Your partner for tool grinding
Product Catalogue

2022

Premium grinding tools since 1919
www.tyrolit.com

The TYROLIT Group

TYROLIT is one of the world's leading manufacturers of grinding and dressing tools as well as a system provider for the construction industry.

Since 1919, our innovative tools have made an important contribution to the technological development in many industries. TYROLIT offers tailored grinding solutions for various applications, as well as a comprehensive assortment of standard tools for customers all over the world.

Headquartered in Schwaz (Austria), the family-owned business combines the strengths of being a part of the dynamic Swarovski Group with a century's worth of individual corporate and technological experience.

TYROLIT headquarters in Schwaz (Austria)

Facts & Figures

80,000
products

29
production sites

4,400+
employees worldwide

36
sales locations

500+
worldwide patents

Sales companies in Argentina, Australia, Austria, Belgium, Brazil, Canada, China, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, India, Indonesia, Italy, the Netherlands, Norway, Poland, Portugal, Russia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, the UAE, the UK and the USA. Distributors in 65 other countries.

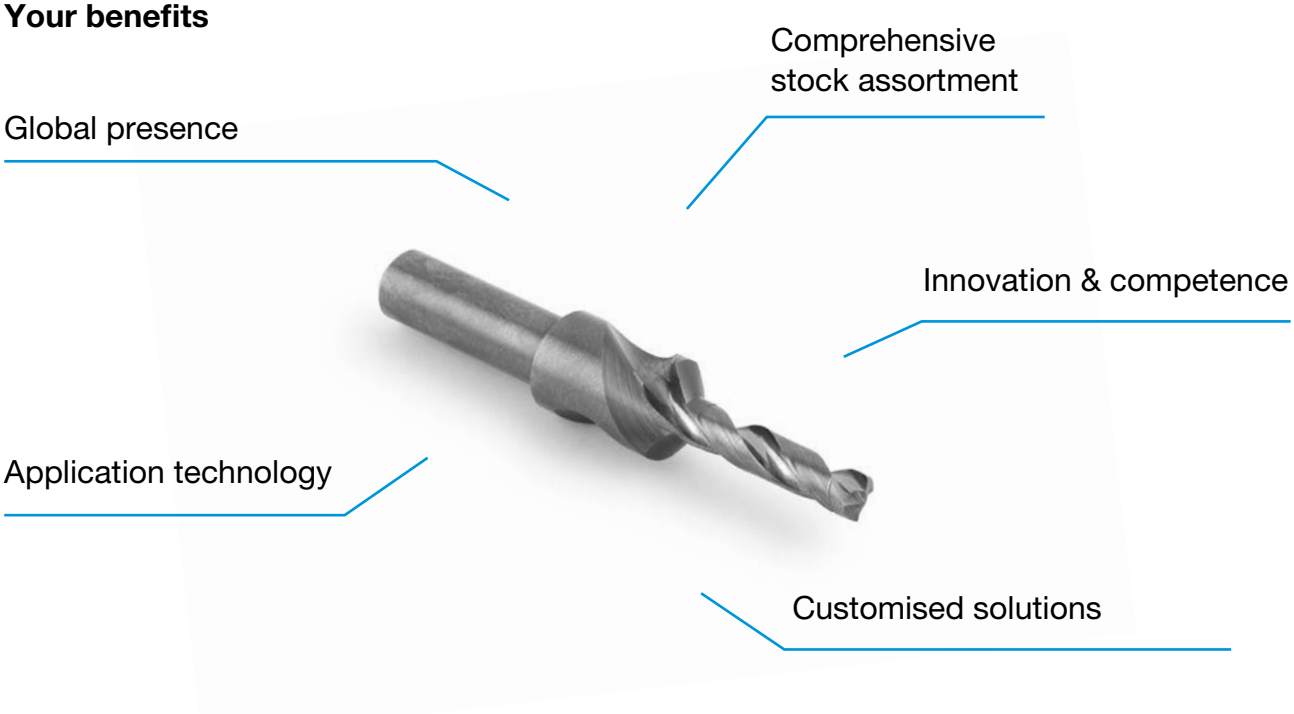
The TYROLIT performance package **at a glance**

In all business development stages, TYROLIT always places the CUSTOMER at the centre of its activities. TYROLIT therefore offers its customers a first-class service in the form of ongoing advice and support. A team of experienced marketing managers and application engineers with many years of experience support you worldwide – for a perfectly tailored package consisting of a grinding solution and attractive services.

Solutions

Especially for tool grinding, TYROLIT offers first-class solutions for the individual fields of application. Based on your individual requirements, we deliver tailored grinding solutions for the production, but also for the professional regrinding, of shaft tools made from tungsten carbide or HSS. With our grinding tools, we meet the high expectations regarding process performance and tool quality. For the shortest possible response times, TYROLIT supplies a wide range of grinding tools ex stock.

Your benefits



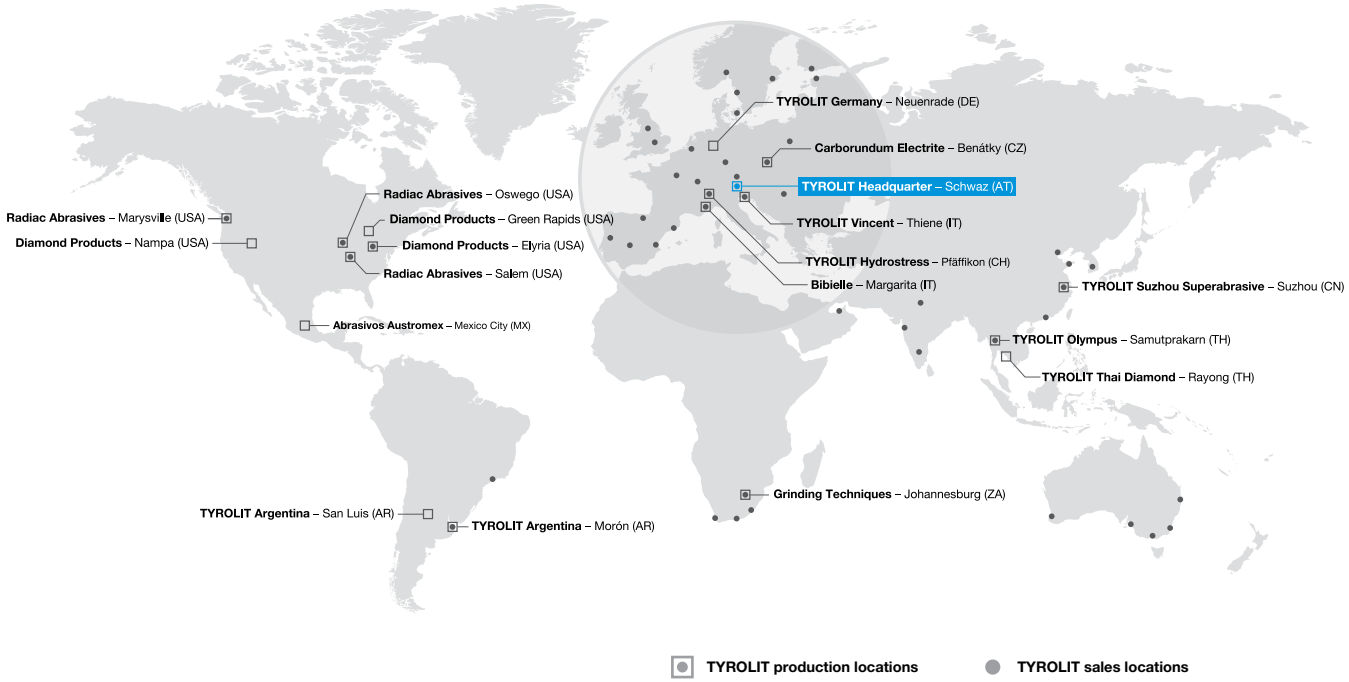
International presence
In your vicinity

Global presence
TYROLIT stands for global thinking and activities. With a worldwide sales network currently in 65 countries and with our own production plants in 29 countries on five continents, we offer our customers all the advantages of a globally operating company.

Local availability
Global thinking, local action – in your national language and in your vicinity. This is the principle we follow in dealing with our customers. Local contacts near your premises and a global team of specialist application engineers ensure optimum customer support and first-class service.

Your benefits

+ Global presence with local contacts
+ Short response and service times



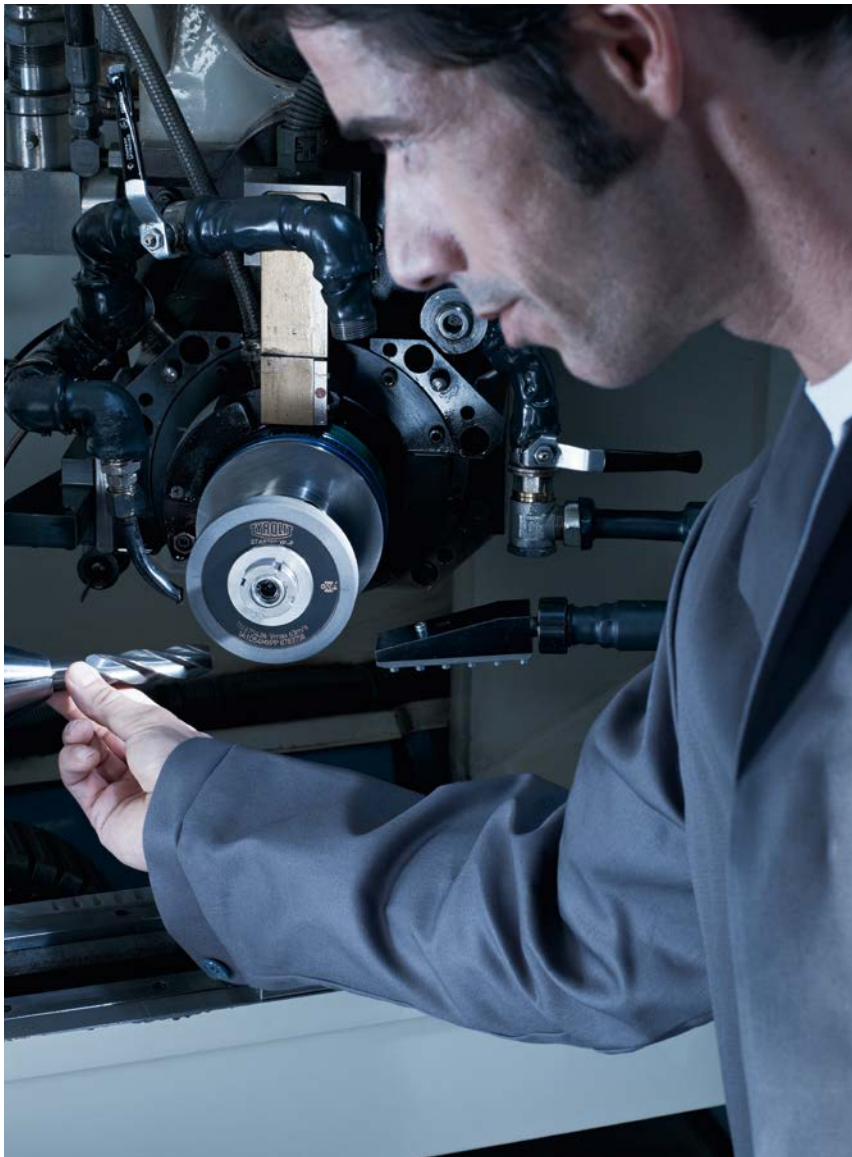
Application technology
The best grinding solutions for your processes

Expertise in cutting and grinding – this has characterised TYROLIT for nearly one hundred years. With the wealth of process expertise commanded by our specialist application engineers, we are able to provide our customers with sustained solutions in line with their demanding technical and economic expectations.

Our global team of specialist application engineers defines solution proposals individually tailored to your requirements. In many years of cooperation with end users and machine manufacturers, grinding processes have been further developed to the highest level.

Your benefits

+ The global presence of our application engineers
+ Process solutions and optimisation for individual tasks
+ Long-standing cooperation with renowned machine manufacturers
+ Internal and external seminars and training courses
+ Customised workshops



Customised solutions
Tailored to your requirements

In tool production and in professional tool service, the focus is on tool quality and the efficiency of the grinding processes.

In order to ensure the best possible solution for your application, TYROLIT offers individually developed products for a wide variety of fields of application.

An overview of the available grinding tools for the production and regrinding of tungsten carbide or HSS shaft tools is provided below.

In the following chapters, you can find detailed descriptions of these tools as well as their fields of application and stock availability.

Production of shaft tools made from tungsten carbide - Chaper 1 from page 9

Tool	Grinding application	Our product recommendation
Drilling, milling and reaming tools, special tools and taps	Centreless grinding	**STARTEC CG** **CSS-REGULATOR**
	Cut-off grinding	**DIAMOND RESIN**
	Peel grinding	**STARTEC PG-1** **STARTEC PG-2**
	Flute grinding	**STARTEC XP-P** **STARTEC RC** **STARTEC XP-P+** **STARTEC HP**
	Clearance and face surface grinding	
	Flute, clearance and face surface polishing	**STARTEC XP-F**
	Profile grinding	**DIAMOND GRINDING TOOLS**
	Roughing cutter teeth grinding	
	Thread grinding	
Small and micro tools	Diameter stepping	**STARTEC PG-1** **STARTEC PG-2**
	Flute, clearance and face surface grinding	**STARTEC MT-1 | MT-2** **STARTEC XP-P** **STRATEC XP-F**

Production of shaft tools made from HSS - Chaper 2 from page 65

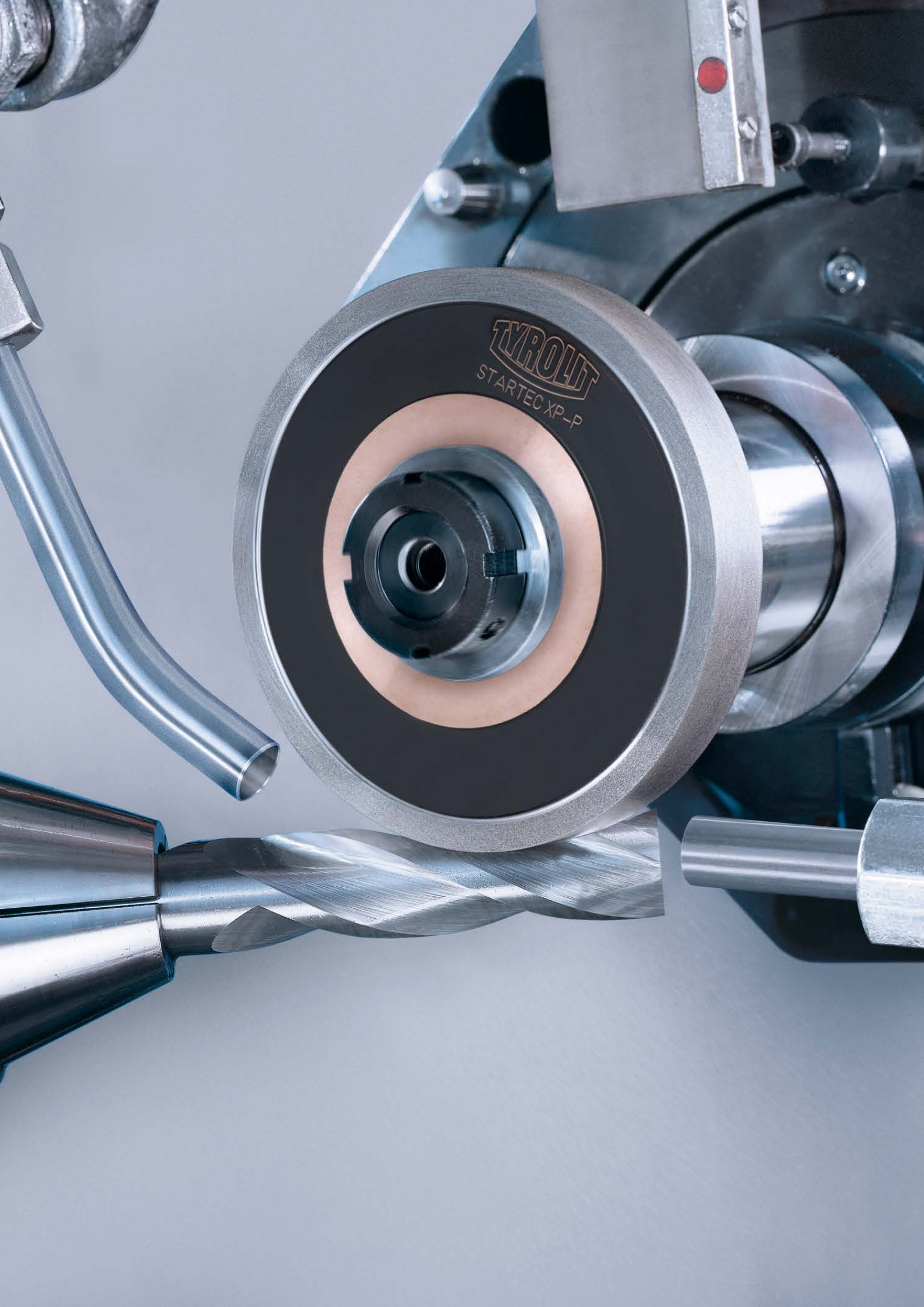
Tool	Grinding application	Our product recommendation
Drilling, milling and reaming tools, special tools and taps	Cut-off grinding	DIAMOND CBN
	Centreless grinding	CSS ULTRA CSS REGULATOR
	Peel grinding	CERAMIC CBN STARTEC PG-1 / PG-2
	Flute grinding	STARTEC PRO STARTEC ICE STARTEC XP-P STARTEC XP-P+
	Clearance and face surface grinding	
	Profile grinding	CBN GRINDING TOOLS
	Roughing cutter teeth grinding	CBN GRINDING TOOLS
	Thread grinding	CSS ULTRA

Conditioning of grinding tools - Chapter 3 from page 101

The process-oriented preparation of the grinding tools is an essential success factor in tool grinding. This chapter describes the basic correlations and possible solutions in detail.

