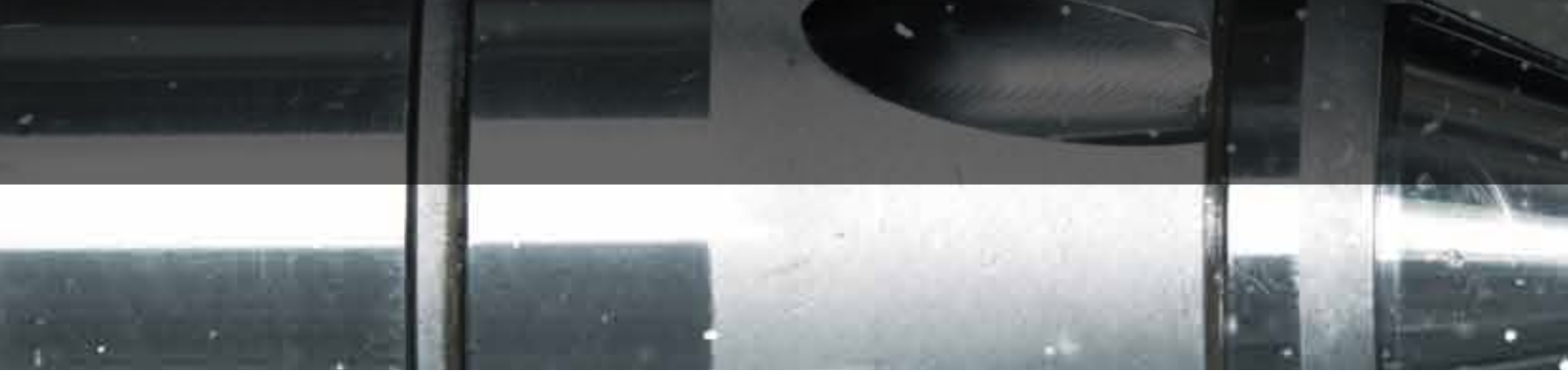




STARTEC

THE CNC GRINDING WHEEL PROGRAM
FOR ROTATING CUTTING TOOLS



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

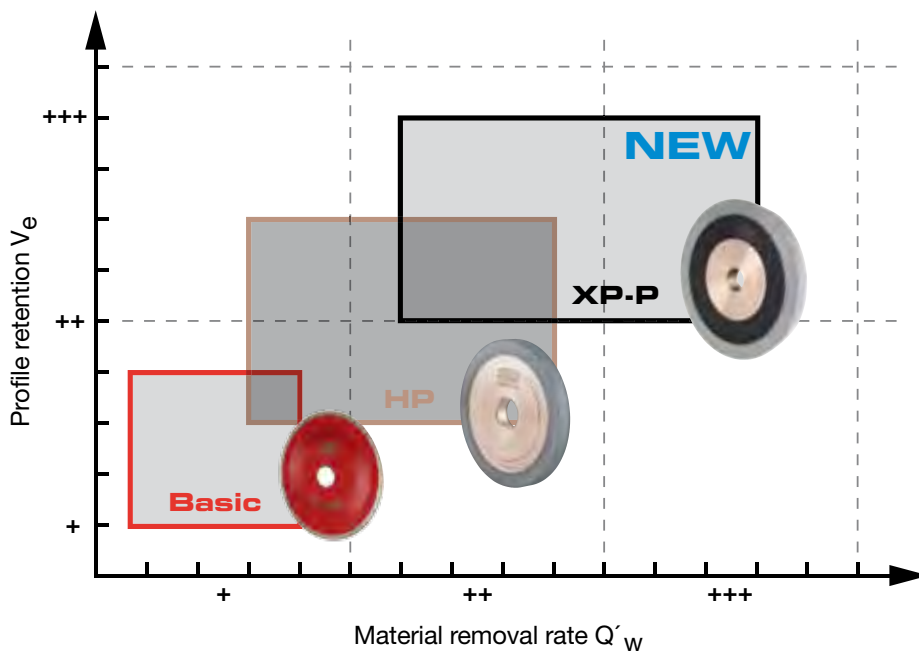
STARTEC HP

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 | $\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$ | $\leq 3 \text{ mm}^3/\text{s} \cdot \text{mm}$ | - | - |
| | 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 | 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 | $\leq 250 \text{ mm/min}$ | 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 cutting depth |
| | 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 | - | 1V1: 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: 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 $\leq WS\varnothing 5$ 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 |

