	X	R
100	10	20	4	6	2
125	10	20	4	6	2
125	10	20	8	10	4
150	10	20	4	6	2
150	10	20	5	6	2,5

Specification for tungsten carbide	TN	Stock
STARTEC-BASIC DE643BS	494495	
STARTEC-BASIC DE643BS	494506	x
STARTEC-BASIC DE643BX	494491	
STARTEC-BASIC DE643BS	494515	
STARTEC-BASIC DE643BS	494525	

Specification for HSS	TN	Stock
STARTEC-BASIC BL1263PD	494531	
STARTEC-BASIC BL1263PD	494535	
STARTEC-BASIC BL1263PD	494536	x
STARTEC-BASIC BL1263PD	494538	
STARTEC-BASIC BL1263PD	494540	



SHAPE 6A9

D	T	H	U	X
75	30	20	3	10
100	30	20	3	10
125	30	20	3	10

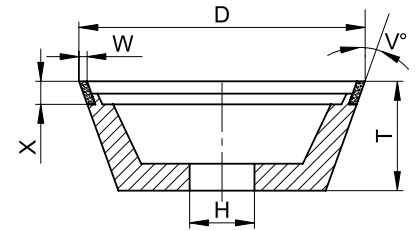
Specification for tungsten carbide	TN	Stock
STARTEC-BASIC DE643BS	494675	
STARTEC-BASIC DE643BS	403512	x
STARTEC-BASIC DE643BS	494676	

Specification for HSS	TN	Stock
STARTEC-BASIC BL1263PD	494677	
STARTEC-BASIC BL1263PD	494678	
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

NEU

D	T	H	W	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
75	30	20	2	10	20	STARTEC HP DN463MC	626754	x	STARTEC-HP BL763MC	771143	
						STARTEC HP DN643MC	529895	x			
75	30	20	3	10	20	STARTEC HP DN463MC	22737	x	STARTEC-HP BL763MC	16587	x
						STARTEC HP DN643MC	758167	x			
100	35	20	2	10	20	STARTEC HP DN643MC	530074	x	STARTEC-HP BL763MC	35083	
						STARTEC HP DN463MC	667542	x			
100	35	20	3	10	20	STARTEC HP DN643MC	478973	x	STARTEC-HP BL763MC	769871	x
						STARTEC HP DN463MC	530077	x			
125	40	20	2	10	20	STARTEC HP DN643MC	530077	x	STARTEC-HP BL763MC	35084	
						STARTEC HP DN463MC	649099	x			
125	40	20	3	10	20	STARTEC HP DN463MC	649099	x	STARTEC-HP BL763MC	771146	x
						STARTEC HP DN643MC	580760	x			

SHAPE 12V9

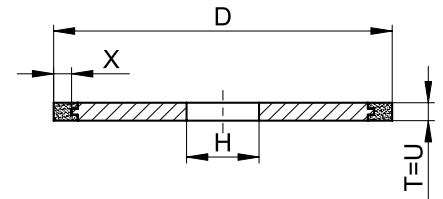
NEU

D	T	H	W	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
100	20	20	2	10	45	STARTEC HP DN643MC	530078	x	STARTEC-HP BL763MC	35090	
100	20	20	3	10	45	STARTEC HP DN643MC	580769	x	STARTEC-HP BL763MC	771147	x
125	25	20	2	10	45	STARTEC HP DN643MC	530079	x	STARTEC-HP BL763MC	35102	
125	25	20	3	10	45	STARTEC HP DN463MC	672678	x	STARTEC-HP BL763MC	771148	x
						STARTEC HP DN643MC	641156	x			
150	25	20	2	10	45	STARTEC-BASIC DE643BS	494650		STARTEC-BASIC BL1263PD	494652	

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



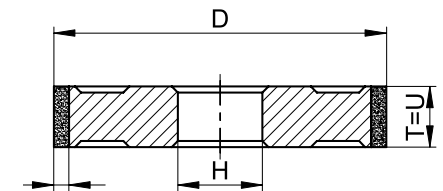
STARTEC BASIC REGRINDING OF ROTATING CUTTING TOOLS



CUT-OFF GRINDING SHAPE 1A1R

D	T	H	U	X	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
75	1	20	1	5	D151C75B	299109	x	B151C75B	244691	
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



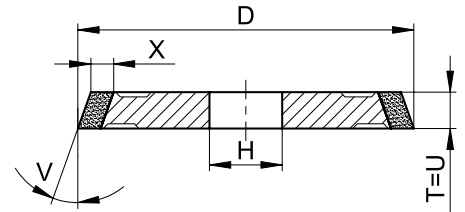
UNIVERSAL APPLICATION SHAPE 1A1

D	T	H	U	X	Specification for tungsten carbide	TN	Stock	Specification for HSS	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