Regrinding of shaft tools - Chaper 4 from page 117

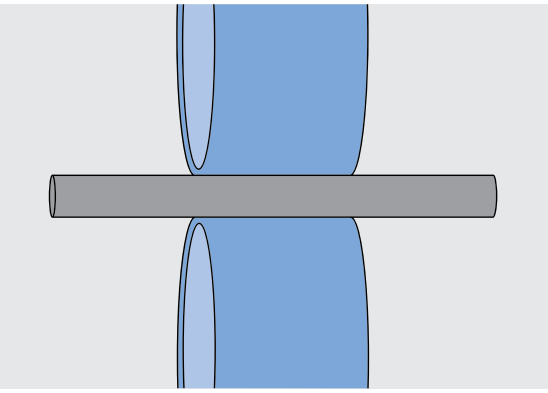
Tool	Material	Grinding application	Our product recommendation
Drills, cutters, reaming tools	Tungsten carbide HSS	Wet regrinding	STARTEC BASIC
	Tungsten carbide	Dry regrinding	DIAGO
	HSS	Dry regrinding	AMIGO
	PCD, PCBN	Regrinding	SKYTEC BASIC+


TYROLIT
STARTEC XP-P

1. Production of shaft tools made from tungsten carbide

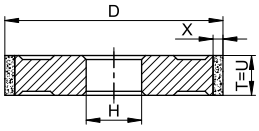
1.1 STARTEC CG – Diamond grinding tools with lightweight core for centreless through feed grinding of tool blanks made from carbide

The new STARTEC CG product line is TYROLIT's response to increasing requirements for grinding wheels that can deliver perfectly ground workpieces. STARTEC CG combines the innovative lightweight technology "N-LW" with diamond grit of the highest quality, raising the standard in centreless through feed grinding to a new level. The low weight of the grinding wheels both protects the machine spindle and greatly simplifies handling in production. At the same time, the grinding tools guarantee the best possible surface finish and optimum workpiece roundness. The damping effect of the N-LW core also extends the lifetime of the grinding wheel.

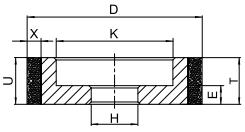


Shapes and dimensions for pre-grinding

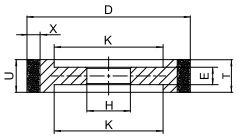
Grinding wheels for all standard external cylindrical grinding machines



Shape 1A1



Shape 6A1



Shape 9A1

	Shapes	D	T=U	H	X	Note
	1A1 6A1 9A1	200	≥ 50 to ≤ 62.5	31.75 to 76.2	10	one-piece core
			>62.5 to ≤ 125			multi-piece core
		250	≥50 to ≤ 62.5	31.75 to 140	10	one-piece core
			>62.5 to ≤ 187.5			multi-piece core
		300	≥50 to ≤ 62.5	38.1 to 230	10	one-piece core
			>62.5 to ≤ 205			multi-piece core
		350	≥50 to ≤ 62.5	50.8 to 203.2	10, 15	one-piece core
			>62.5 to ≤ 254			multi-piece core
		400	≥50 to ≤ 62.5	76 to 305	10	one-piece core
			>62.5 to ≤ 312.5			multi-piece core
		450	≥50 to ≤ 62.5	76 to 305	10	one-piece core
			>62.5 to ≤ 312.5			multi-piece core
		500	≥50 to ≤ 62.5	127 to 305	10, 15	one-piece core
			>62.5 to ≤ 400			multi-piece core

For pre-grinding of carbide bars, our application engineers recommend the following specification:
D126-2-B-1CG

Shapes and dimensions for finish grinding and polishing

Shapes	D	T=U	H	X	Note
1A1	200	≥ 50 to ≤ 125	31.75 to 76.2	6	
6A1	250	≥50 to ≤ 187.5	31.75 to 140	6	
9A1	300	≥50 to ≤ 205	38.1 to 230	6	
	350	≥50 to ≤ 205	50.8 to 203.2	6	
	400	≥50 to ≤ 312.5	76 to 305	6	
	450	≥50 to ≤ 312.5	76 to 305	6, 10	
	500	≥50 to ≤ 400	127 to 305	6, 10	

For the finishing or polishing of rods made of carbide, our application technicians recommend the following specifications:
Fertigschleifen: D46-2-B-1CG
Polieren: DY20-1-B-1CG

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
The diamond centreless grinding wheels are dressed in the machine using SiC dressing wheels.

b. Application recommendation for centreless through feed grinding
For centreless through feed grinding, the TYROLIT application engineers recommend the following specifications and parameters:

Grinding process	Recommended specification	Cutting speed vc [m/s]
Pre-grinding	D126-2-B-1CG	18 – 23
Finish grinding	D46-2-B-1 CG	18 – 23
Polish grinding	DY20-1-B-1CG	16 - 20

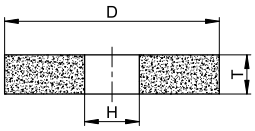
Please note that the application parameters presuppose optimum coolant supply and workpiece clamping.
Please observe the safety information on page 156.

CSS REGULATOR

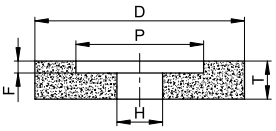
Regulating wheels for all standard centreless grinding machines

Centreless grinding is a complex grinding process. In addition to a good grinding wheel and the correct setting parameters, a reliable regulating wheel is required to stabilise the grinding process. The regulating wheels from the CSS Regulator product line guarantee a long tool life and an optimum coefficient of friction for reliable control of the workpiece.

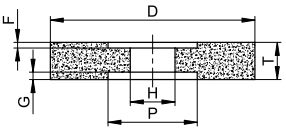
Shapes and dimensions for regulating wheels



Shape 1



Shape 5



Shape 7

We produce the dimensions individually, according to customer requirements.
Delivery time on request.

Specification recommendations for regulating wheels

Standard recommendations

Application	Specification	Note
Centerless through feed grinding	CRA 100-BR60	Resin-bonded
Plunge cut grinding	CRA 100-BR63	Resin-bonded
Centerless through feed grinding	NK120 R1150	Rubber-bonded
Centerless through feed grinding	NK180 R1150	Rubber-bonded, wear-resistant

Finer grit sizes, 120, 150, 180 and 220, are available for special applications.

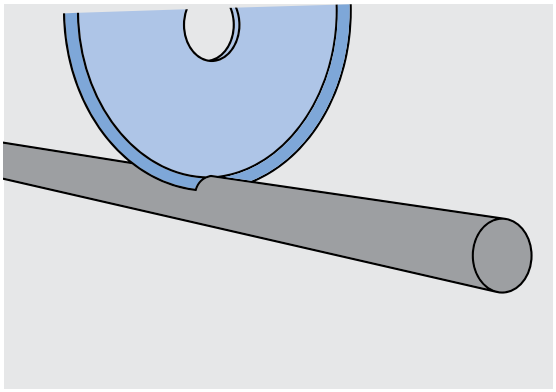
Further recommendations

Application	Specification
Regulating/drive wheel for abrasive belts	A240-BE19F
Soft regulating wheel, also for non-metallic workpieces	A80-BE41
Ceramic regulating wheel for special applications	10A809Q2AV56

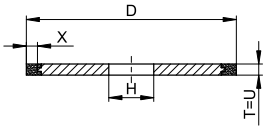
In order to achieve an optimum grinding process, the TYROLIT application engineers support you in defining your individual grinding solution.

1.2 Cut-Off Grinding
of tungsten carbide blanks

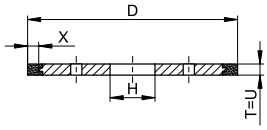
Shaft tools are often manufactured from standardised tungsten carbide blanks. These must be shortened to the individual tool length. The cut-off wheels from TYROLIT impress with cool cutting and optimum wear resistance.



Stock range



Shape 1A1R



Shape 1A1RH

	Shape	Type number	D	T	H	U	X	Specification	Stock	Note
	1A1R	157800	75	0.8	20	0.8	5	D126C75B	●	
		299109	75	1	20	1	5	D151C75B	●	
		119395	100	0.8	20	0.8	5	D126C100B	●	
		100660	100	1	20	1	5	D126C100B	●	
		101000	125	1	20	1	5	D126C100B	●	
		148132	150	1	20	1	5	D126C100B	●	
		278979	150	1	20	1	5	D151C100B	●	
		175978	150	1	20	1	7	D151C100B	●	
		667995	200	1	22	1	5	D126C100B	●	For Ihle machine
		858531	200	1.2	20	1.2	7	D126C100B	●	
		610217	300	1.5	40	1.5	7	D151C75B	●	For P+S machine
	1A1RH	603284	200	1.2	30	1.2	7	D151C100B	●	For Wimmer machine
		708153	250	1.2	30	1.2	5	D151C100B	●	For Wimmer machine

● *... Available ex stock*

Standard range

	Shape	Type number	D	T	H	U	X	Specification	Note
	1A1R	618209	75	0.8	10	0.8	5	D126C100B	For EWAG WS11 machine
		327616	200	1.2	20	1.2	7	D126C100B	
		145778	200	1.2	22	1.2	7	D126C100B	For Ihle machine
		412224	250	1.2	20	1.2	5	D126C100B	
		403700	300	1.5	20	1.5	7	D126C100B	
		377940	300	1.5	32	1.5	5	D126C100B	
	1A1RH	187992	150	1	30	1	5	D126C100B	For Wimmer machine

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
TYROLIT cut-off wheels can be used in as delivered condition, without dressing.

b. Application recommendation for cut-off grinding
For the use of our cut-off wheels, the TYROLIT application engineers recommend the following parameters:

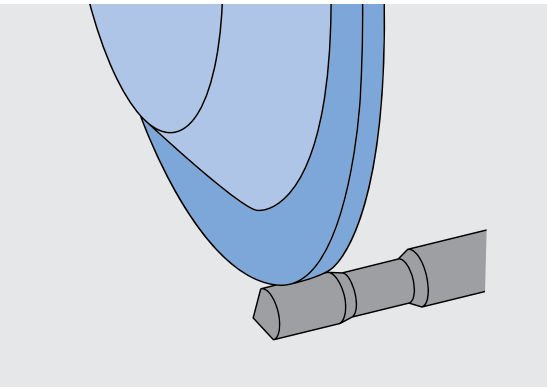
Cutting speed vc [m/s]	Feed vt [mm/min]	Cooling
22 - 25	6 - 60	Required

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping.
Please observe the safety information on page 156.

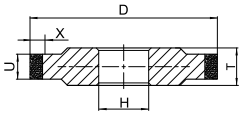
1.3 STARTEC PG
Grinding tools for high-speed external cylindrical longitudinal grinding

With the STARTEC PG-1 and PG-2 product lines TYROLIT is offering roughing and finishing wheels for the peel grinding of tungsten carbide tool blanks.

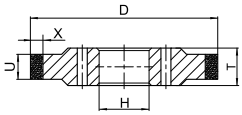
A high-strength metal bond is used for the roughing wheel. This enables especially cost-effective and reliable process control. Long-life ceramic or metal bonds are used for the finishing wheel. This enables even large stock removal fluctuations to be compensated after roughing, and maximum surface quality to be achieved.



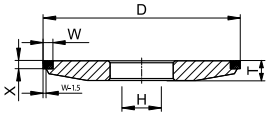
Stock range



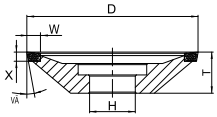
Shape 14A1



Shape 14A1H



Shape 4B9P



Shape 12B9

Reinecker SF40

	Shape	Type number	D	T	H	U	X	Specification	vmax	Stock	Note
	14A1	34077044	350	18	127	5	6	STARTEC PG-1 D91MPG-1	140	●	Rough grinding wheel
		34256478	350	18	127	5	6	STARETC PG-2 D91MPG-2	140	●	Rough grinding wheel with vibration-reducing core

Reinecker RS500/RS700

	Shape	Type number	D	T	H	U	X	Specification for TC	vmax	Stock	Note
	14A1	34077044	350	18	127	5	6	STARTEC PG-1 D91MPG-1	140	●	Rough grinding wheel
		34025539	350	18	127	5	5	STARTEC PG-1 D46VPG-1	125	●	Vitrified bonded finishing wheel
		34256478	350	18	127	5	6	STARTEC PG-2 D91MPG-2	140	●	Rough grinding wheel with vibration-reducing core
		34328732	350	18	127	5	6	STARTEC PG-2 D46MPG-2	140	●	Rough grinding wheel with vibration-reducing core

Junker Quickpoint

	Shape	Type number	D	T	H	U	X	Specification for TC	vmax	Stock	Note
	14A1	34164238	350	18	126.94	5	6	STARTEC PG-1 D54MPG-1	140	●	JUNKER standard bore ring, central
		34326555	350	18	126,94	5	6	STARTEC PG-2 D54M PG-2	140	●	JUNKER standard bore ring, central, vibration-reducing core
		34164236	350	25	126.94	5	6	STARTEC PG-1 D54MPG-1	140	●	JUNKER standard bore ring, plane-side coating
		34292633	350	18	126,94	5	6	STARTEC PG-2 D54M PG-2	140	●	JUNKER standard bore ring, central, vibration-reducing core

Rollomatic NP3/NP4/NP5

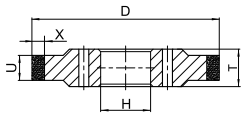
	Shape	Type number	D	T	H	W	X	V°	Specification for TC	vmax	Stock	Note
	4B9P	34077270	200	20	31.75	5	6	11	STARTEC PG-1 D91MPG-1	80	●	Rough grinding wheel
		34328739	200	20	31,75	5	6	11	STARTEC PG-2 D91M PG-2	80	●	Rough grinding wheel, increased stability
		34434791	200	20	20	6	6	30	STARTEC PG-2 D91MPG-2	80	●	D91 rough grinding wheel for tool d ≥ 3 mm, core steel/aluminum, increased stability
		34159731	250	20	31.75	5	6	11	STARTEC PG-1 D64MPG-1	80	●	D64 rough grinding wheel for tool d < 3 mm
		34330987	250	20	31,75	5	6	11	STARTEC PG-2 D64M PG-2	80	●	D64 rough grinding wheel for tool d < 3 mm, increased stability
		34058513	250	20	31.75	5	6	11	STARTEC PG-1 D91MPG-1	80	●	D91 rough grinding wheel for tool d ≥ 3 mm
		34281090	250	20	31,75	5	6	11	STARTEC PG-2 D91M PG-2	80	●	D91 rough grinding wheel for tool d < 3 mm, increased stability
	12B9	34181642	150	24	31.75	6	3	10	STARTEC PG-1 D15BPG-1	63	●	D15 resin-bonded grinding wheel
		34024068	150	24	31.75	6	3	10	STARTEC PG-1 D25VPG-1	80	●	Vitrified bonded finishing wheel
		142891	150	24	31.75	6	3	10	STARTEC PG-1 D46VPG-1	80	●	Vitrified bonded finishing wheel

● ... Available ex stock

ANCA CPX

	Shape	Type number	D	T	H	W	X	V°	Specification for TC	vmax	Stock	Note
	4B9P	34330987	250	20	31,75	5	6	11	STARTEC PG-2 D64M PG-2	80	●	D64 rough grinding wheel for tool d < 3 mm, increased stability
		34281090	250	20	31,75	5	6	11	STARTEC PG-2 D91M PG-2	80	●	D91 rough grinding wheel for tool d ≥ 3 mm, increased stability

Standard range



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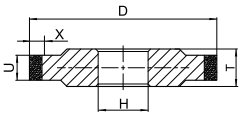

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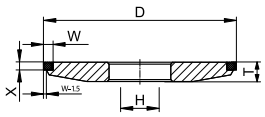

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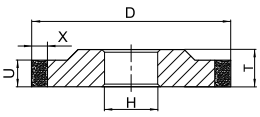
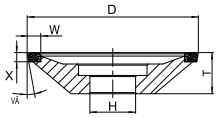


Shape 3A1



Shape 12B9

Reinecker SF40

	Shape	Type number	D	T	H	U	X	Specification	vmax	Note
	14A1H	34043145	250	18	90	5	5	STARTEC PG-1 D46MPG-1	140	Metal-bonded finishing wheel
		34289164	250	18	90	5	5	STARTEC PG-2 D46MPG-2	140	Metal-bonded finishing wheel, increased stability

Reineker RS500/RS700/RS800

	Shape	Type number	D	T	H	U	X	Specification for TC	vmax	Note
	14A1	34164191	350	18	127	5	6	STARTEC PG-1 D46MPG-1	140	Metal-bonded finishing wheel
	14D1R	34580693	400	23	127	5	5	STARTEC PG-1 D91C180M	140	Metal-bonded rough grinding wheel for RS800
	14B1P	34580241	400	23	127	5	5	STARTEC PG-1 D39C150V	140	Vitrified-bonded finishing wheel for RS800

Junker Quickpoint

	Shape	Type number	D	T	H	U	X	Specification for TC	vmax	Note
	14A1	34289121	350	12	126,94	5	6	STARTEC PG-2 D54MPG-2	140	JUNKER standard bore ring, central, increased stability
		34164239	350	18	126.94	5	6	STARTEC PG-1 D54MPG-1	140	JUNKER standard bore ring, plane-side coating
		34328736	350	18	126,94	5	6	STARTEC PG-2 D54MPG-2	140	JUNKER standard bore ring, plane-side coating, increased stability