* 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 | 16 – 22 m/s |

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

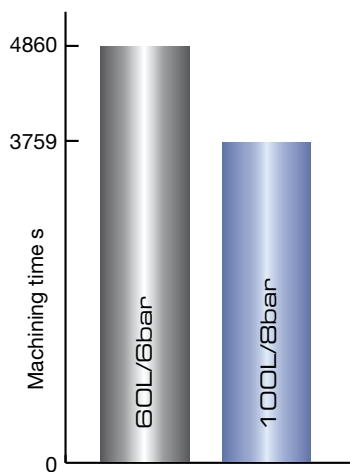


Fig. 1: 20% time saving due to optimized coolant supply

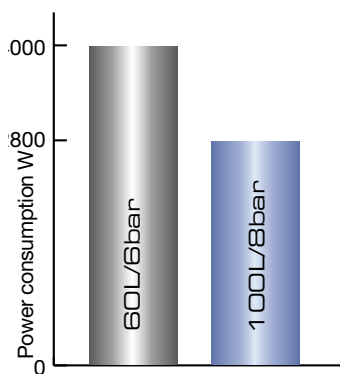


Fig. 2: 30% reduction of power consumption due to optimized coolant supply



Example:

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

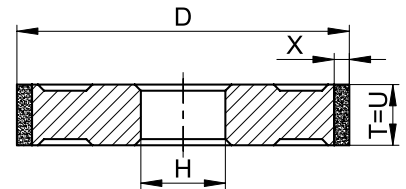
With 60L / 6bar max. material removal rate $Q'w=9$ – traverse feed while flute grinding 108mm/min

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.



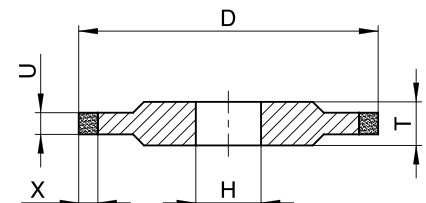
STARTEC XP-P PRODUCTION OF ROTATING CUTTING TOOLS



FLUTE GRINDING SHAPE 1A1

NEW

| D | T | H | U | X | 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 | STARTEC XP-P D54MXPP | 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 | | 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 | | STARTEC XP-P D54MXPP | 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 | 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 | STARTEC XP-P D54MXPP | | 679951 | x |
| 150 | 12 | 20 | 12 | 10 | | | 679952 | x |
| 150 | 12 | 31,75 | 12 | 10 | | 716183 | | |
| 150 | 12 | 32 | 12 | 10 | | 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

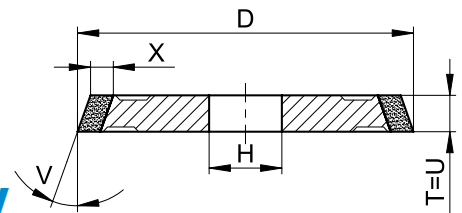
NEW

| 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 | STARTEC XP-P D54MXPP | 680138 | x |
| 100 | 6 | 31,75 | 4 | 6 | | 723430 | |
| 100 | 6 | 32 | 4 | 6 | | 724660 | |
| 125 | 6 | 20 | 4 | 6 | STARTEC XP-P D54MXPP | 680137 | x |
| 125 | 6 | 31,75 | 4 | 6 | | 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

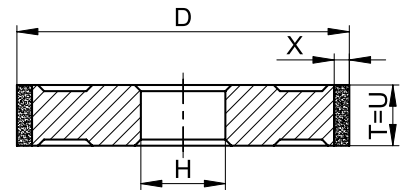
NEW

| 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 | | 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 | 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.