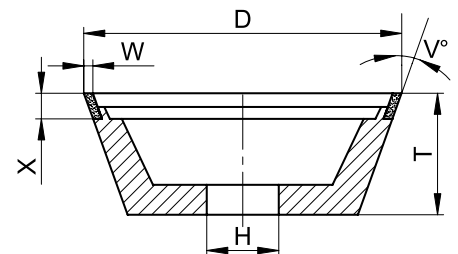


SHAPE 1V1

D	T	H	W	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	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



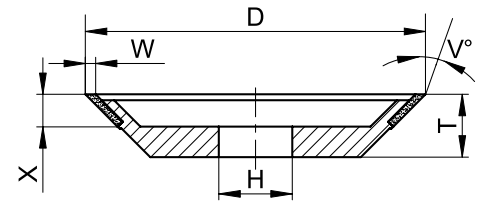
SHAPE 11V9

D	T	H	W	X	V°	Specification 1 for tungsten carbide	TN	Stock	Specification 2 for tungsten carbide	TN	Stock	Specification for HSS	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.



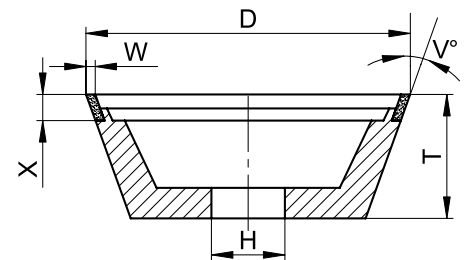
AMIGO | DIAGO DRY REGRINDING



SHAPE 12V9

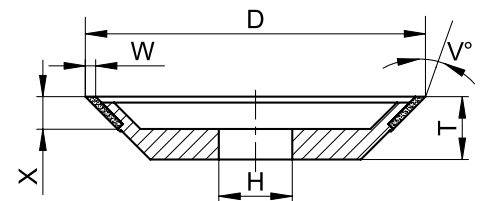
D	T	H	W	X	V°	Specification 1 for tungsten carbide	TN	Stock	Specification 2 for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
75	20	20	2	6	45	DIAGO D126C75B	696324	x	DIAGO D64C50B	721319	x	AMIGO B126C75	703242	x
100	20	20	2	10	45	DIAGO D126C75B	689930	x				AMIGO B126C75	636658	x
125	25	20	2	10	45	DIAGO D126C75B	311250	x	DIAGO D54C65B	90998	x	AMIGO B126C75	840506	x
150	25	20	2	10	45	DIAGO D126C75B	494994		DIAGO D64C50B	268823		AMIGO B126C75	917415	

STARTEC-BASIC WET REGRINDING (WITH COOLANT)



SHAPE 11V9

D	T	H	W	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
75	30	20	2	10	20	STARTEC-BASIC DE643BS	390970	x	STARTEC-BASIC BL763PD	494983	x
100	35	20	2	10	20	STARTEC-BASIC DE643BS	357223	x	STARTEC-BASIC BL763PD	494985	x
100	35	31,75	2	10	20	STARTEC-BASIC DE643BS	494972		STARTEC-BASIC BL763PD	901440	
100	35	20	3	10	20	STARTEC-BASIC DE643BS	532514	x	STARTEC-BASIC BL763PD	532564	x
125	40	20	2	10	20	STARTEC-BASIC DE643BS	494978	x	STARTEC-BASIC BL763PD	494987	x
125	40	20	3	10	20	STARTEC-BASIC DE643BS	494976		STARTEC-BASIC BL763PD	494988	



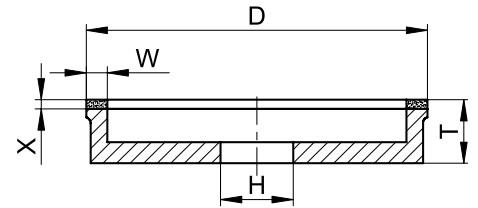
SHAPE 12V9

D	T	H	W	X	V°	Specification for tungsten carbide	TN	Stock	Specification for HSS	TN	Stock
75	20	20	2	6	45	STARTEC-BASIC DE643BS	495020	x	STARTEC-BASIC BL763PD	495030	
100	20	20	2	10	45	STARTEC-BASIC DE643BS	532510	x	STARTEC-BASIC BL763PD	532571	x
100	20	20	3	10	45	STARTEC-BASIC DE643BS	532529	x	STARTEC-BASIC BL763PD	532576	
125	25	20	2	10	45	STARTEC-BASIC DE643BS	363993	x	STARTEC-BASIC BL763PD	495027	x
125	25	20	3	10	45	STARTEC-BASIC DE643BS	532540	x	STARTEC-BASIC BL763PD	532579	
150	25	20	2	10	45	STARTEC-BASIC DE643BS	495025		STARTEC-BASIC BL763PD	495026	