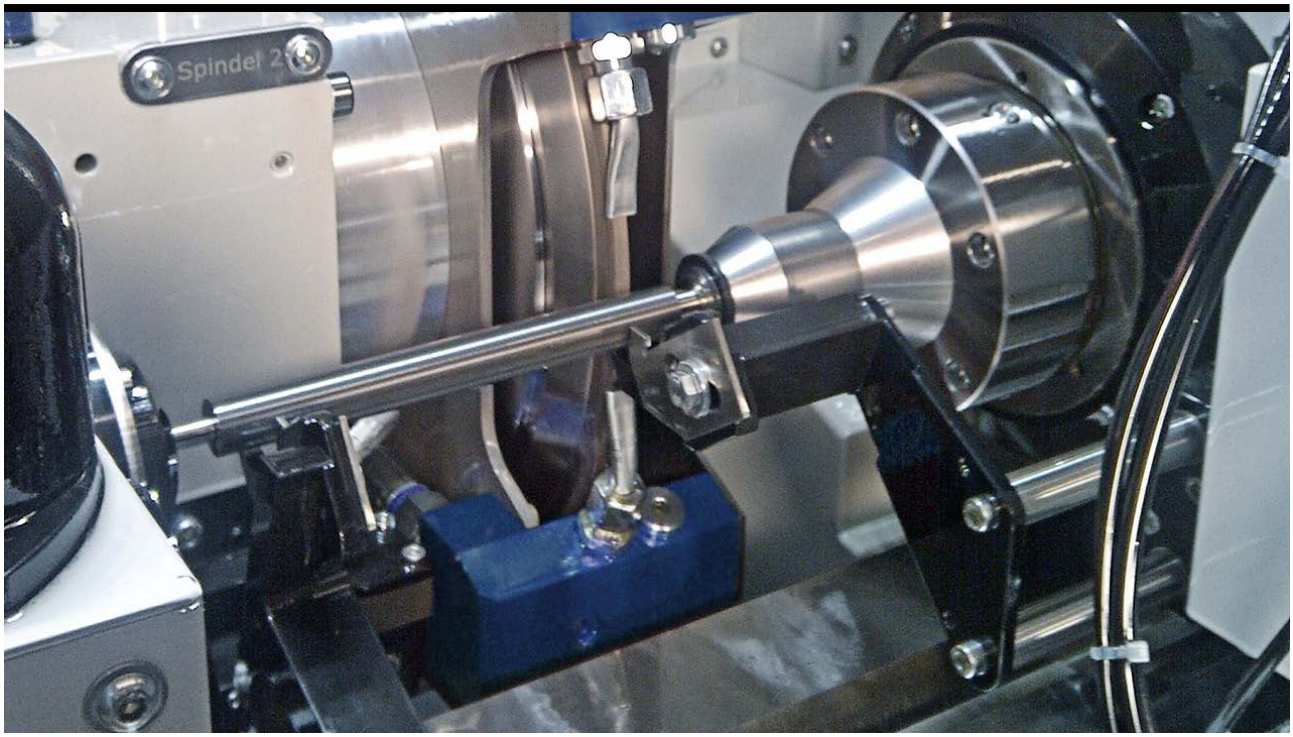
Rollomatic NP3/NP4/NP5

	Shape	Type number	D	T	H	U	X	V°	Specification for TC	vmax	Note
	4B9P	34427220	250	20	31,75	5	6	0	STARTEC PG-2 D91MPG-2	80	D91 rough grinding wheel without setting angle (ANCA CPX)
		34427466	250	20	31,75	5	6	0	STARTEC PG-2 D91MPG-2	80	D64 rough grinding wheel without setting angle (ANCA CPX, finishing)
		34180315	250	20	31.75	5	6	11	STARTEC PG-1 D54MPG-1	80	D54 rough grinding wheel for tool d< 3 mm
		34308603	250	20	31,75	5	6	11	STARTEC PG-2 D54MPG-2	80	D54 rough grinding wheel for tool d < 3 mm, increased stability
		34199403	250	20	31,75	5	6	11	STARTEC PG-1 D91MPG-1	80	D91 rough grinding wheel for tool d ≥ 3 mm, core steel/ aluminum
		34330965	250	20	31,75	5	6	11	STARTEC PG-2 D91MPG-2	80	D91 rough grinding wheel for tool d ≥ 3 mm, core steel/ aluminum new
	12B9	34052953	150	24	31.75	6	3	10	STARTEC PG-1 D20BPG-1	63	D20 resin-bonded grinding wheel
		34024511	150	24	31.75	6	3	10	STARTEC PG-1 D35VPG-1	80	Vitrified bonded finishing wheel

Standard CNC machines

	Shape	Type number	D	T	H	U	X	V°	Specification for TC	vmax	Note
	3A1	34467419	150	15	20	5	5		D54C125M774ST		Rough grinding wheel / finishing wheel (STD grinding machine)

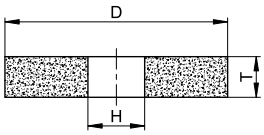
Customer-specific grinding tools can be produced on request.
Delivery times on request.



Application recommendation

a. Application recommendation for dressing

Specially adapted dressing wheels are available ex stock for dressing the grinding wheels.



Shape 1

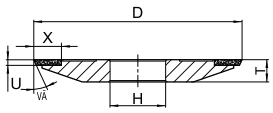
Dressing wheels

	Shape	Type number	D	T	H	Specification	Stock	Note
	1	746089	140	20	20	C80 J5 V 15		Dressing on SF40
		7348	200	20	20	C80 J5 V15	●	Dressing D91 rough grinding wheel in the machine
		34163206	200	20	20	C120 J5 V15	●	External dressing of wheel in D54/D46
		619701	250	12	51	C80 J5 V15	●	External dressing of rough grinding wheel in D91
		889495	250	12	51	C120 J5 V15	●	External dressing of wheel in D54/D46
		631579	250	12	51	C240 H5 AV18	●	External dressing of finishing wheel in D46
		34047880	300	10	76.2	C80 J5 V15	●	External dressing of rough grinding wheel in D91
		34066742	300	10	76.2	C120 J5 V15	●	External dressing of rough grinding wheel in D54/D46
		57814	300	10	76.2	C240 H5 AV18	●	External dressing of finishing wheel in D46

Recommended dressing parameters for grinding wheels with metal bond

Dressing process	Grinding wheel cutting speed vc [m/s]	Dressing wheel cutting speed vc [m/s]	Infeed/ stroke ae [mm]	Feed vt [mm/min]	Grinding direction		Recommended specification	Note
					Forward	Reverse		
In the machine	10 - 12	22 - 24	0.033	800		x	C80 for D54 to D91 rough grinding wheels C120 for D46 finishing wheels	Rough dressing, approx. 60 strokes
			0.01	575	x			Fine dressing, approx. 30 strokes
External on dressing machine	3 - 5	22 - 24	0.033	according to machine		x	C80 for D54 to D91 rough grinding wheels C120 for D46 finishing wheels	Rough dressing, approx. 60 strokes
			0.01	according to machine	x		C80 for D54 to D91 rough grinding wheels C120 for D46 finishing wheels	Fine dressing, approx. 30 strokes

Vitrified bonded grinding wheels can only be cost-effectively dressed using diamond dressing wheels.



Shape 3A2H

Diamond dressing wheels for Reinecker machines

	Shape	Type number	D	T	H	W	Specification	Note
	3A2H	34037195	140	7.5	75	5	D426XG RPX	Dressing of ceramic wheel
		34033080	175	11	110	5	D426XG RPX	Dressing of ceramic wheel, mounting on C-axis

Recommended dressing parameters for grinding wheels with vitrified bond

Dressing process	Grinding wheel cutting speed vc [m/s]	Dressing wheel cutting speed vc [m/s]	Infeed/ stroke ae [mm]	Feed vt [mm/min]	Grinding direction		Recommended specification	Note
					Forward	Reverse		
In the machine	24 - 26	20 - 22	0.003	220 - 230	x		D426 XG RPX	Approx. 30 strokes

b. Application recommendation for peel grinding

For the use of our grinding wheels, the TYROLIT application engineers recommend the following parameters:

Reineker SF40

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0,5 - 0,7	7 - 10	100 - 160		x	Required	Workpiece RPM dependent on diameter
Finish grinding	90 - 105	0,02 - 0,04	15 - 35	40 - 70		x	Required	Workpiece RPM dependent on diameter

Reinecker RS500/RS700/RS800

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0.5 - 0.7	7 - 10	100 - 160		x	Required	Workpiece RPM dependent on diameter
Finish grinding	90 - 105	0.02 - 0.04	7 - 10	40 - 70		x	Required	Workpiece RPM dependent on diameter

Junker Quickpoint

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0.1 - 1.0	6 - 8	80 - 90		x	Required	Workpiece RPM dependent on diameter

Rollomatic NP3, NP4, NP5

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	60 - 90	0.1 - 0.2	7 - 12	12 - 24		x	Required	Workpiece RPM dependent on diameter
Finish grinding	40 - 60	0.02 - 0.04	7 - 12	12 - 24		x	Required	Workpiece RPM dependent on diameter

ANCA CPX

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	60 - 100	1 - 4		15 - 35		x	Required	Workpiece RPM dependent on diameter
Finish grinding	40 - 80	0,02 - 0,04		15 - 35		x	Required	Workpiece RPM dependent on diameter

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

Recommended dressing parameters for metal-bonded wheels

Dressing process	Cutting speed vc [m/s]	Cutting speed dressing wheel vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/ min]	Grinding direction		Specification recommendation	Note
					Forward	Reverse		
In the machine	10 - 12	22 - 24	0,033	800		x	C80 for D54 to D91 rough grinding wheels C120 for D46 finishing wheels	Rough dressing, approx. 60 strokes
			0,01	575	x			Fine dressing, approx. 30 strokes
In the external dressing machine	3 - 5	22 - 24	0,033			x	C80 for D54 to D91 rough grinding wheels C120 for D46 finishing wheels	Rough dressing, approx. 60 strokes
			0,01		x			Fine dressing, approx. 30 strokes

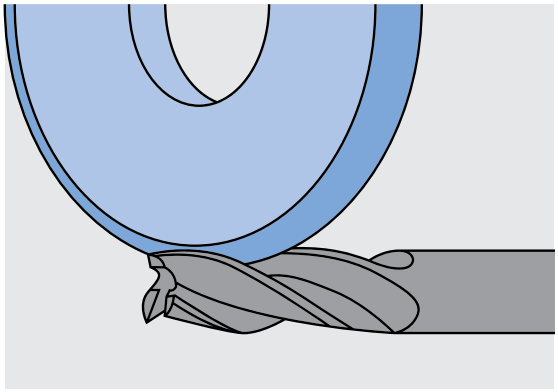
Recommended dressing parameters for ceramic-bonded wheels

Dressing process	Cutting speed vc [m/s]	Cutting speed dressing wheel vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/ min]	Grinding direction		Specification recommendation	Note
					Forward	Reverse		
in der Maschine	24 - 26	20 - 22	0,003	220 - 230	x		D426 XG RPX	Approx. 30 strokes

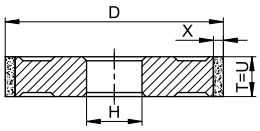
1.4 STARTEC XP-P
Grinding tools for flute grinding

The high quality requirements for high-tech tungsten carbide stock removal tools and the sustained cost pressure require the efficient use of state-of-the-art CNC tool grinding machines. In order to fully exploit the advantages of CNC tool grinding machines, an innovative grinding tool is required.

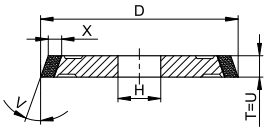
The STARTEC XP-P line now offers improved profile retention and low power consumption. State-of-the-art raw material combinations and tried and tested production sequences ensure optimum tool quality for our customers.



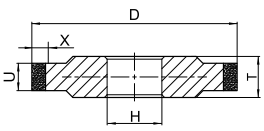
Stock range



Shape 1A1



Shape 1V1



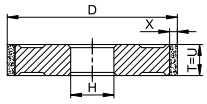
Shape 14A1

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	736474	50	6	20	6	6		STARTEC XP-P D54-3-MXPP	●
		742350	50	10	20	10	6		STARTEC XP-P D54-3-MXPP	●
		679931	75	6	20	6	6		STARTEC-XP-P D54-3-MXPP	●
		662236	75	6	20	6	10		STARTEC-XP-P D54-3-MXPP	●
		719821	75	8	20	8	10		STARTEC-XP-P D54-3-MXPP	●
		679936	75	10	20	10	6		STARTEC-XP-P D54-3-MXPP	●
		742939	75	10	20	10	10		STARTEC-XP-P D54-3-MXPP	●
		747789	75	15	20	15	10		STARTEC XP-P D54-3-MXPP	●
		679938	100	6	20	6	6		STARTEC-XP-P D54-3-MXPP	●
		695084	100	6	20	6	10		STARTEC-XP-P D54-3-MXPP	●
		7012761	100	8	20	8	10		STARTEC XP-P D54-3-MXPP	●
		679939	100	10	20	10	6		STARTEC-XP-P D54-3-MXPP	●
		682530	100	10	20	10	10		STARTEC-XP-P D54-3-MXPP	●
		694995	100	10	31.75	10	6		STARTEC-XP-P D54-3-MXPP	●
		711619	100	10	31.75	10	10		STARTEC-XP-P D54-3-MXPP	●
		679940	100	12	20	12	6		STARTEC-XP-P D54-3-MXPP	●
		700297	100	12	20	12	10		STARTEC-XP-P D54-3-MXPP	●
		760411	100	12	20	12	15		STARTEC XP-P D54-3-MXPP	●
		685346	100	12	31.75	12	6		STARTEC-XP-P D54-3-MXPP	●
		724476	100	12	31.75	12	10		STARTEC-XP-P D54-3-MXPP	●

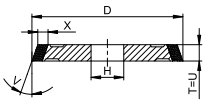
Shape	Type number	D	T	H	U	X	V°	Specification	Stock
1A1	679942	100	15	20	15	6		STARTEC-XP-P D54-3-MXPP	●
	675436	100	15	20	15	10		STARTEC-XP-P D54-3-MXPP	●
	679945	125	6	20	6	6		STARTEC-XP-P D54-3-MXPP	●
	686906	125	6	20	6	10		STARTEC-XP-P D54-3-MXPP	●
	679947	125	10	20	10	6		STARTEC-XP-P D54-3-MXPP	●
	682527	125	10	20	10	10		STARTEC-XP-P D54-3-MXPP	●
	702678	125	10	31.75	10	6		STARTEC-XP-P D54-3-MXPP	●
	685975	125	10	31.75	10	10		STARTEC-XP-P D54-3-MXPP	●
	679948	125	12	20	12	6		STARTEC-XP-P D54-3-MXPP	●
	682529	125	12	20	12	10		STARTEC-XP-P D54-3-MXPP	●
	34305356	125	12	20	12	15		STARTEC XP-P D54-3-MXPP	●
	712482	125	12	31.75	12	6		STARTEC-XP-P D54-3-MXPP	●
	711866	125	12	31.75	12	10		STARTEC-XP-P D54-3-MXPP	●
	679949	125	15	20	15	6		STARTEC-XP-P D54-3-MXPP	●
	683963	125	15	20	15	10		STARTEC-XP-P D54-3-MXPP	●
	684827	150	8	20	8	10		STARTEC-XP-P D54-3-MXPP	●
	679951	150	10	20	10	10		STARTEC-XP-P D54-3-MXPP	●
	679952	150	12	20	12	10		STARTEC-XP-P D54-3-MXPP	●
	679953	150	15	20	15	10		STARTEC-XP-P D54-3-MXPP	●
1V1	680097	75	6	20	6	6	15	STARTEC-XP-P D54-3-MXPP	●
	680098	75	8	20	8	10	15	STARTEC-XP-P D54-3-MXPP	●
	680099	75	10	20	10	10	15	STARTEC-XP-P D54-3-MXPP	●
	680100	100	6	20	6	10	15	STARTEC-XP-P D54-3-MXPP	●
	680102	100	10	20	10	10	15	STARTEC-XP-P D54-3-MXPP	●
	701700	100	10	20	10	10	20	STARTEC-XP-P D54-3-MXPP	●
	680104	100	12	20	12	10	15	STARTEC-XP-P D54-3-MXPP	●
	694778	100	12	20	12	10	20	STARTEC-XP-P D54-3-MXPP	●
	694777	100	12	20	12	10	30	STARTEC-XP-P D54-3-MXPP	●
	680107	100	12	20	12	10	45	STARTEC-XP-P D54-3-MXPP	●
	680110	100	15	20	15	10	15	STARTEC-XP-P D54-3-MXPP	●
	680112	125	6	20	6	10	15	STARTEC-XP-P D54-3-MXPP	●
	680114	125	10	20	10	10	15	STARTEC-XP-P D54-3-MXPP	●
	688961	125	10	20	10	10	20	STARTEC-XP-P D54-3-MXPP	●
	680115	125	10	20	10	10	45	STARTEC-XP-P D54-3-MXPP	●
	680116	125	12	20	12	10	15	STARTEC-XP-P D54-3-MXPP	●
	712126	125	12	20	12	10	30	STARTEC-XP-P D54-3-MXPP	●
	680118	125	12	20	12	10	45	STARTEC-XP-P D54-3-MXPP	●
	680120	125	15	20	15	10	15	STARTEC-XP-P D54-3-MXPP	●
	680123	150	10	20	10	10	10	STARTEC-XP-P D54-3-MXPP	●
	680124	150	12	20	12	10	10	STARTEC-XP-P D54-3-MXPP	●
14A1	680140	75	8	20	4	6		STARTEC-XP-P D54-3-MXPP	●
	680138	100	6	20	4	6		STARTEC-XP-P D54-3-MXPP	●
	680137	125	6	20	4	6		STARTEC-XP-P D54-3-MXPP	●

● *... Available ex stock*

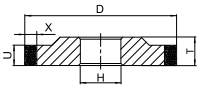
Standard range



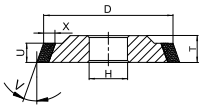
Shape 1A1



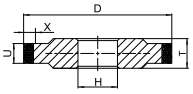
Shape 1V1



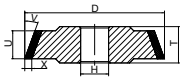
Shape 3A1



Shape 3V1



Shape 14A1



Shape 14V1

	Shape	D	T	U	X	V°
	1A1	50		5 – 15	6,10	
		75		5 - 18.	6,10	
		100		5 – 20	6, 10, 15	
		125		5 – 20	6, 10, 15	
		150		5 – 25	6, 10, 15	
		200		6 – 25	6, 10, 15	
	1V1	75		6 – 18	6, 10	
		100		6 – 20	6, 10	
		125		6 – 20	6, 10	≤ 45°
		150		6 – 18	6, 10, 15	
		200		10 – 20	6, 10	
	3A1 14A1	75		3 - 8	6, 10	
		100	3A1: T=U+3 mm	3 - 8	6, 10	
		125		3 - 8	6, 10, 15	
		150	14A1: T=U+6 mm	3 - 10	6, 10, 15	
		200		6 -12	10, 15	
	3V1 14V1	75		4 - 6	6	
		100	3A1: T=U+3 mm	4 - 8	6, 10	
		125		4 - 8	6, 10	≤ 45°
		150	14A1: T=U+6 mm	6 - 15	6, 10	
		200		6 -12	10	

Standard assortment

Grain	Grain size	Concentration	Bond	Note
D	17 – 34	3	MXPP	Fine grain
D	39 – 181	3, 4	MXPP	