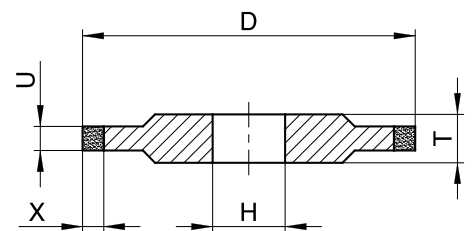


STARTEC HP PRODUCTION OF ROTATING CUTTING TOOLS



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 | | 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 |
| 125 | 10 | 31,75 | 15 | 6 | 698108 | | |



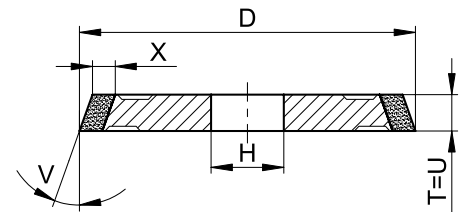
FLUTE GRINDING SHAPE 14A1

| 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 |

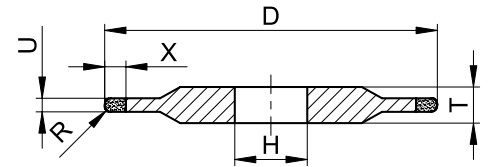


x ... available from stock | Customised grinding tools can be manufactured on request.



STARTEC BASIC UNIVERSAL APPLICATION

SHAPE 14F1R

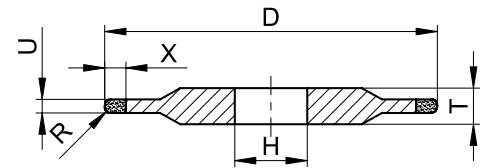


| D | T | H | U | X | R |
|-----|----|----|-----|---|-----|
| 100 | 10 | 20 | 3 | 5 | 1,5 |
| 150 | 10 | 20 | 1,2 | 5 | 0,6 |
| 150 | 10 | 20 | 2 | 5 | 1 |

| Tungsten Carbide | | |
|-----------------------|--------|----------|
| Specification | TN | Stock |
| STARTEC-BASIC DE643BS | 494480 | |
| STARTEC-BASIC DE643BS | 494485 | x |
| STARTEC-BASIC DE643BS | 494491 | x |

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

SHAPE 14F1

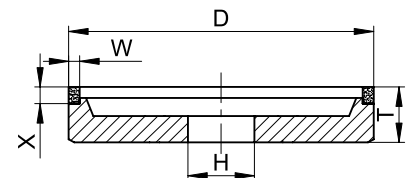


| D | T | H | U | X | R |
|-----|----|----|---|----|-----|
| 100 | 10 | 20 | 4 | 6 | 2 |
| 125 | 10 | 20 | 4 | 6 | 2 |
| 125 | 10 | 20 | 8 | 10 | 4 |
| 150 | 10 | 20 | 4 | 6 | 2 |
| 150 | 10 | 20 | 5 | 6 | 2,5 |

| Tungsten Carbide | | |
|-----------------------|--------|----------|
| Specification | TN | Stock |
| STARTEC-BASIC DE643BS | 494495 | |
| STARTEC-BASIC DE643BS | 494506 | x |
| STARTEC-BASIC DE643BX | 494491 | |
| STARTEC-BASIC DE643BS | 494515 | |
| STARTEC-BASIC DE643BS | 494525 | |

| HSS | | |
|------------------------|--------|----------|
| Specification | 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 |

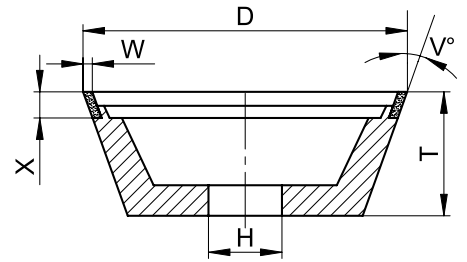
| Tungsten Carbide | | |
|-----------------------|--------|----------|
| Specification | TN | Stock |
| STARTEC-BASIC DE643BS | 494675 | |
| STARTEC-BASIC DE643BS | 403512 | x |
| STARTEC-BASIC DE643BS | 494676 | |

| HSS | | |
|------------------------|--------|-------|
| Specification | 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.