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

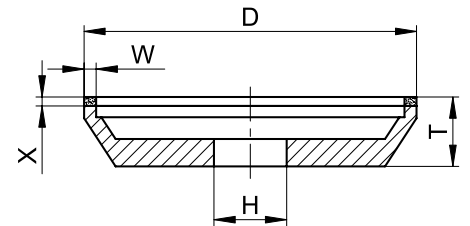


UNIVERSAL TOOL GRINDING WET REGRINDING



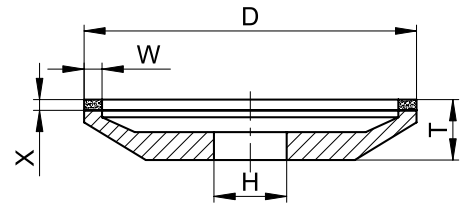
SHAPE 6A2

D	T	H	W	X	Specification for tungsten carbide	TN	Stock	Specification for HSS	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

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



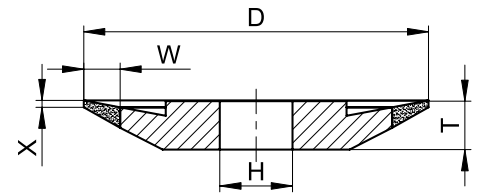
SHAPE 12A2

D	T	H	W	X	Specification for tungsten carbide	TN	Stock	Specification for HSS	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

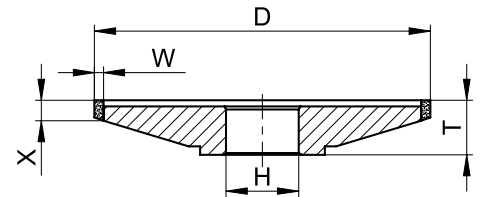


SHAPE 4BT9

D	T	H	W	X
75	8	20	6	1
100	10	20	10	1
125	10	20	10	1

Specification for tungsten carbide	TN	Stock
D126C75B	495049	
D91C75B	255835	x
D126C75B	495051	
D126C75B	495053	

Specification for HSS	TN	Stock
STARTEC-BASIC BL1263PD	495055	
B126 C75 B	119325	x
STARTEC-BASIC BL1263PD	495058	x

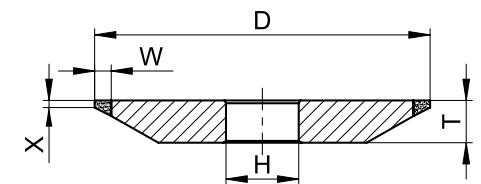


SHAPE 4B2

D	T	H	W	X
150	18	20	2	2

Specification for tungsten carbide	TN	Stock
STARTEC-BASIC DE643BX	665141	x

Specification for HSS	TN	Stock
B126C100B	667930	x



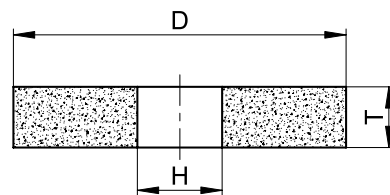
SHAPE 4ET9

D	T	H	W	X
150	14	32	10	1

Specification for tungsten carbide	TN	Stock
D126C100B	897024	x

Specification for HSS	TN	Stock
B126C75B	440322	

DRESSING AND SHARPENING ASSORTMENT OVERVIEW

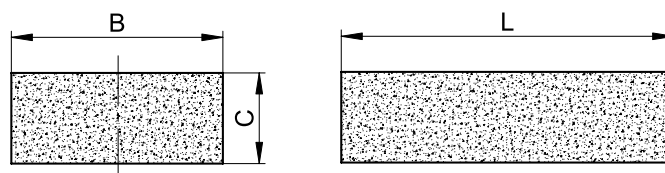


SHAPE 1

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

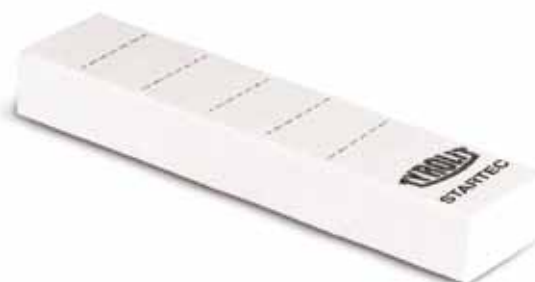
D	T	H	Specification	TN	Stock	Notes
51	9	32	Reduzerring	911408	x	Available free of charge
32	6	20	Reduzerring	111434	x	Available free of charge



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	A240 STARTEC	904607	x	For STARTEC XP-C and XP-P
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 and HSS 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.

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.



Fig. 1: Non-sharpened abrasive layer

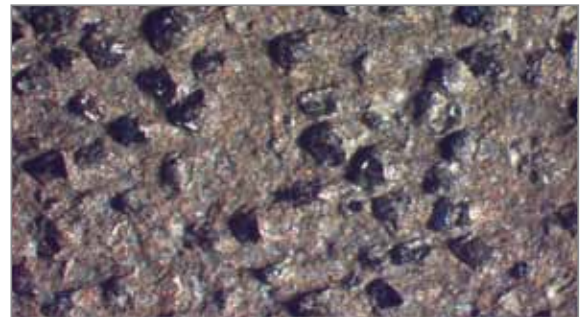


Fig. 2: Sharpened abrasive layer



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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