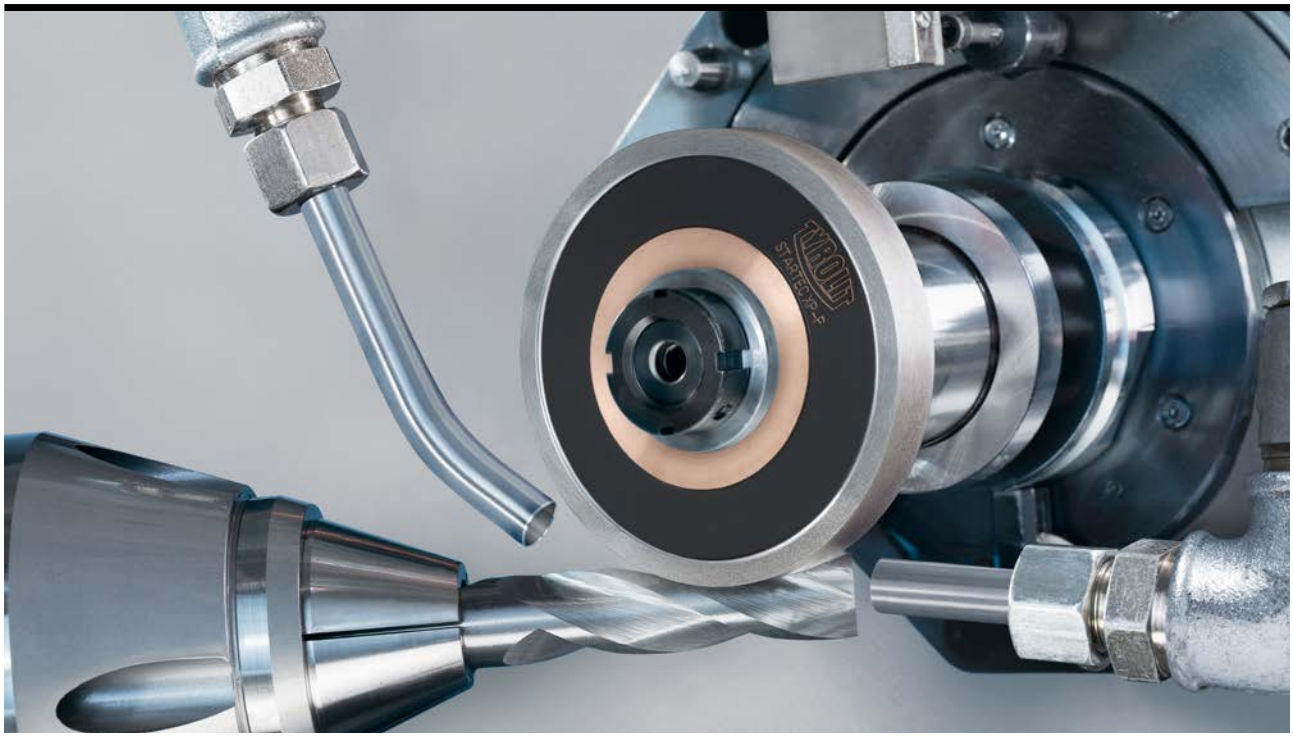
Standard specification: D54-3-MXPP

Concentration selection

3 = medium concentration (standard)
4 = high concentration

Bond selection

MXPP = standard metal bonding



Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition.

Find our dressing wheels assortment on page 112

b. Application recommendation for flute grinding
For the use of our STARTEC XP-P flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

Flute grinding with diamond grinding wheels STARTEC XP-P

Grinding process	Cutting speed vc [m/s]		Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Flute grinding	Rough grinding Finishing	16 - 22 22 - 27	see table 0,2 - 0,7	see table 150 - 200	x		Required	
Face grinding	18 - 25		Full depth	25 - 80	x		Required	Shape 1V1

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC XP-P flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

		Q'w [mm3/s.mm]	
Product line	**vc [m/s]**	**Standard**	**TOP PERFORMANCE**
STARTEC XP-P	16-22	3 to 6	7 to 9

Feed vt [mm/min]

Profile depth ae [mm]	30	40	50	60	70	80	100	120	140	160	180	200	220
2.6								5.2	**6.1**	**6.9**	**7.8**	**8.7**	9.5
2.8								5.6	**6.5**	**7.5**	**8.4**	**9.3**	10.3
3.0							5.0	**6.0**	**7.0**	**8.0**	**9.0**	10.0	
3.2							5.3	**6.4**	**7.5**	**8.5**	**9.6**	10.7	
3.4							5.7	**6.8**	**7.9**	**9.1**	**10.2**	11.3	
3.6						4.8	**6.0**	**7.2**	**8.4**	**9.6**	10.8		
3.8						5.1	**6.3**	**7.6**	**8.9**	**10.1**	11.4		
4.0						5.3	**6.7**	**8.0**	**9.3**	**10.7**	12.0		
4.2					4.9	**5.6**	**7.0**	**8.4**	**9.8**	11.2			
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					
6.0			5.0	**6.0**	**7.0**	**8.0**	**10.0**	12.0					
6.5		4.3	**5.4**	**6.5**	**7.6**	**8.7**	10.8						
7.0		4.7	**5.8**	**7.0**	**8.2**	**9.3**	11.7						
7.5	3.8	**5.0**	**6.3**	**7.5**	**8.8**	10.0							
8.0	4.0	**5.3**	**6.7**	**8.0**	**9.3**	10.7							
8.5	4.3	**5.7**	**7.1**	**8.5**	**9.9**	11.3							

Calculation of values

Q'w = ae x vt / 60
vt = Q'w x 60 / ae

vt standard STARTEC XP-P

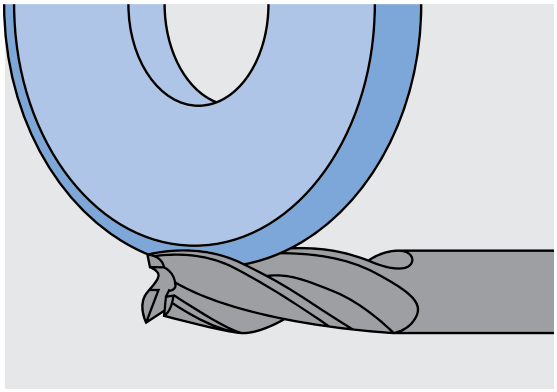
vt optimisation potential

Resin-bonded diamond grinding wheels for flute grinding are listed in Chapter 4.1.

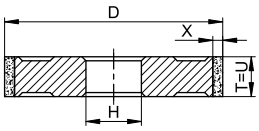
1.5 STARTEC RC
Grinding tools for flute grinding

Tyrolit is setting new standards in high performance flute grinding with the STARTEC RC product line. The new specifications feature impressively low grinding forces and maximum stock removal rates with little profile wear.

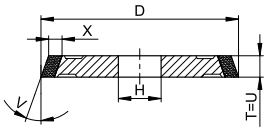
The STARTEC RC grinding tools guarantee maximum precision for your tools and an optimum surface finish. This is all down to a tailored diamond quality, a new bond system and innovative production processes.



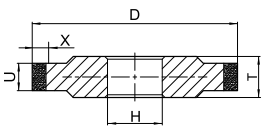
Stock range



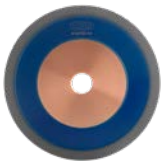
Shape 1A1

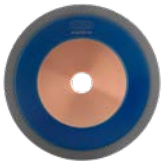


Shape 1V1



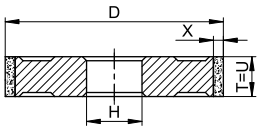
Shape 14A1

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	34263891	75	6	20	6	10		STARTEC RC D54-28-M-1	●
		34263892	75	8	20	8	10		STARTEC RC D54-28-M-1	●
		34263894	75	10	20	10	10		STARTEC RC D54-28-M-1	●
		34263898	100	6	20	6	10		STARTEC RC D54-28-M-1	●
		34266405	100	8	20	8	10		STARTEC RC D54-28-M-1	●
		34257797	100	10	20	10	10		STARTEC RC D54-28-M-1	●
		34264111	100	10	31,75	10	10		STARTEC RC D54-28-M-1	●
		34264115	100	12	20	12	10		STARTEC RC D54-28-M-1	●
		34264159	100	12	31,75	12	10		STARTEC RC D54-28-M-1	●
		34241206	100	15	20	15	10		STARTEC RC D54-28-M-1	●
		34264172	125	6	20	6	10		STARTEC RC D54-28-M-1	●
		34266407	125	8	20	8	10		STARTEC RC D54-28-M-1	●
		34266850	125	10	20	10	10		STARTEC RC D54-28-M-1	●
		34264180	125	10	31,75	10	10		STARTEC RC D54-28-M-1	●
		34264195	125	12	20	12	10		STARTEC RC D54-28-M-1	●
		34264198	125	12	31,75	12	10		STARTEC RC D54-28-M-1	●
		34249863	125	15	20	15	10		STARTEC RC D54-28-M-1	●
		34264210	150	8	20	8	10		STARTEC RC D54-28-M-1	●
		34256267	150	10	20	10	10		STARTEC RC D54-28-M-1	●

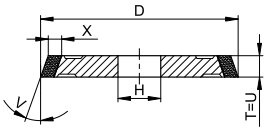
	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	34264213	150	12	20	12	10		STARTEC RC D54-28-M-1	●
		34264216	150	15	20	15	10		STARTEC RC D54-28-M-1	●
	1V1	34264485	100	6	20	6	10	15	STARTEC RC D54-28-M-1	●
		34264494	100	10	20	10	10	15	STARTEC RC D54-28-M-1	●
		34340986	100	12	20	12	15	15	STARTEC RC D54-28-M-1	●
		34264772	125	10	20	10	10	15	STARTEC RC D54-28-M-1	●
		34340987	125	12	20	12	15	15	STARTEC RC D54-28-M-1	●
		34241339	125	15	20	15	10	15	STARTEC RC D54-28-M-1	●
		34264818	150	10	20	10	10	10	STARTEC RC D54-28-M-1	●
		34264823	150	12	20	12	10	10	STARTEC RC D54-28-M-1	●
	14A1	34264849	75	6	20	4	6		STARTEC RC D54-28-M-1	●
		34266308	100	6	20	4	6		STARTEC RC D54-28-M-1	●
		34266361	125	6	20	4	6		STARTEC RC D54-28-M-1	●

● … *Available ex stock*

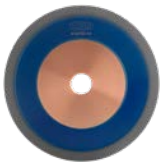
Standard range



Shape 1A1



Shape 1V1

	Shape	D	T	X	V°
	1A1	75	5 - 18	6, 10	
		100	5 – 20	6, 10, 15	
		125	5 – 20	6, 10, 15	
		150	5 – 18	6, 10, 15	
		200	10 – 15	6, 10, 15	
	1V1	75	6 – 18	6, 10	
		100	6 – 20	6, 10	
		125	6 – 20	6, 10	≤ 45°
		150	6 – 18	6, 10, 15	
		200	10 – 20	6, 10	

Standard assortment

Grain	Grain size	Concentration	Bond	Note
D	39 – 126	16, 28, 29, 3	M1-RC	
D	39 – 91	29, 3	M2-RC	

Standard specification: **D54-28-M1-RC**

Concentration selection

16 = lowest concentration
28 = very low concentration (standard)
29 = low concentration
3 = medium concentration

Bond selection

M1-RC = Standard metal bonding
M2-RC = more wear-resistant than standard

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition.
ATTENTION: Exert only slight pressure when sharpening the STARTEC RC grinding tools!

Find our dressing wheels assortment on page 112

b. Application recommendation for flute grinding

For the use of our STARTEC RC flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

Flute grinding with diamond grinding wheels STARTEC RC

Dressing process	Cutting speed vc [m/s]	Infeed ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Flute grinding	16 - 22	see Q'w table		x		Required	

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC RC flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the chip flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

Product line	vc [m/s]	Q'w [mm3/s.mm]	
		Standard	TOP PERFORMANCE
STARTEC RC	16-22	6 to 8	9 to 12

Feed vt [mm/min]

Profile depth ae [mm]	50	60	70	80	100	120	140	160	180	200	220	240	250
2,6								6,9	**7,8**	**8,7**	**9,5**	**10,4**	10,8
2,8								7,5	**8,4**	**9,3**	**10,3**	**11,2**	11,7
3,0							7,0	**8,0**	**9,0**	**10,0**	**11,0**	12,0	
3,2							7,5	**8,5**	**9,6**	**10,7**	**11,7**	12,8	
3,4							7,9	**9,1**	**10,2**	**11,3**	**12,5**	13,6	
3,6						7,2	**8,4**	**9,6**	**10,8**	**12,0**	13,2		
3,8						7,6	**8,9**	**10,1**	**11,4**	**12,7**	13,9		
4,0						8,0	**9,3**	**10,7**	**12,0**	**13,3**	14,7		
4,2					7,0	**8,4**	**9,8**	**11,2**	**12,6**	14,0			
4,4					7,3	**8,8**	**10,3**	**11,7**	**13,2**	14,7			
4,6				6,1	**7,7**	**9,2**	**10,7**	**12,3**	13,8				
4,8				6,4	**8,0**	**9,6**	**11,2**	**12,8**	14,4				
5,0				6,7	**8,3**	**10,0**	**11,7**	**13,3**	15,0				
5,5			6,4	**7,3**	**9,2**	**11,0**	**12,8**	14,7					
6,0			7,0	**8,0**	**10,0**	**12,0**	**14,0**	16,0					
6,5		6,5	**7,6**	**8,7**	**10,8**	**13,0**	15,2						
7,0		7,0	**8,2**	**9,3**	**11,7**	**14,0**	16,3						
7,5	6,3	**7,5**	**8,8**	**10,0**	**12,5**	15,0							
8,0	6,7	**8,0**	**9,3**	**10,7**	**13,3**	16,0							
8,5	7,1	**8,5**	**9,9**	**11,3**	**14,2**	17,0							

Calculation of values

Q'w = ae x vt / 60
vt = Q'w x 60 / ae

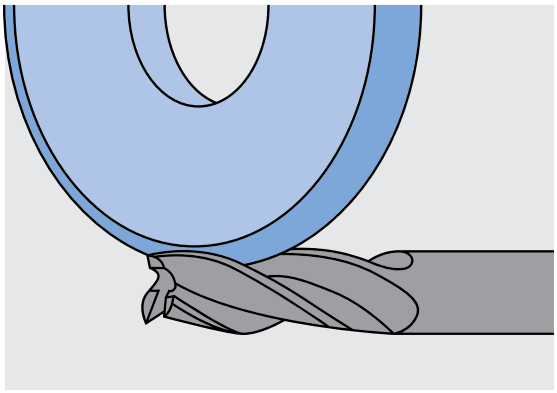
vt standard STARTEC RC

vt optimisation potential

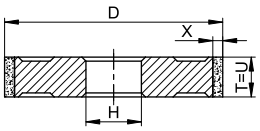
Resin-bonded diamond grinding wheels for flute grinding are listed in Chapter 3.1.

1.6 STARTEC XP-P+
Grinding tools for flute grinding

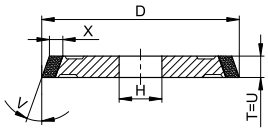
With the STARTEC XP-P+ product line, TYROLIT defines a new performance level for the flute grinding of tungsten carbide cutting tools. The diamond quality specially designed for high cutting performance combined with an innovative bond structure leads to a significant reduction of grinding forces while keeping high profile retention. The precision of the machined tools remains at the usual high level.



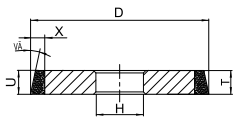
Stock range



Shape 1A1



Shape 1V1

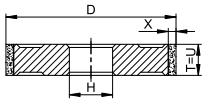


Shape 1B1

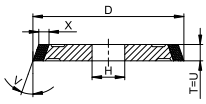
	Shape	Type number	D	T	H	U	X	Specification	Stock
	1A1	34340118	75	6	20	6	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34313779	75	8	20	8	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34236951	75	10	20	10	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34236953	100	6	20	6	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34340119	100	8	20	8	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34200198	100	10	20	10	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34200149	100	10	20	10	15	STARTEC XP-P+ DC54-4-MXPP+	●
		34225156	100	15	20	15	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34238222	125	8	20	8	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34202047	125	10	20	10	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34236955	125	12	20	12	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34188415	125	15	20	15	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34201930	150	8	20	8	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34214456	150	10	20	10	10	STARTEC XP-P+ DC54-4-MXPP+	●
		34216673	150	15	20	15	10	STARTEC XP-P+ DC54-4-MXPP+	●

Shape	Type number	D	T	H	U	X	V	Specification	Stock	Note
1V1	34340355	75	8	20	8	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
	34340356	75	10	20	10	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540466	100	6	20	6	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
	34236956	100	8	20	8	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34340357	100	10	20	10	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540467	100	10	20	10	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
	34181111	100	12	20	12	10	45	STARTEC XP-P+ DC54-4-MXPP+	●	
	34181070	100	15	20	15	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540468	125	6	20	6	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
	34340120	125	8	20	8	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34236394	125	10	20	10	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540469	125	10	20	10	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
	34340985	125	12	20	12	15	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34198878	125	12	20	12	10	45	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540470	125	12	20	12	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
	34306148	125	15	20	15	10	15	STARTEC XP-P+ DC54-4-MXPP+	●	
	34236398	150	8	20	8	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
	34231456	150	10	20	10	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
	34236401	150	12	20	12	10	45	STARTEC XP-P+ DC54-4-MXPP+	●	
	34540481	150	12	20	12	10	45	STARTEC XP-P+ DS46-4-M-2XPP+	●	Face grinding
14A1	34340151	75	10	20	4	10		STARTEC XP-P+ DC54-4-MXPP+	●	
	34304654	100	10	20	4	10		STARTEC XP-P+ DC54-4-MXPP+	●	
	34304655	125	10	20	4	10		STARTEC XP-P+ DC54-4-MXPP+	●	
14B1	34340152	75	10	20	4	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
	34340153	100	10	20	4	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
	34340154	125	10	20	4	10	10	STARTEC XP-P+ DC54-4-MXPP+	●	
1B1	34340984	100	12	20	12	15	15	STARTEC XP-P+ DC54-4-MXPP+	●	

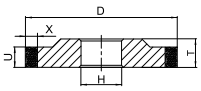
Standard range



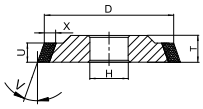
Shape 1A1



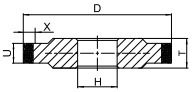
Shape 1V1



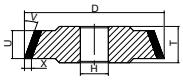
Shape 3A1



Shape 3V1



Shape 14A1



Shape 14V1

	Shape	D	T	U	X	V°
	1A1	50		5 – 15	6,10	
		75		5 - 18.	6,10	
		100		5 – 20	6, 10, 15	
		125		5 – 20	6, 10, 15	
		150		5 – 25	6, 10, 15	
		200		6 – 25	6, 10, 15	
	1V1	75		6 – 18	6, 10	
		100		6 – 20	6, 10	
		125		6 – 20	6, 10	≤ 45°
		150		6 – 18	6, 10, 15	
		200		10 – 20	6, 10	
	3A1 14A1	75	3A1: T=U+3 mm 14A1: T=U+6 mm	3 - 8	6, 10	
		100		3 - 8	6, 10	
		125		3 - 8	6, 10, 15	
		150		3 - 10	6, 10, 15	
		200		6 -12	10, 15	
	3V1 14V1	75	3A1: T=U+3 mm 14A1: T=U+6 mm	4 - 6	6	≤ 45°
		100		4 - 8	6, 10	
		125		4 - 8	6, 10	
		150		6 - 15	6, 10	
		200		6 -12	10	

Standard assortment

Grain	Grain size	Concentration	Bond	Note
DC, DP	39 – 181	3, 4	MXPP+	
DS	39 – 126	3, 4	M-2XPP+	For profile grinding wheels

Standard specification: **DC54-4-MXPP+**

Concentration selection

3 = medium concentration
4 = high concentration (standard)

Bond selection

MXPP+ = Standard metal bond
M-2XPP+ = more wear-resistant

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing.
Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition. If the diamond grinding wheel is trued with an aluminium oxide grinding wheel, roughening can be omitted.