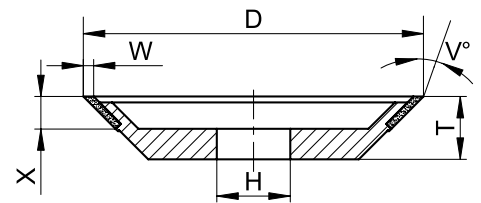
STARTEC HP

GRINDING OF CLEARANCE ANGLES AND FACE GEOMETRIES



SHAPE 11V9

| | | | | | | Tungsten Carbide NEW | | | HSS | | |
|-----|----|----|---|----|----|-----------------------------|--------|-------|------------------------|--------|-------|
| D | T | H | W | X | V° | Specification | TN | Stock | Specification | TN | Stock |
| 75 | 30 | 20 | 2 | 10 | 20 | STARTEC HP DN463MC | 626754 | x | STARTEC-BASIC BL763PD | 494983 | x |
| | | | | | | STARTEC HP DN643MC | 529895 | x | STARTEC-BASIC BL1263PD | 75669 | x |
| 100 | 35 | 20 | 2 | 10 | 20 | STARTEC HP DN643MC | 530074 | x | STARTEC-BASIC BL1263PD | 949953 | x |
| 100 | 35 | 20 | 3 | 10 | 20 | STARTEC HP DN463MC | 667542 | x | STARTEC-BASIC BL763PD | 532564 | x |
| | | | | | | STARTEC HP DN643MC | 478973 | x | STARTEC-BASIC BL1263PD | 50786 | |
| 125 | 40 | 20 | 2 | 10 | 20 | STARTEC HP DN643MC | 530077 | x | STARTEC-BASIC BL1263PD | 494643 | x |
| 125 | 40 | 20 | 3 | 10 | 20 | STARTEC HP DN463MC | 649099 | x | | | |
| | | | | | | STARTEC HP DN643MC | 580760 | x | STARTEC-BASIC BL1263PD | 947117 | x |



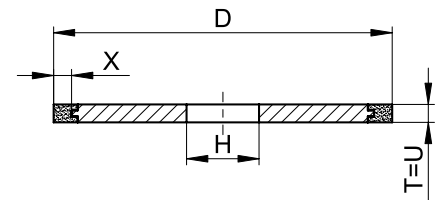
SHAPE 12V9

| | | | | | | Tungsten Carbide NEW | | | HSS | | |
|-----|----|----|---|----|----|-----------------------------|--------|-------|------------------------|--------|-------|
| D | T | H | W | X | V° | Specification | TN | Stock | Specification | TN | Stock |
| 100 | 20 | 20 | 2 | 10 | 45 | STARTEC HP DN643MC | 530078 | x | STARTEC-BASIC BL763PD | 532571 | x |
| 100 | 20 | 20 | 3 | 10 | 45 | STARTEC HP DN643MC | 580769 | x | STARTEC-BASIC BL1263PD | 75679 | x |
| 125 | 25 | 20 | 2 | 10 | 45 | STARTEC HP DN643MC | 530079 | x | STARTEC-BASIC BL1263PD | 556486 | |
| 125 | 25 | 20 | 3 | 10 | 45 | STARTEC HP DN463MC | 672678 | x | STARTEC-BASIC BL763PD | 495027 | x |
| | | | | | | STARTEC HP DN643MC | 641156 | x | STARTEC-BASIC BL1263PD | 75685 | x |
| 150 | 25 | 20 | 2 | 10 | 45 | STARTEC-BASIC DE643BS | 494650 | | 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.



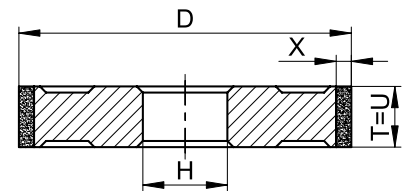
STARTEC BASIC REGRINDING OF ROTATING CUTTING TOOLS



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

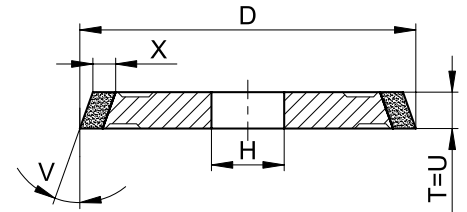
| | | | | | Tungsten Carbide | | | HSS | | |
|-----|----|-------|----|---|-----------------------|--------|-------|-----------------------|--------|-------|
| D | T | H | U | X | Specification | TN | Stock | Specification | TN | Stock |
| 75 | 4 | 20 | 4 | 6 | STARTEC-BASIC DE643BS | 494719 | | STARTEC-BASIC 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