Find our dressing wheels assortment on page 112

b. Application recommendation for flute grinding

For the use of our STARTEC XP-P+ flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling
				Forward	Reverse	
Rough grinding	16 - 22	see Q'w table		x		Required
Finishing	16 - 22	see Q'w table	200-250			
Face grinding	20 - 24	Full depth	80 - 160			Required

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC XP-P+ flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

Product line	vc [m/s]	Q'w [mm3/s.mm] Standard	TOP PERFORMANCE
STARTEC XP-P+	16-22	7 to 9	10 to 12

Feed vt [mm/min]

Profile depth ae [mm]	50	60	70	80	100	120	140	160	180	200	220	240	250
2.6								6.9	**7.8**	**8.7**	**9.5**	**10.4**	10.8
2.8								7.5	**8.4**	**9.3**	**10.3**	**11.2**	11.7
3.0							7.0	**8.0**	**9.0**	**10.0**	**11.0**	12.0	
3.2							7.5	**8.5**	**9.6**	**10.7**	**11.7**	12.8	
3.4							7.9	**9.1**	**10.2**	**11.3**	**12.5**	13.6	
3.6						7.2	**8.4**	**9.6**	**10.8**	**12.0**	13.2		
3.8						7.6	**8.9**	**10.1**	**11.4**	**12.7**	13.9		
4.0						8.0	**9.3**	**10.7**	**12.0**	**13.3**	14.7		
4.2					7.0	**8.4**	**9.8**	**11.2**	**12.6**	14.0			
4.4					7.3	**8.8**	**10.3**	**11.7**	**13.2**	14.7			
4.6				6.1	**7.7**	**9.2**	**10.7**	**12.3**	13.8				
4.8				6.4	**8.0**	**9.6**	**11.2**	**12.8**	14.4				
5.0				6.7	**8.3**	**10.0**	**11.7**	**13.3**	15.0				
5.5			6.4	**7.3**	**9.2**	**11.0**	**12.8**	14.7					
6.0			7.0	**8.0**	**10.0**	**12.0**	**14.0**	16.0					
6.5		6.5	**7.6**	**8.7**	**10.8**	**13.0**	15.2						
7.0		7.0	**8.2**	**9.3**	**11.7**	**14.0**	16.3						
7.5	6.3	**7.5**	**8.8**	**10.0**	**12.5**	15.0							
8.0	6.7	**8.0**	**9.3**	**10.7**	**13.3**	16.0							
8.5	7.1	**8.5**	**9.9**	**11.3**	**14.2**	17.0							

Calculation of values

Q'w = ae x vt / 60
vt = Q'w x 60 / ae

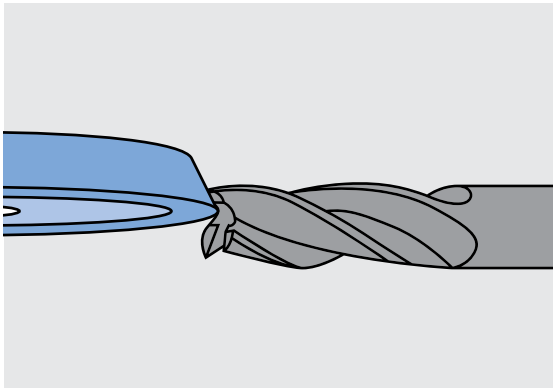
vt standard STARTEC XP-P+

vt optimisation potential

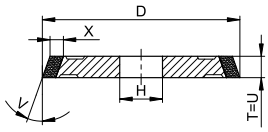
Resin-bonded diamond grinding wheels for flute grinding are listed in Chapter 3.1.

1.7 STARTEC HP
Grinding wheels for gashing

The STARTEC HP grinding wheels have been especially developed for gashing shaft tools made of tungsten carbide. The STARTEC HP diamond grinding tools are characterised by a high stock removal rate and excellent profile retention. This results in the highest shape accuracy, optimum cutting edge quality and an outstanding surface finish of the ground tools.



Stock range



Shape 1V1

	Shape	Type number	D	T	H	W	X	V°	Specification	Stock
	1V1	34223498	100	6	20	6	10	45	STARTEC-HP DN54-4-M-1HP	●
		34249023	100	10	20	10	10	45	STARTEC-HP DN54-4-M-1HP	●
		34223806	125	6	20	6	10	45	STARTEC-HP DN54-4-M-1HP	●
		34223808	125	10	20	10	10	45	STARTEC-HP DN54-4-M-1HP	●
		34184537	125	12	20	12	10	45	STARTEC-HP DN54-4-M-1HP	●
		34223899	150	10	20	10	10	45	STARTEC-HP DN54-4-M1-HP	●
		34223900	150	13	20	13	10	45	STARTEC-HP DN54-4-M-1HP	●

● ... Available ex stock
Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard range

Shape 1V1

Shape	Type number	D	T	H	W	X	V°	Specification
1V1	637608	100	6	20	6	10	60	STARTEC-HP DN54-4-M-1HP
	34223801	100	8	20	8	10	45	STARTEC-HP DN54-4-M-1HP
	34223804	100	12	20	12	10	45	STARTEC-HP DN64-4-M-1HP
	34223807	125	8	20	8	10	45	STARTEC-HP DN64-4-M-1HP

Customer-specific grinding tools can be produced on request. Delivery times on request.

Application recommendation

a. Application recommendation for dressing
ATTENTION: Exert only slight pressure when sharpening the STARTEC HP grinding tools and sharpen in the direction of the tip!

Find our dressing wheels assortment on page 112

b. Application recommendation for gashing

For the use of our STARTEC HP grinding wheels for gashing, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Gashing	20 - 24	Full infeed	Select as appropriate to workpiece stability	x		Recom-mended	Wheel must be well dressed

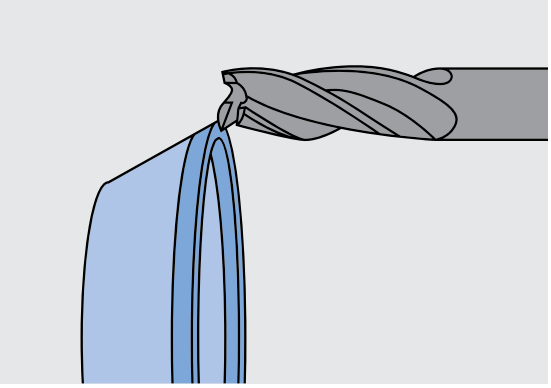
Metal-bonded diamond grinding wheels for face grinding are listed in chapter 1.9.

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

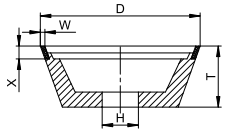
1.8 STARTEC XP-P
Cup wheels for grinding of face and clearance surfaces

STARTEC XP-P from TYROLIT stands for maximum efficiency and optimum tool quality in flute grinding. This high performance level is also achievable with the cup wheels for machining clearance surfaces and face geometries on tungsten carbide stock removal tools.

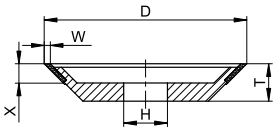
An innovative bond system, tailored diamond qualities and new manufacturing technologies guarantee extremely high edge stability, low cutting forces and the best surface finish on the ground tool.



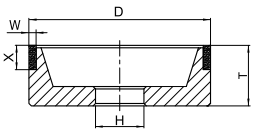
Stock range



Shape 11V9



Shape 12V9



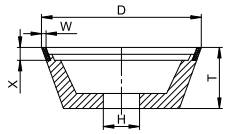
Shape 6A9

	Shape	Type number	D	T	H	W	X	V°	Specification	Stock
	11V9	34065405	75	30	20	3	10	20	STARTEC-XP-P D46-BXPP	●
		34039198	75	30	20	3	10	20	STARTEC-XP-P D64-BXPP	●
		34065406	75	30	20	3	10	20	STARTEC-XP-P D91-BXPP	●
		34065402	100	35	20	3	10	20	STARTEC-XP-P D46-BXPP	●
		34039199	100	35	20	3	10	20	STARTEC-XP-P D64-BXPP	●
		34065403	100	35	20	3	10	20	STARTEC-XP-P D91-BXPP	●
		34156731	100	35	31,75	3	10	20	STARTEC XP-P D46BXP-P	●
		34049640	100	35	31,75	3	10	20	STARTEC XP-P D64BXP-P	●
		34065409	125	40	20	3	10	20	STARTEC-XP-P D46-BXPP	●
		34065410	125	40	20	3	10	20	STARTEC-XP-P D64-BXPP	●
		34065411	125	40	20	3	10	20	STARTEC-XP-P D91-BXPP	●
		34044242	150	50	20	3	10	20	STARTEC-XP-P D64-BXPP	●
		34065413	150	50	20	3	10	20	STARTEC-XP-P D91-BXPP	●

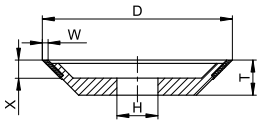
	Shape	Type number	D	T	H	W	X	V°	Specification for TC	Stock
	12V9	34065204	100	20	20	3	10	45	STARTEC-XP-P D46-BXPP	●
		34044248	100	20	20	3	10	45	STARTEC-XP-P D64-BXPP	●
		34044247	100	20	20	3	10	45	STARTEC-XP-P D91-BXPP	●
		34065415	125	25	20	3	10	45	STARTEC-XP-P D46-BXPP	●
		34056064	125	25	20	3	10	45	STARTEC-XP-P D64-BXPP	●
		34065416	125	25	20	3	10	45	STARTEC-XP-P D91-BXPP	●
		34065456	150	25	20	3	10	45	STARTEC-XP-P D91-BXPP	●
	6A9	34065417	100	30	20	3	10		STARTEC-XP-P D64-BXPP	●

● ... Available ex stock

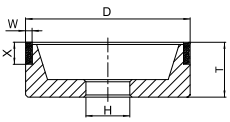
Standard range



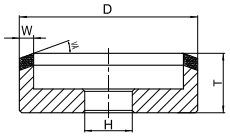
Shape 11V9



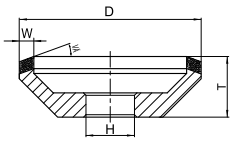
Shape 12V9



Shape 6A9



Shape 6V5



Shape 12V5

	Shape	Type number	D	T	H	W	X	V°	Specification for TC	Note
	11V9	34065404	75	30	20	2	10	20	STARTEC-XP-P D46-BXPP	
		34044241	75	30	20	2	10	20	STARTEC-XP-P D64-BXPP	
		34044230	75	30	20	2	10	20	STARTEC-XP-P D91-BXPP	
		34283239	75	30	20	5	10	20	STRATEC XP-P D46-BXPP	
		34044225	100	35	20	2	10	20	STARTEC-XP-P D64-BXPP	
		34044224	100	35	20	2	10	20	STARTEC-XP-P D91-BXPP	
		34028411	100	35	20	3	10	20	STARTEC-XP-P D91-B-1XPP	soft
		34541757	100	35	20	5	10	20	STRATEC XP-P D46-BXPP	
		34065407	125	40	20	2	10	20	STARTEC-XP-P D64-BXP-P	
		34065408	125	40	20	2	10	20	STARTEC-XP-P D91-BXPP	
		34211868	125	40	20	3	10	20	STARTEC-XP-P D91-B-1XPP	soft
		34065412	150	50	20	3	10	20	STARTEC-XP-P D46-BXPP	
	12V9	34044245	100	20	20	2	10	45	STARTEC-XP-P D64-BXPP	
		34044244	100	20	20	2	10	45	STARTEC-XP-P D91-BXPP	
		34056062	125	25	20	2	10	45	STARTEC-XP-P D64-BXPP	
		34065414	125	25	20	2	10	45	STARTEC-XP-P D91-B-1XPP	soft
		34059014	150	25	20	3	10	45	STARTEC-XP-P D64-BXPP	

	Shape	Type number	D	T	H	W	X	V°	Specification for TC
	6A9	34065419	100	20	20	2	10		STARTEC-XP-P D64-BXPP
		34065420	100	20	20	2	10		STARTEC-XP-P D91-BXPP
		34065418	125	25	20	2	10		STARTEC-XP-P D91-BXPP
		34065421	125	25	20	2	10		STARTEC-XP-P D64-BXPP
		34065422	150	25	20	3	10		STARTEC-XP-P D91-BXPP
	6V5	34482394	100	34	20	5	10	30	STARTEC-XP-P D46-BXPP
		34201572	100	30	20	6	4	30	STARTEC-XP-P D46-BXPP
	12V5	34223180	100	25	20	10	6	10	STARTEC-XP-P B46-BXPP

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing.

Find our dressing wheels assortment on page 112

b. Application recommendation for grinding clearance and face surfaces
For the use of our grinding tools for clearance and face grinding,
the TYROLIT application engineers recommend the following parameters:

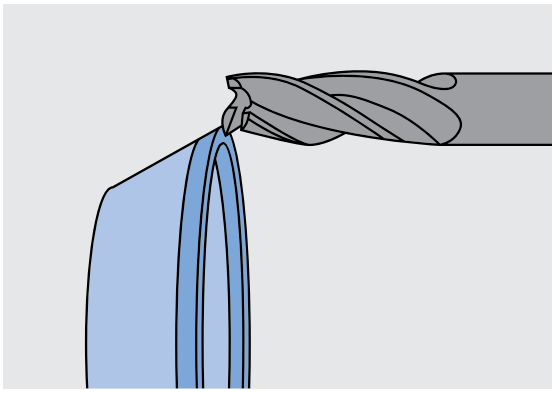
Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Clearance surfaces	28 - 32	0.5 - 2.0	120 - 250	x		Required	
Face geometry	26 - 30	max. 1.5	100 - 170	x		Required	
Face gap	26 - 30	Full depth	60 - 120	x		Required	

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

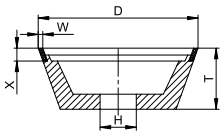
1.9 STARTEC XP-P+
Cup wheels for grinding of clearance surfaces and face geometries

The new STARTEC XP-P+ diamond cup wheels feature the use of innovative metal bonds combined with the highest diamond qualities and state-of-the-art production processes. This greatly enhances the edge retention of the grinding tools, surface results and feed speed.

In addition to the standard, a version suitable for dressing with spark erosion is available.



Stock range



Shape 1A1

	Shape	Type number	D	T	H	W	X	V°	Specification	Stock
	11V9	34495642	75	30	20	3	10	20	STARTEC XP-P+ DS46-4-MXPP+	●
		34459153							STARTEC XP-P+ DS64-4-MXPP+	●
		34546132	100	35	20	3	10	20	STARTEC XP-P+ DS39-4-MXPP+	●
		34499341							STARTEC XP-P+ DS46-4-MXPP+	●
		34459156							STARTEC XP-P+ DS64-4-MXPP+	●
		34512362	100	35	31,75	3	10	20	STARTEC XP-P+ DS46-4-MXPP+	●
		34512363							STARTEC XP-P+ DS64-4-MXPP+	●

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing.
If you are dressing with spark erosion, please note the correct specification selection.

Find our dressing wheels assortment on page 112

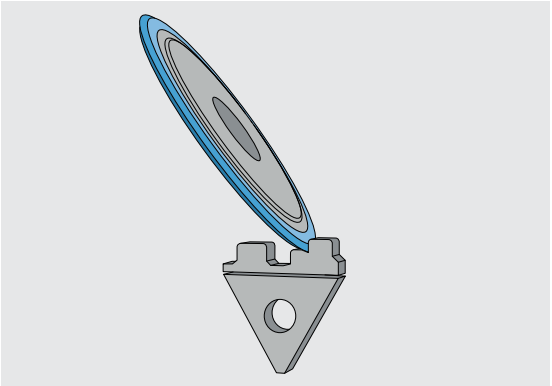
b. Application recommendation for grinding clearance and face surfaces
For the use of our grinding tools for clearance and face grinding,
the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Clearance surfaces	28 - 35	0.5 - 2.0	160 - 280	x		Required	
Face geometry	28 - 35	max. 1.5	150 - 200	x		Required	

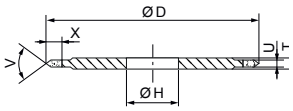
Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

1.10 Tools for profile grinding

This product range has been specially developed for profile grinding. High-strength diamond qualities in both the macro- and micro-grain range and an extremely stable, metallic bond system guarantee best edge stability in pre- and finish-grinding of complex geometries.



Stock range



Shape 14E1

	Shape	Type number	D	T	H	U	X	V°	Specification for HM	Stock	Note
	14E1	34541971	150	10	20	4	10	30	68D126 C125 M774 ST	●	Pre-grinding
		34541972	150	10	20	3	10	30	68D46 C125 M774 ST	●	Finish-grinding
		34541973	200	12	20	4	10	30	68D126 C125 M774 ST	●	Pre-grinding
		34541974	200	12	20	3	10	30	68D46 C125 M774 ST	●	Finish-grinding

Customer-specific grinding tools can be produced on request. Delivery times on request. Limited to design "E1".

Standard range

	Shape	D	T	U	X	V°
	3V1 14V1	75	lt. Anfrage	4 - 6	6	≤ 45°
		100	lt. Anfrage	4 - 8	6, 10	
		125	lt. Anfrage	4 - 8	6, 10	
		150	lt. Anfrage	6 - 15	6, 10	
		200	lt. Anfrage	6 -12	10	
	3E1 14E1	75	lt. Anfrage	3 - 5	10	30° - Umax. 5 45° - Umax. 8 90° - Umax. 15
		100	lt. Anfrage	3 - 8	10	
		125	lt. Anfrage	3 - 8	10	
		150	lt. Anfrage	4 - 15	10	
		200	lt. Anfrage	4 -12	10	

Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard specifications

Grain	Grain size	Concentration	Bond	Note
68D	76 – 151	125	M774	Pre-grinding
68D	39 – 64	125	M728	Finish-grinding, better surface quality

Customer-specific grinding tools can be produced on request. Delivery times on request.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Care should be taken when sharpening manually, as too much pressure can damage the sharpening profile, resulting in an undefined radius. If the diamond grinding wheel is trued with an aluminium oxide grinding wheel, roughening can be omitted.

Find our dressing wheels assortment on page 112

b. Application recommendation for profile grinding
For the use of our grinding tools for clearance and face grinding,
the TYROLIT application engineers recommend the following parameters:

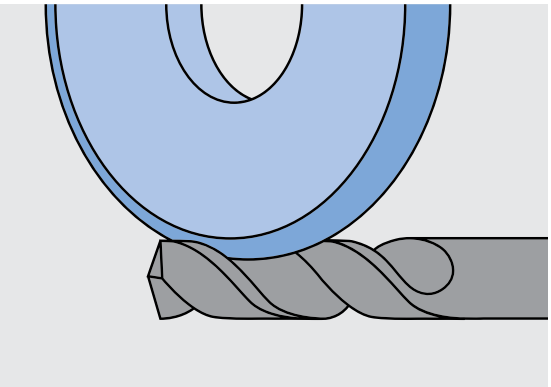
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Cooling
Pre-grinding	18 - 25	bis zu 0.5	30 - 60	Required
Finish-grinding	18 - 25	0.1 - 0-2	20 - 60	Required

Please note that the application parameters presuppose optimum coolant supply
and workpiece clamping. Please observe the safety information on page 156.

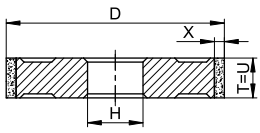
1.11 STARTEC XP-F
Grinding wheels for polishing shaft tools

Polished functional surfaces on shaft tools reduce the friction between tool and material, which results in easier removal of the chips and lower tool wear.

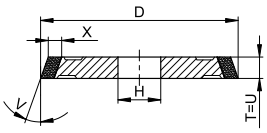
The STARTEC XP-F polishing wheels from TYROLIT guarantee the highest precision in the polished tools through complete stock removal up to 0.2 mm. Complete stock removal is guaranteed, even in the case of stock removal fluctuations. The high surface quality of the polished tool and low wear characterise these polishing wheels.



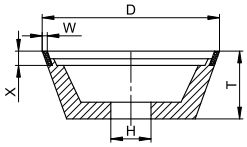
Stock range



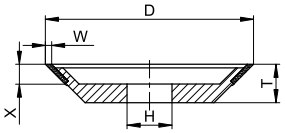
Shape 1A1



Shape 1V1



Shape 11V9



Shape 12V9

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	34243589	100	6	20	6	10		STARTEC XP-F DY15-3-BXPF	●
		34245254	100	10	20	10	10		STARTEC XP-F DY15-3-BXPF	●
		34244283	100	12	20	12	10		STARTEC XP-F DY15-3-BXPF	●
		34245256	125	10	20	10	10		STARTEC XP-F DY15-3-BXPF	●
		34245257	125	12	20	12	10		STARTEC XP-F DY15-3-BXPF	●
		34245258	125	15	20	15	10		STARTEC XP-F DY15-3-BXPF	●
	1V1	34245260	100	10	20	10	10	15	STARTEC XP-F DY15-3-BXPF	●
		34245261	100	12	20	12	10	15	STARTEC XP-F DY15-3-BXPF	●
		34245264	125	10	20	10	10	15	STARTEC XP-F DY15-3-BXPF	●
		34245265	125	12	20	12	10	15	STARTEC XP-F DY15-3-BXPF	●
		34245266	125	15	20	15	10	15	STARTEC XP-F DY15-3-BXPF	●
		34497918	100	6	20	6	10	10	STARTEC XP-F DY15-3-BXPF	●
	11V9	34245273	75	30	20	3	10	20	STARTEC XP-F DY15-3-BXPF	●
		34245275	100	35	20	3	10	20	STARTEC XP-F DY15-3-BXPF	●
		34245277	125	40	20	3	10	20	STARTEC XP-F DY15-3-BXPF	●
	12V9	34245279	100	20	20	3	10	45	STARTEC XP-F DY15-3-BXPF	●
		34245291	125	25	20	3	10	45	STARTEC XP-F DY15-3-BXPF	●

Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard range

Shape	D	T	X	V°
1A1	50	5 – 15	6,1	
	75	5 - 18	6,1	
	100	5 – 20	6, 10, 15	
	125	5 – 20	6, 10, 15	
	150	5 – 18	6, 10, 15	
	200	10 – 15	6, 10, 15	
1V1	75	6 – 18	6, 10	
	100	6 – 20	6, 10	
	125	6 – 20	6, 10	≤ 45°
	150	6 – 18	6, 10, 15	
	200	10 – 20	6, 10	

Shape	D	W	X	V°
4A2	75	3 - 10	3 - 6.	
6A2	100	4 - 12	3 - 10	
11A2	125	5 - 15	3 - 10	
12A2	150	6 - 15	3 - 10	
6B5	75	4/6/10	3 - 10	
6V5	75	4/6/10	3 - 10	
11B5	75	4/6/10	3 - 10	
11V5	100	4/5/6/8/10/12	3 - 10	15 - 30°
12B5	125	5/6/8/10/12/15	3 - 10	
12V5	150	6/8/10/12/15	3 - 10	
6A9	75, 100, 125, 150	2	6	
	75, 100, 125, 150	3	10	
12B9	150	5/6/8/15		
11V9	75, 100, 125, 150	2	10	
12V9	75, 100, 125, 150	3	10	

Standard assortment

Grain	Grain size	Concentration	Bond	Note
DY	3 – 32	1, 2, 3, 4	BXP-F	
170D	9 – 20	50, 75	B241	softer

Standard specification: **DY15-3-BXPF**

Concentration selection

1 = lowest concentration
2 = very low concentration
3 = medium concentration (standard)
4 = high concentration

Bond selection

BXP-F = standard resin-bond
B241 = softer resin-bond

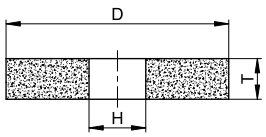
Further specifications for polishing shank tools can be found on page 56 in chapter 1.14

Customer-specific grinding tools can be produced on request. Delivery times on request.

Application recommendation

a. Application recommendation for dressing

Specially adapted dressing wheels are available for dressing the polishing wheels.



Shape 1

	Shape	Type number	D	T	H	Specification	Stock	Note
	1	520149	200	10	32	89A240M5AV217	●	For grit sizes D39-D20, Kirner machine
		34049397	200	10	32	89A400H5AV83	●	For grit sizes D20-D10, Kirner machine
		189322	200	20	32	A400 H5 AV217	●	For grit sizes D20-D10, Cleveland machine
		34061809	250	10	51	89A400H5AV83	●	Standard recommendation for grit sizes D20-D10
		34033629	250	10	51	89A240M5AV217		For grit sizes D39-D20
		34023728	300	10	76,2	A400 H5 AV	●	For grit sizes D20-D10, Rollomatic

● ... Available ex stock.
Customer-specific grinding tools can be produced on request. Delivery times on request.

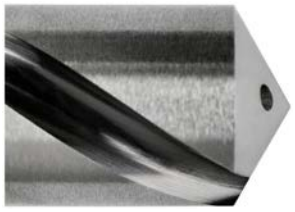
b. Application recommendation for polishing

RECOMMENDED PROCEDURE

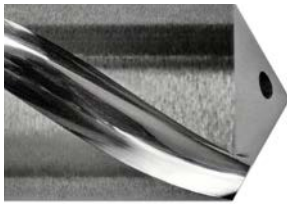
1. Grinding of the flute out of the full material
Recommended specification and parameters: STARTEC XP-P, RC or XP-P+ (see chapter 1.4 and 1.7)
Residual stock to be removed for polishing: 0.1 bis 0.2 mm

2. Polishing of the flute with a convolute grinding wheel
Recommended specification: STARTEC XP-F DY15-3-BXPF

Drill flute insufficiently polished Rz = 0.45 µm



Drill flute polished using STARTEC XP-F Rz = 0.20 µm



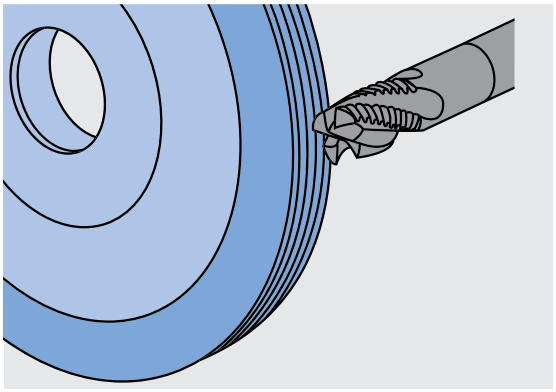
For the use of our grinding tools for clearance and face surface grinding, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Chip flute	25 - 40	0,1 - 0,2	150 - 200	x		Required	
Clearance surface	30 - 40	0,1	100 - 150	x		Required	Observe grinding direction

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

1.12 Roughing cutter teeth grinding
on end mills

For the production of roughing teeth on end mills, TYROLIT offers pre-profiled grinding wheels with adapted specifications. Various bond systems guarantee high profile retention and a good stock removal rate with low heat generation, in order to prevent damage to the cutting edges of the tools.



Range

We manufacture the grinding tools for roughing teeth grinding according to individual requirements.
Please send us a detailed workpiece drawing and information on your grinding tool for this purpose.

Grinding process	Recommended specification	Cutting speed vc [m/s]	Use	Benefits
Profile grinding	STARTEC XP-P D46-4-MXPP	18 - 25	Single-profile	Metal bond, high profile retention, high stock removal rate
	STARTEC XP-P+ DS46-4-M-2XPP+	18 - 25	Single-profile	Metal bond, high profile retention, high stock removal rate
	15D64C160B272	28 - 32	Single-profile	Resin bond, low cutting-edge chipping, good surface finish
	115D64 XG36	25 - 30	Multi-profile	Electroplated bond, very high profile retention
	321D39 C150 R37 V700	22 - 28	Multi-profile	Ceramic bond, high profile retention

In addition, we offer individual specifications tailored to your requirements.
Please send us a data sheet with information on your grinding process for this purpose.

Application recommendation

a. Application recommendation for dressing

The metal- or resin-bonded grinding wheels are trued with a diamond dressing roller or a corresponding crushing roller in flanged condition, externally or in the machine. If there is no possibility for truing, the use of an electroplated grinding wheel is recommended.

Eroding can be beneficial for truing metal-bonded grinding tools. This results in higher exposure of the grain, having a positive effect on the expected heat development during grinding and on the wear of the profile grinding wheel.

b. Application recommendation for profile grinding

For the use of our grinding wheels for the production of roughing teeth,
the TYROLIT application engineers recommend the following parameters:

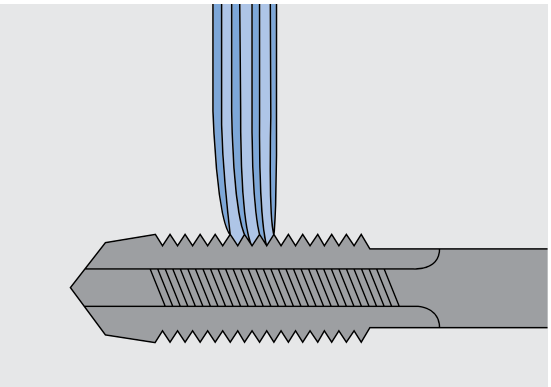
Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction	Cooling	Notes
Roughing teeth	See recommendation p. 51	Full profile depth	160 - 600	Against the cutting edge	Required	feed dependent on control of A-axis

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping.
Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

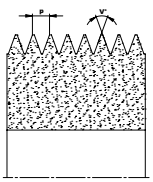
1.13 Thread grinding

For the grinding of high-precision thread profiles, TYROLIT offers optimally adapted grinding tools with high profile retention, which generate low cutting forces during grinding. These can be used to produce high-grade thread-cutting tools in a stable process and in the highest quality.



Range

We manufacture the grinding tools for thread grinding according to individual requirements.
Please send us a detailed workpiece drawing and information on your grinding tool for this purpose.

	Grinding process	Recommended specification	Benefits	Note
	Thread grinding with single-profile wheels	68D39 C150 R37 V700	– Ceramic bond – Low grinding forces – High profile retention – Good dressability	The grit size must be selected depending on the thread pitch Grit size D39 is recommended for p=0.5 - 0.8 mm
		34546191 1E1 150x10x20 DS39-4-M-2XPP+ STARTEC-XP 34546192 1E1 150x10x31,75 DS39-4-M-2XPP+ STARTEC	– Metal bond – High profile retention	more stable
	Thread grinding with multi-profile wheels	68D39 C80 Y48 V640	– Ceramic bond – Low grinding forces – High profile retention – Good dressability	The grit size must be selected depending on the thread pitch Grit size D39 is recommended for p=0.5 - 0.8 mm

In addition, we offer individual specifications tailored to your requirements.
Please send us a data sheet with information on your grinding process for this purpose.

Application recommendation

a. Application recommendation for dressing

Single-profile wheels:

Additionally, eroding can be beneficial for trueing metal-bonded grinding tools. This results in large grain releases, having a positive effect on the expected heat development during grinding and on the wear of the profile grinding wheel.

Vitrified-bonded grinding tools are trued in the machine using a diamond forming roller.

Vitrified-bonded multi-profile wheels:

With vitrified-bonded multi-profile wheels, the profile is applied to the grinding wheel using crushing rollers or diamond profile rollers.

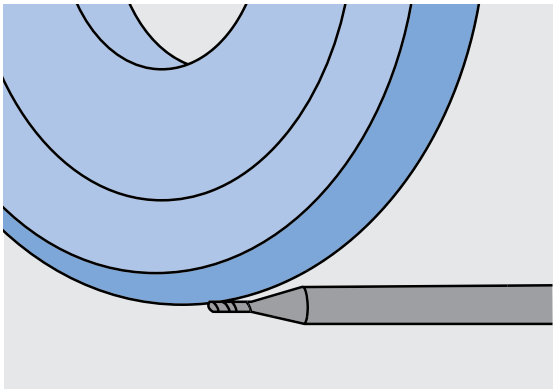
b. Application recommendation for thread grinding

Thread grinding is a very complex grinding process. The grinding parameters depend on numerous influencing factors. For this reason, no specific parameter recommendations can be made at this point.

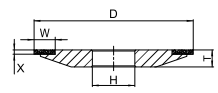
In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

1.14 STARTEC MT
Precision grinding wheels for producing high-precision small and micro tools

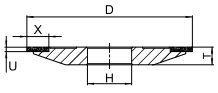
System solutions comprising high-precision grinding tools and specially designed dressing wheels make up the STARTEC MT-1 and MT-2 product lines from TYROLIT. The STARTEC MT-1 assortment consists of grinding tools for the production of high-precision micro tools; the STARTEC MT-2 product line is dedicated to the requirements of all manufacturers of tools for the 3C industry. Bespoke diamond qualities and an innovative bond structure ensure low grinding forces and particularly high cutting efficiency during the grinding process. The results are minimal reject-part rates and optimum ground tool quality.