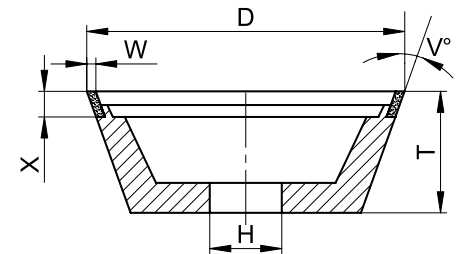


SHAPE 1V1

| | | | | | | 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



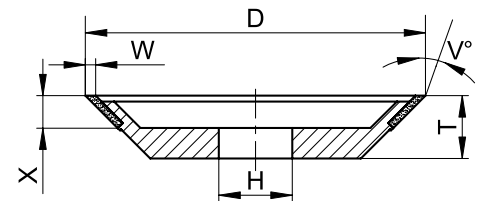
SHAPE 11V9

| | | | | | | 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



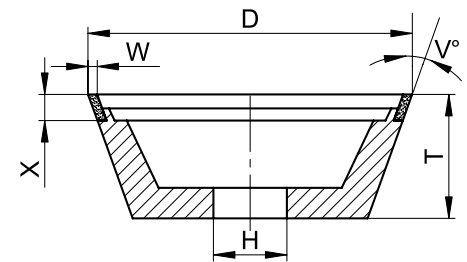
SHAPE 12V9

| 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)



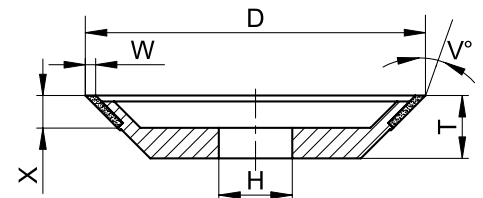
SHAPE 11V9

| 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 |

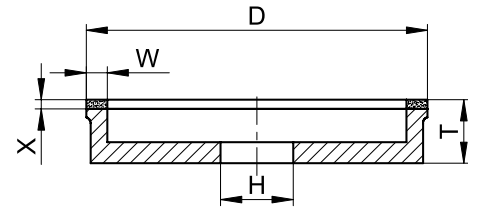
| Tungsten Carbide | | |
|-----------------------|--------|-------|
| Specification | TN | Stock |
| STARTEC-BASIC DE643BS | 495020 | x |
| STARTEC-BASIC DE643BS | 532510 | x |
| STARTEC-BASIC DE643BS | 532529 | x |
| STARTEC-BASIC DE643BS | 363993 | x |
| STARTEC-BASIC DE643BS | 532540 | x |
| STARTEC-BASIC 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.

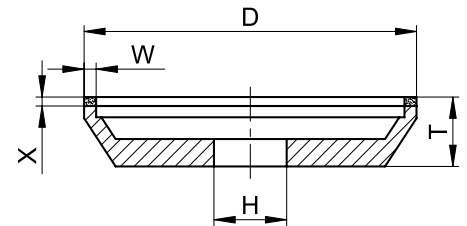
UNIVERSAL TOOL GRINDING

WET REGRINDING



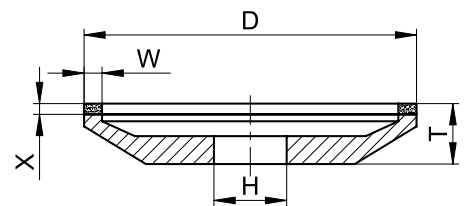
SHAPE 6A2

| | | | | | 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

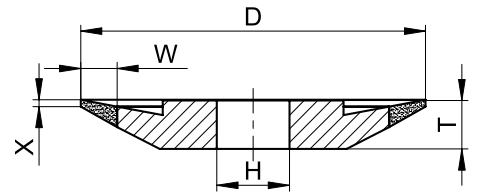
| | | | | | Tungsten Carbide | | | HSS | | |
|-----|----|----|---|---|------------------|--------|----------|---------------|--------|-------|
| D | T | H | W | X | Specification | TN | Stock | Specification | TN | Stock |
| 125 | 16 | 20 | 6 | 2 | D126C75B | 19220 | x | B91C100B | 715765 | |
| 150 | 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

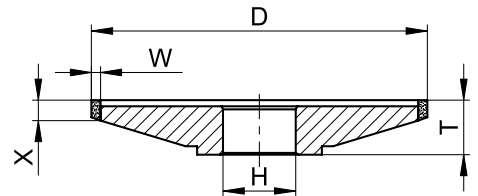


SHAPE 4BT9

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

| Tungsten Carbide | | |
|------------------|--------|-------|
| Specification | TN | Stock |
| D126C75B | 495049 | |
| D91C75B | 255835 | x |
| D126C75B | 495051 | |
| D126C75B | 495053 | |

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

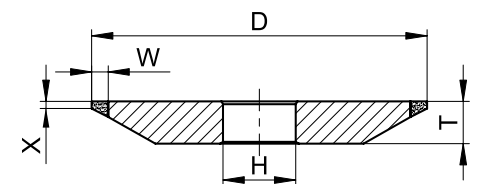


SHAPE 4B2

| D | T | H | W | X |
|-----|----|----|---|---|
| 150 | 18 | 20 | 2 | 2 |

| Tungsten Carbide | | |
|-----------------------|--------|-------|
| Specification | TN | Stock |
| STARTEC-BASIC DE643BX | 665141 | x |

| HSS | | |
|---------------|--------|-------|
| Specification | TN | Stock |
| B126C100B | 667930 | x |



SHAPE 4ET9

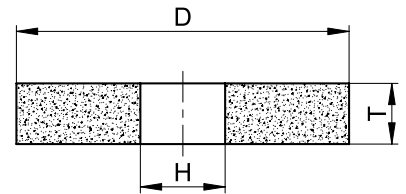
| D | T | H | W | X |
|-----|----|----|----|---|
| 150 | 14 | 32 | 10 | 1 |

| Tungsten Carbide | | |
|------------------|--------|-------|
| Specification | TN | Stock |
| D126C100B | 897024 | x |

| HSS | | |
|---------------|--------|-------|
| Specification | TN | Stock |
| B126C75B | 440322 | |



DRESSING AND SHARPENING ASSORTMENT OVERVIEW

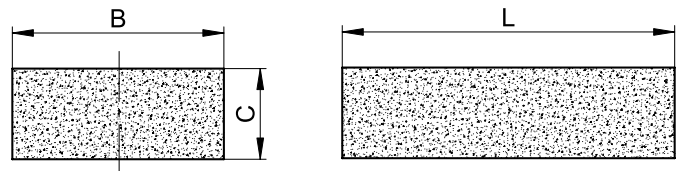


SHAPE 1

| 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 | 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.

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

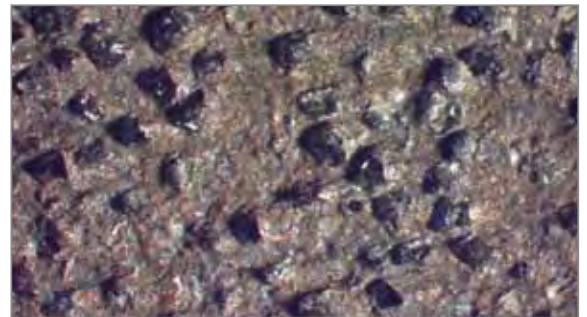
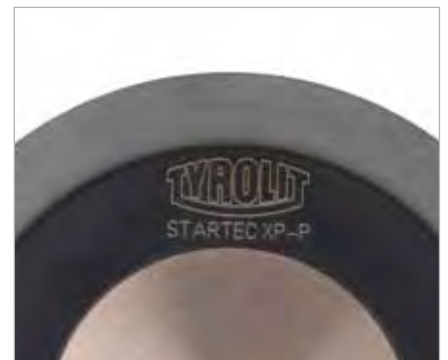
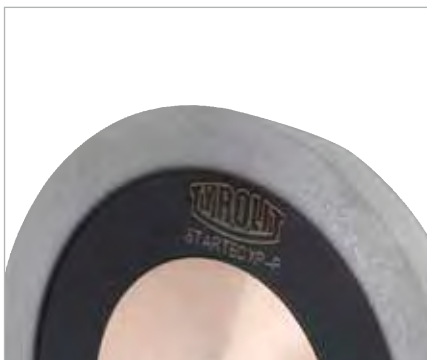


Fig. 2: Sharpened abrasive layer



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.

TYROLIT SCHLEIFMITTELWERKE SWAROVSKI K.G.

Swarovskistraße 33 | 6130 Schwaz | Austria
Tel +43 5242 606-0 | Fax +43 5242 63398

Our **worldwide subsidiary companies** can be found on
our website at www.tyrolit.com



www.tyrolit.com