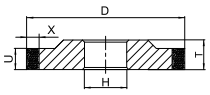
Stock range



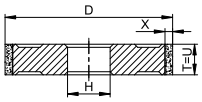
Shape 4A9



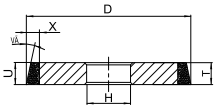
Shape 4A1P



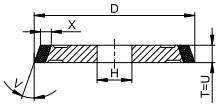
Shape 3A1



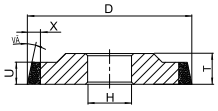
Shape 1A1



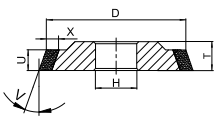
Shape 1B1



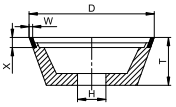
Shape 1V1



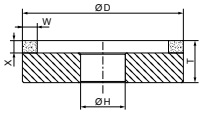
Shape 3B1



Shape 3V1



Shape 11V9



Shape 1A2

Flute grinding on Rollomatic machines

	Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
	3A1	118823	100	6	20	4	6		STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
		34541133	100	6	20	4	6		STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding
		34053784	125	6	20	4	6		STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
		34541136	125	6	20	4	6		STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding
		34053786	150	6	20	4	6		STARTEC-MT-2	D39-3-MXPP	●	Pre grinding
		34541138	150	6	20	4	6		STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding
	3B1	34061806	100	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
		34541181	100	6	20	4	6	10	STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding
		34061805	125	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
		34541182	125	6	20	4	6	10	STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding
		34061807	150	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
		34541183	150	6	20	4	6	10	STARTEC-XP-P+	DK25-3M-2XPP+	●	Finish grinding

Flute grinding on Rollomatic machines

	Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
	4A9	196414	80	6	20	10	2		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm, also suitable for point thinning
		34053789	80	6	40	10	2		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm, also suitable for point thinning
		34392915	150	8	50	8	3		STARTEC MT-2	D20 C125 B269	●	Finish grinding
	4A1P	746906	100	6	40	2	6		STARTEC-MT-1	D15-MMT-1	●	For tool 0.1 < d ≤1.0 mm
		34027237	100	8	50	2	6		STARTEC-MT-1	D15-MMT-1	●	For tool 0.1 < d ≤1.0 mm
	3A1	34311695	150	6	50	3	10		STARTEC MT-2	D25 C100 M728	●	Semifinish grinding
		34392126	150	8	50	5	10		STARTEC-MT-2	SDE46-3-M2-MT-2	●	Pre grinding
		34395066	150	8	50	3	10		STARTEC-MT-2	SDB32-4-B2-MT-2	●	Semifinish grinding

Flute grinding on ANCA machines

	Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
	4A9	196414	80	6	20	10	2		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm, also suitable for point thinning
	1A1	34330954	125	6	31,75	6	10		STARTEC-MT-2	SDA46-6-B3-MT-2	●	Pre grinding
	3A1	34489155	125	6	31,75	3	10		STARTEC-MT-2	SDB32-6-B3-MT-2	●	Semifinish grinding
		34497221	125	6	31,75	2	10		STARTEC-MT-2	SDB25-6-B3-MT-2	●	Semifinish grinding
		34497222	125	6	31,75	2	10		STARTEC-MT-2	SDC9-2-B4-MT-2	●	Polishing
		34497223	125	6	31,75	4	10		STARTEC-MT-2	SDC9-2-B4-MT-2	●	Polishing
		34497228	125	6	31,75	2	10		STARTEC-XP-F	DY15-3-BXPF	●	Finish grinding
		34497229	125	6	31,75	2	10		STARTEC-XP-F	DY9-3-BXPF	●	Polishing
		34497242	125	6	31,75	4	10		STARTEC-MT-2	SDB32-6-B3-MT-2	●	Semifinish grinding

Flute grinding on WALTER machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
1A1	34495921	100	6	20	6	10		STARTEC-MT-2	SDB25-6-B3-MT-2	●	Semifinish grinding
1B1	34498461	100	5	20	5	10	10	STARTEC-MT-2	SDC9-2-B4-MT-2	●	Polishing
1V1	34497918	125	6	20	6	10	10	STARTEC-XP-F	DY15-3-BXPF	●	Finish grinding
3A1	118823	100	6	20	4	6		STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
	34053784	125	6	20	4	6		STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
	34053786	150	6	20	4	6		STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
	34478694	150	6	20	4	10		STARTEC-MT-2	SDA46-6-B3-MT-2	●	Pre grinding
3B1	34061806	100	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
	34061805	125	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
	34061807	150	6	20	4	6	10	STARTEC-XP-P	D39-3-MXPP	●	Pre grinding
3V1	34497919	125	6	20	4	10	10	STARTEC-MT-2	SDC15-2-B4-MT-2	●	Finish grinding
4A9	196414	80	6	20	10	2		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm, also suitable for point thinning
4A1P	34027237	100	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
	34027252	125	8	20	2	6		STARTEC-MT-1	D20-MMT-1	●	Semifinish grinding

Relief grinding on Rollomatic machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
4A9	196414	80	6	20	2	10		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm
	34053663	80	6	20	10	2		STARTEC-MT-1	D15-BMT-1	●	Semifinish grinding
	34053664	80	6	25	10	2		STARTEC-MT-1	D15-BMT-1	●	Semifinish grinding
3A1	34311201	100	6	25	3	8		STARTEC-MT-1	D20-BMT-1	●	Semifinish grinding
	34369281	100	6	25	3	8			D30 C100 B250	●	Semifinish grinding
4A1P	34027240	80	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
	34053788	80	6	25	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding

Relief grinding on ANCA machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
4A9	196414	80	6	20	2	10		STARTEC-MT-1	D9-BMT-1	●	Für WZ d ≤ 0,1 mm
	34053663	80	6	20	10	2		STARTEC-MT-1	D15-BMT-1	●	Semifinish grinding
4A1P	34027240	80	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
3A1	34371878	100	6	31,75	3	10			D30 C100 B250	●	Semifinish grinding

Relief grinding on WALTER machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
3A1	34498385	75	6	20	3	6			D9 C75 B241	●	Polishing
4A9	196414	80	6	20	2	10		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm
	34053663	80	6	20	10	2		STARTEC-MT-1	D15-BMT-1	●	Semifinish grinding
4A1P	34027240	80	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
3V1	34497920	125	6	20	5	10	10	STARTEC-MT-2	SDC15-2-B4-MT-2	●	Finish grinding

Point thinning on Rollomatic machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
4A1P	197600	80	6	32	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
	34027166	100	6	35	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
4A9	201627	80	6	32	10	2		STARTEC-MT-1	D9-BMT-1	●	For tool d ≤ 0.1 mm
3B1	34395067	100	6	35	3	10	45	STARTEC-MT-2	SDA39-6-B3-MT-2	●	Pre grinding

Point thinning on ANCA machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
4A1P	34027240	80	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
	34027237	100	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
1V1	34497224	125	6	31,75	6	10	45	STARTEC-MT-2	SDC25-4-B1-MT-2	●	Semifinish grinding
	34497921	125	10	20	10	10	45		D15 C100 B242	●	Finish grinding

Point thinning on WALTER machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
4A1P	34027240	80	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
	34027237	100	6	20	2	6		STARTEC-MT-1	D15-MMT-1	●	Semifinish grinding
1V1	34497921	125	10	20	10	10	45		D15 C100 B242	●	Finish grinding

Face grinding on Rollomatic machines

Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
1A2	34342142	75	11	25	3	5		STARTEC-MT-2	SDA46-6-B3-MT-2	●	Pre grinding
	34371061	75	11	25	3	5		STARTEC-MT-2	SDB20-4-B2-MT-2	●	Finish grinding

Face grinding on ANCA machines

	Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
	11V9	34156731	100	35	31,75	3	10		STARTEC-XP-P	D46-BXPP	●	Pre grinding

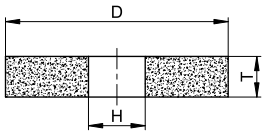
Face grinding on WALTER machines

	Shape	Type number	D	T	H	U	X	V°	Product line	Specification	Stock	Note
	11V9	34065402	100	35	20	3	10		STARTEC-XP-P	D46-BXPP	●	Pre grinding

Application recommendation

a. Application recommendation for dressing

Specially adapted dressing wheels are available ex stock for dressing the grinding wheels.



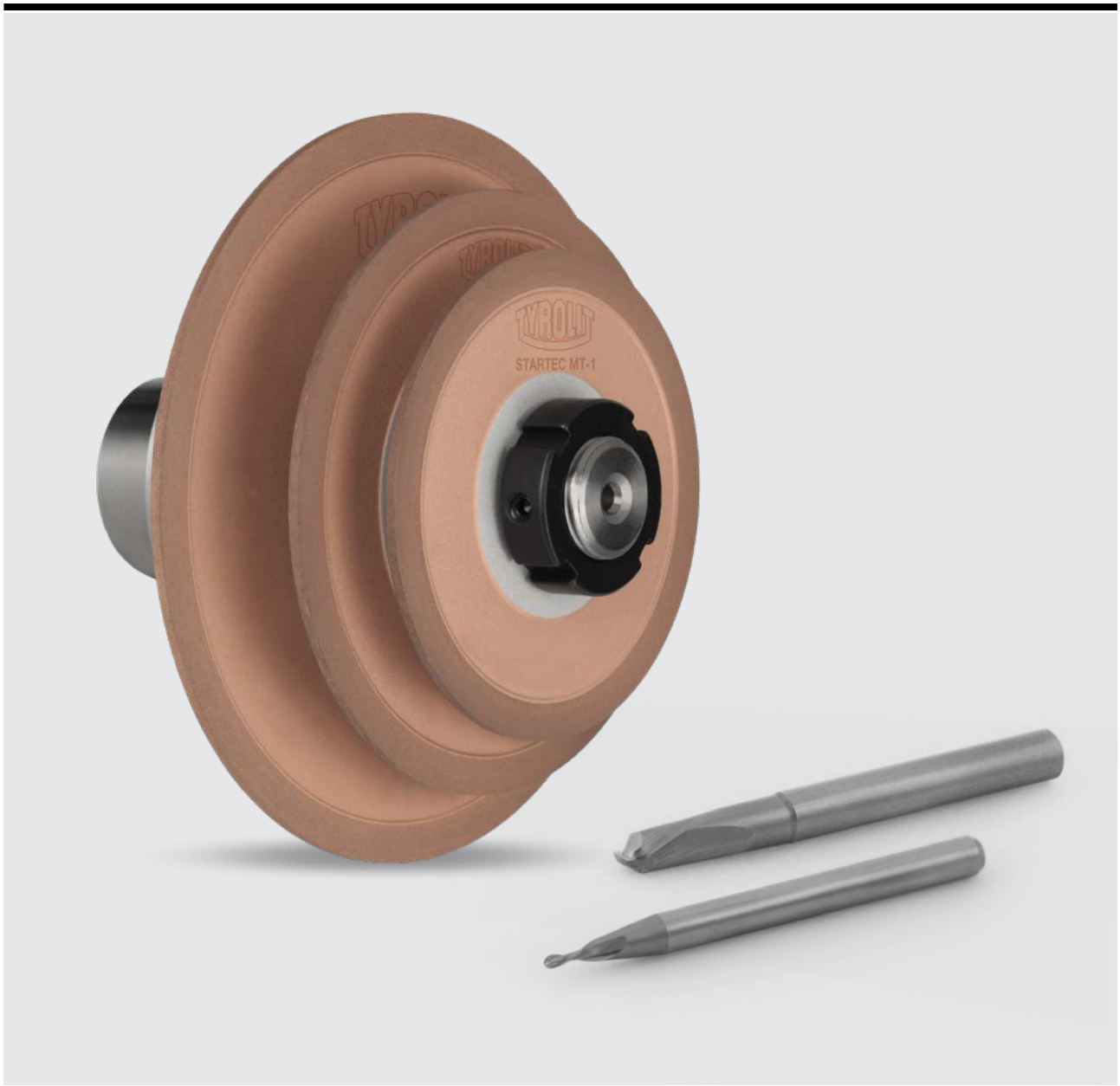
Shape 1

	Shape	Type number	D	T	H	J	U	Vs	Specification	Stock	Note
	1	34061809	250	10	51			35	A400 H5 AV	●	For grit sizes KG > 15 µm
		34157690	250	10	51			20	A800 G5 AV	●	For grit sizes KG ≤ 15 µm
		34023726	300	10	76.2			35	A240M5AV217	●	
		34023728	300	10	76.2			35	A400 H5 AV	●	For grit sizes KG > 15 µm
		34157689	300	10	76.2			20	A800 G5 AV	●	For grit sizes KG ≤ 15 µm
		34023732	300	10	76.2	140	6	20	A400 H5 AV83		For grit sizes KG > 15 µm
		34173471	300	10	76.2	140	6	20	A800 G5 AV83	●	For grit sizes KG ≤ 15 µm

Recommended dressing parameters for STARTEC MT grinding wheels

Dressing process	Grinding wheel grit size	Grinding wheel cutting speed vc [m/s]	Dressing wheel cutting speed vc [m/s]	Infeed/stroke ae [mm]	Feed vt [mm/min]	Grinding direction		Recommended specification
						Forward	Reverse	
In the machine	≤ D10	2 - 5	16 - 25	0.003 - 0.005	200 - 500	x		A 800 V
	D12 - D20	2 - 5	16 - 25	0.005 - 0.008	200 - 500	x		A 400 V
	> D20	2 - 5	16 - 25	0.007 - 0.012	200 - 500	x		A 240 V
	D20-D32	5 - 7	12 - 25	0.015-0.03	200 - 800	x		A 240 V

Note: Always dress grinding wheels on the spindle. Balance the spindle.

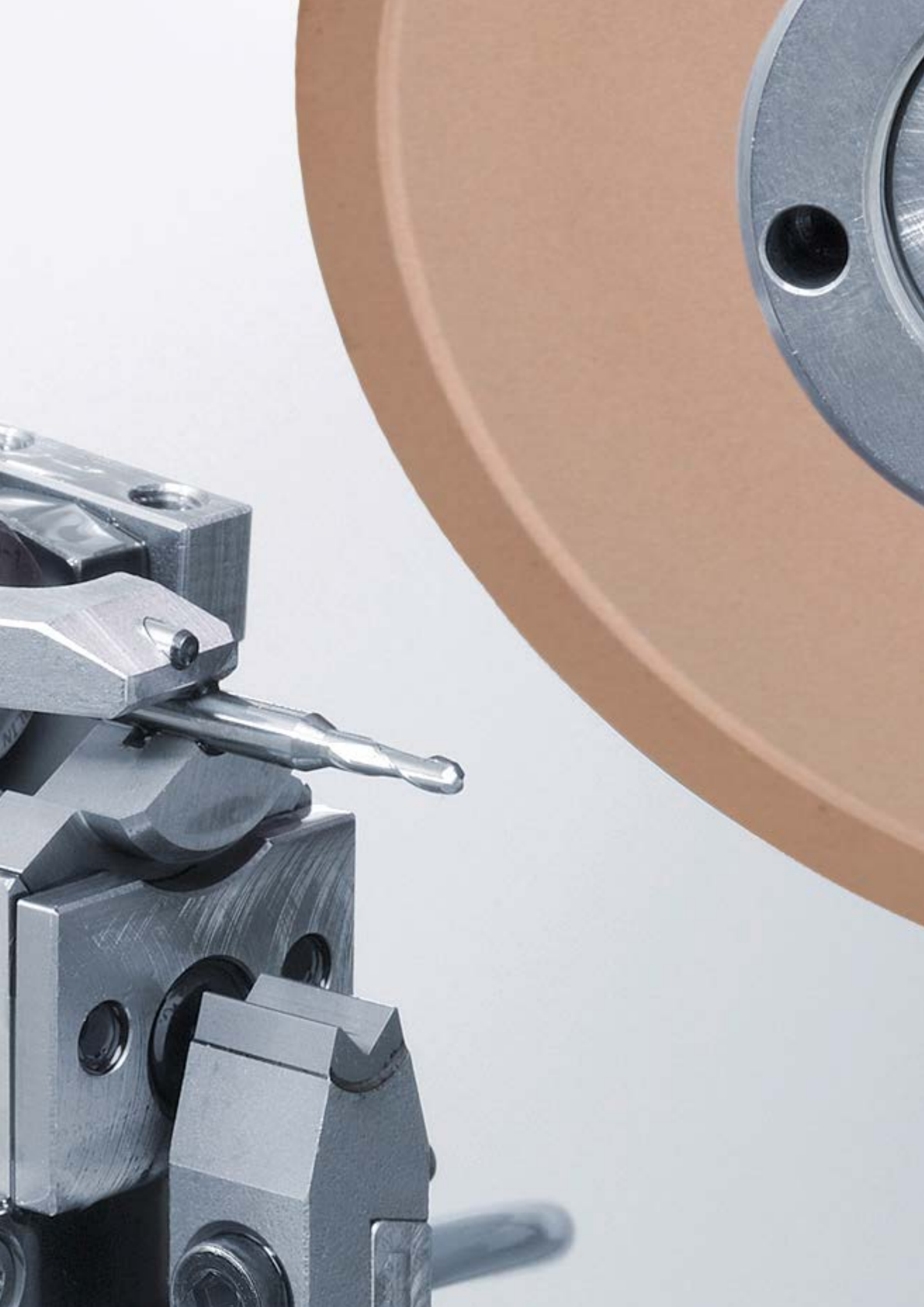


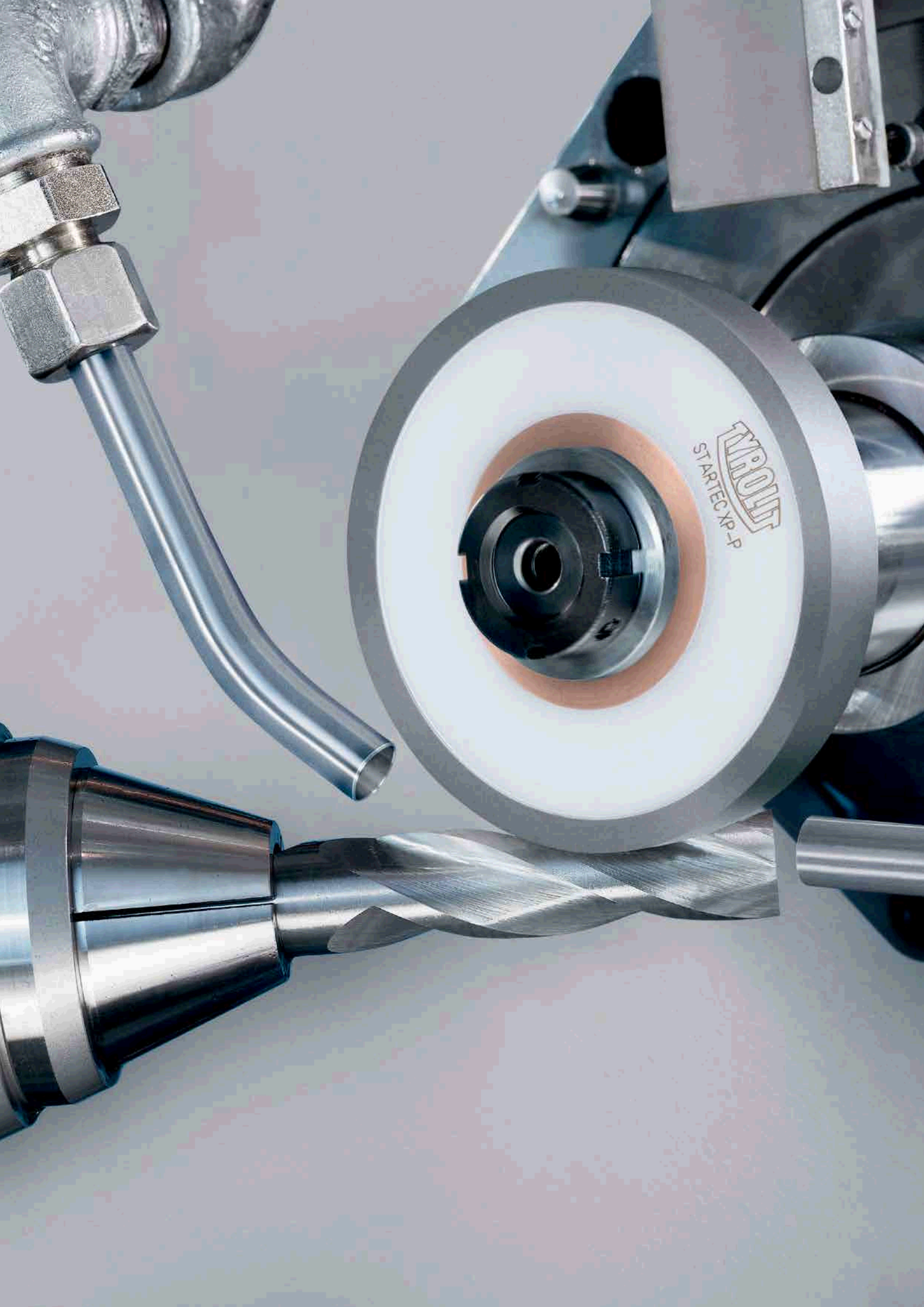
b. Application recommendation for grinding of small and micro tools
For the use of our grinding wheels, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Notes
				Forward	Reverse		
Flute grinding	10 - 40	Full depth	10 - 35	x		Required	vc depending on tool type
Relief grinding	16 - 25	Full depth	10 - 25	x		Required	
Face geometry	8 - 25	Full depth	6 - 15	x		Required	

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

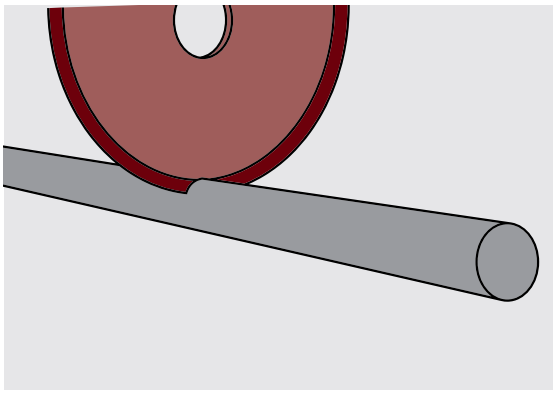



TYROLIT
STARTEC XP-P

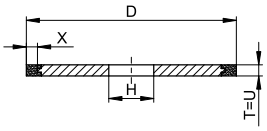
2. Production of HSS shaft tools

2.1 Cut-off grinding of HSS blanks

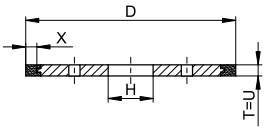
Shaft tools are often manufactured from standardised HSS blanks. These must be shortened to the individual tool length. The cut-off wheels from TYROLIT impress with cool cutting and optimum wear resistance.



Stock range



Shape 1A1R



Shape 1A1RH

	Shape	Type number	D	T	H	U	X	Specification	Stock
	1A1R	486834	100	1	20	1	5	51B126C100B53	●
		788700	125	1	20	1	5	B126C75B	●
	1A1RH	164485	125	1	20	1	5	B151C100B	●
		494701	150	1	20	1	7	B151C100B	●
		290842	200	1.2	30	1.2	5	51B126C75B53	●

● *... Available ex stock*

Standard range

	Shape	Type number	D	T	H	U	X	Specification	Note
	1A1RH	786577	75	1	20	1	5	51B126C75B53	
		513944	100	1	20	1	5	51B151C100B53	
		364801	125	0.8	20	0.8	5	51B126C75B53	
		786578	150	1	20	1	5	B126C100B	
		34197167	150	1	30	1	5	B151C100B	For Wimmer machine
		39880	200	1.2	20	1.2	7	B151C100B	
		34437309	300	1.5	40	1.5	7	51B151C100B53	For P+S machine

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
TYROLIT cut-off wheels can be used in delivery condition, without dressing.

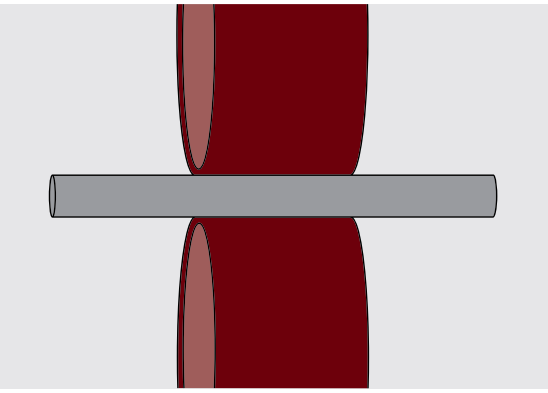
b. Application recommendation for cut-off grinding
For the use of our cut-off wheels, the TYROLIT application engineers recommend the following parameters:

Cutting speed vc [m/s]	Feed vt [mm/sec]	Cooling
24 - 32	0.1 - 1	Required

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping.
Please observe the safety information on page 156.

2.2 CSS ULTRA
Centreless grinding wheels

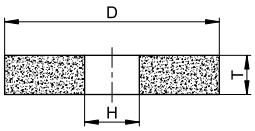
For the production of HSS tool blanks, TYROLIT offers proven grinding tools from the CSS-ULTRA product line for the centreless grinding process.



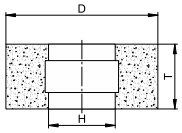
With CSS ULTRA, TYROLIT has created a sustainable grinding wheel micro-architecture using new high-quality components and innovative sintering technology. In addition to thermal load, particularly high wearing forces affect the grain and bond during centreless grinding. Furthermore, the boundary layer between both components becomes heavily eroded due to the increased stock removal rate. Thanks to the innovative bond system, a significant increase in grinding performance is possible.

Standard range

Grinding wheels for all standard external cylindrical grinding machines



Shape 1



Shape 1 CES

	Shapes	D	T max.	H
	1	300	200	Bore according to customer requirement
	1 CES	up to 350	160	
		up to 406	205	
		up to 450	225	
		up to 508	305	
		> 508	400	

Multi-part version from width T=U > 150 mm.

Customer-specific grinding tools can be produced on request.
Delivery time on request.

Application recommendation

a. Application recommendation for dressing
The CSS-Ultra grinding tools for centreless grinding are dressed in the machine using diamond tools. Single-grain or multi-grain dressers as well as diamond profile rollers are used.

b. Application recommendation for centreless grinding
Centreless grinding is a very complex grinding process. The grinding parameters depend on numerous influencing factors. For this reason, no specific parameter recommendations can be made at this point. Please send us a data sheet with information on your grinding process for this purpose.

Specification selection

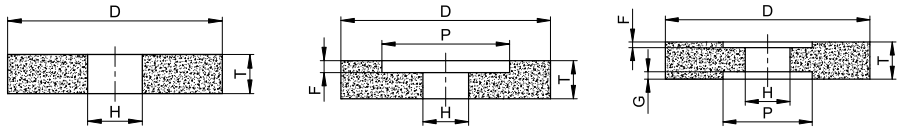
Grain type	Grit size	Hardness	Structure	Bond	Note
CS33A, CS65A, CS66A, CS81A,CS83A, CS85A	80 - 150	JJ – LL	3 - 5	VB1, VB3, VK3, VK8	Definition of specification according to data sheet

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

CSS REGULATOR
REGULATING WHEELS FOR ALL STANDARD CENTRELESS GRINDING MACHINES

Centreless grinding is a complex grinding process. In addition to a good grinding wheel and the correct setting parameters, a reliable regulating wheel is required to stabilise the grinding process. The regulating wheels from the CSS Regulator product line guarantee a long tool life and an optimum coefficient of friction for reliable control of the workpiece.

Shapes and dimensions for regulating wheels



Shape 1 Shape 5 Shape 7

We produce the dimensions individually, according to customer requirements.
Delivery time on request.

Specification recommendations for regulating wheels

Standard recommendations

Application	Specification
Centerless through feed grinding	CRA 100-BR60
Plunge cut grinding	CRA 100-BR63

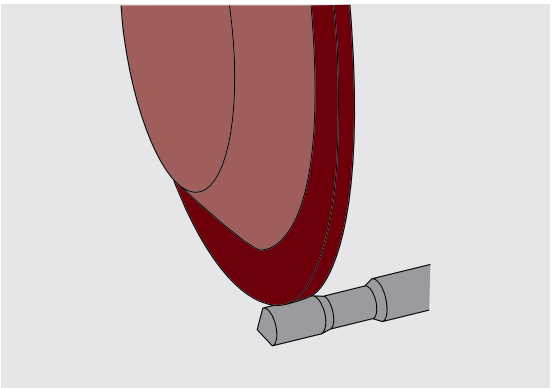
Finer grit sizes, 120, 150, 180 and 220, are available for special applications.

In order to achieve an optimum grinding process, the TYROLIT application engineers support you in defining your individual grinding solution.

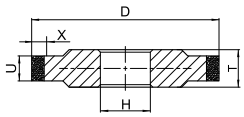
2.3 STARTEC PG Grinding tools
for high-speed external cylindrical longitudinal grinding

With the STARTEC PG-1 and PG-2 product lines TYROLIT is offering roughing and finishing wheels for the peel grinding of tungsten carbide tool blanks.

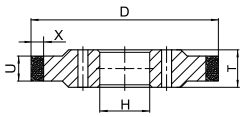
A high-strength vitrified bond is used for the roughing wheel and, in certain cases, a metal bond. This enables especially cost-effective and reliable process control. Depending on requirements, long-life vitrified or resinoid bonds are used for the finishing wheel. This enables even large stock removal fluctuations to be compensated after roughing, and maximum surface quality to be achieved.



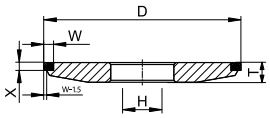
Stock range



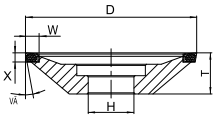
Shape 14A1



Shape 14A1H



Shape 4B9P



Shape 12B9

	Shape	Type number	D	T	H	U	X	V°	Specification	vmax	Note
	4B9P	34057429	250	20	31.75	5	6	11	B126 C150 M787	80	Metal-bonded roughing wheel, ANCA CPX
		34473356	150	24	31.75	6	3	11	B76 C160 B272	63	Resin-bonded finishing wheel, ANCA CPX

Customer-specific grinding tools can be produced on request. Delivery times on request.

Peel grinding Reinecker SF40 / RS500 / RS700

	Shape	Type number	D	T	H	U	X	Specification	vmax	Note
	14A1	34285722	350	18	127	5	6	83B126 C150 M774ST 140	140	Metal-bonded roughing wheel

Standard range

	Shape	Type number	D	T	H	U	X	V°	Specification	vmax	Note
	4A9P	34476694	250	20	31,75	5	6		B126 C150 M787	80	Metal-bonded roughing wheel, ANCA CPX

Peel grinding Reinecker SF40

	Shape	Type number	D	T	H	U	X	Specification	vmax	Note
	14A1S	34035118	350	18	127	5	5	B91 C150 V400	140	Vitrified-bonded roughing wheel
	14A1H	34181745	250	18	90	5	5	B64 C150 V410	125	Vitrified-bonded finishing wheel

Peel grinding Reinecker RS500 / RS700 / RS800

	Shape	Type number	D	T	H	U	X	Specification	vmax	Note
	14A1S	34035118	350	18	127	5	5	B91 C150 V400	140	Vitrified-bonded roughing wheel
	14D1R	34580589	400	23	127	5	5	B126 C150M	140	Metal-bonded roughing wheel for RS800
	14B1P	34580242	400	23	127	5	5	B64 C150V	140	Vitrified-bonded finishing wheel for RS800

Peel grinding Junker Quickpoint

	Shape	Type number	D	T	H	U	X	Specification	vmax	Note
	14A1	34219043	350	25	126,94	5	5	B91 C150 V400	140	JUNKER standard bore ring, plane-side coating

Peel grinding Rollomatic NP3 / NP4 / NP5, ANCA CPX

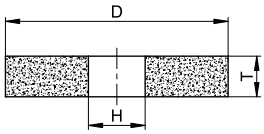
	Shape	Type number	D	T	H	U	X	V°	Specification	vmax	Note
	4B9P	34379463	250	20	31,75	5	6	11	B126 C150 M788	80	Metal-bonded roughing wheel
	12B9	34228013	150	24	31,75	6	3	10	B54 V380	80	Vitrified-bonded finishing wheel
	12B9	34489777	150	24	31,75	6	3	10	B39 V380	80	Vitrified-bonded finishing wheel

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing

Specially adapted dressing wheels are available ex stock for dressing the grinding wheels. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition.

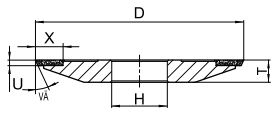


Shape 1

Dressing wheels

	Shape	Type number	D	T	H	Specification	Stock	Note
	1	7348	200	20	20	C80 J5 V15	●	Dressing D91 rough grinding wheel in the machine
		34163206	200	20	20	C120 J5 V15	●	External dressing of wheel in D54/D46
		619701	250	12	51	C80 J5 V15	●	External dressing of rough grinding wheel in D91
		889495	250	12	51	C120 J5 V15	●	External dressing of wheel in D54/D46
		631579	250	12	51	C240 H5 AV18	●	External dressing of finishing wheel in D46
		34047880	300	10	76.2	C80 J5 V15	●	External dressing of rough grinding wheel in D91
		34066742	300	10	76.2	C120 J5 V15	●	External dressing of rough grinding wheel in D54/D46
		57814	300	10	76.2	C240 H5 AV18	●	External dressing of finishing wheel in D46

Vitrified-bonded grinding wheels can only be dressed cost-effectively when using diamond dressing wheels.



Shape 3A2H

Diamond dressing wheels for Reinecker machines

	Shape	Type number	D	T	H	W	Specification	Note
	3A2H	34037195	140	7.5	75	5	D426XG RPX	Dressing of ceramic wheel
		34033080	175	11	110	5	D426XG RPX	Dressing of ceramic wheel, mounting on C-axis

Recommended dressing parameters for grinding wheels with vitrified bond

Dressing process	Grinding wheel cutting speed vc [m/s]	Dressing wheel cutting speed vc [m/s]	Infeed/ stroke ae [mm]	Feed vt [mm/min]	Grinding direction		Recommended specification	Note
					Forward	Reverse		
In the machine	24 - 26	20 - 22	0.003	220 - 230	x		D426 XG RPX	Approx. 30 strokes

b. Application recommendation for peel grinding

For the use of our grinding wheels, the TYROLIT application engineers recommend the following parameters:

Peel grinding, Reinecker SF40

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0.5 - 0.7	7 - 10	100 - 160		x	Required	Workpiece RPM dependent on diameter
Finish grinding	90 - 105	0.02 - 0.04	15 - 35	40 - 70		x	Required	Workpiece RPM dependent on diameter

Peel grinding, Reinecker RS500/RS700/RS800

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0.5 - 0.7	7 - 10	100 - 160		x	Required	Workpiece RPM dependent on diameter
Finish grinding	90 - 105	0.02 - 0.04	7 - 10	40 - 70		x	Required	Workpiece RPM dependent on diameter

Rollomatic NP3, NP4, NP5

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	60 - 90	0.1 - 0.2		12 - 24		x	Required	Workpiece RPM dependent on diameter
Finish grinding	40 - 60	0.02 - 0.04		12 - 24		x	Required	Workpiece RPM dependent on diameter

Junker Quickpoint

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/ min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	105 - 120	0.1 - 1.0	6 - 8	80 - 90		x	Required	Workpiece RPM dependent on diameter

ANCA CPX

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Plunge feed vt [mm/min]	Feed vt [mm/min]	Grinding direction		Cooling	Note
					Forward	Reverse		
Rough grinding	60 - 90	0.1 - 1.5		15 - 30		x	Required	Workpiece RPM dependent on diameter
Finish grinding	40 - 60	0.02 - 0.04		12 - 24		x	Required	Workpiece RPM dependent on diameter

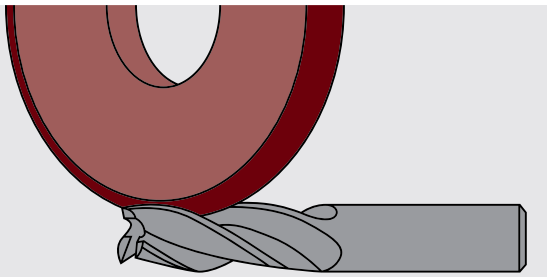
Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

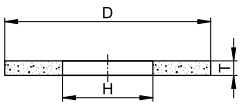
2.4 STARTEC Grinding tools
for flute grinding

For grinding the chip flute, the focus is on precise geometry and a high stock removal rate with minimal heat generation. The new STARTEC ICE assortment was developed together with TYROLIT experts and is dedicated to all HSS precision cutting tool manufacturers. A new development approach has made it possible to combine economic efficiency and cool grinding in an unprecedented way.

STARTEC PRO combines the latest grit and bond technology and guarantees optimum results at an impressive price-performance ratio. TYROLIT also offers a cost-effective range of proven flute grinding wheels with high stock removal rates as well as cool grinding. In both cases the benefits are significantly reduced machining costs and an increase in workpiece quality.



Standard range STARTEC ICE



Shape 1 FLUTE

	Shapes	D	T = U	H
	1 NUT	120	3 - 12	31,75 – 45
		150	3 – 12	31,75 – 45
		175 ≤ D < 200	3 – 14	44,45 – 51
		200 ≤ D ≤ 260	3 – 30	20 – 127
		300 ≤ D ≤ 305	3 – 30	30 – 203,2
		305 < D ≤ 350	3 – 30	127
		380 ≤ D ≤ 406	3 – 30	127 – 305
		450 ≤ D ≤ 460	3 – 30	
		460 < D ≤ 508	3 – 30	

U in 0.1 mm increments

Customer-specific grinding tools can be produced on request.
Delivery time on request.

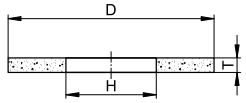
Specification recommendation

In order to meet the requirements at different performance levels, TYROLIT offers in the product line STARTEC ICE two specifications for flute and relief grinding.

Specification selection

	STANDARD **Q'w ≤ 100 mm³/s mm**	**PREMIUM** **Q'w > 100 mm³/s mm**
	STARTEC ICE	STARTEC ICE
Flute grinding	SI95-A 60 Q4 B25	HY-A 30 R5 B109
Relief grinding	SI99-A 60 Q4 B25	

Standard range STARTEC PRO



Shape 1 FLUTE

	Shapes	**D**	**T = U**	**H**
	1 NUT	200 ≤ D ≤ 260	3 – 30	20 – 127
		300 ≤ D ≤ 305	3 – 30	30 – 203.2
		305 < D ≤ 350	3 – 30	127
		380 ≤ D ≤ 406	3 – 30	127 – 305

T in 0.1 mm increments

Customer-specific grinding tools can be produced on request.
Delivery time on request.

Specification recommendation

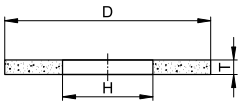
The flute grinding wheels of the STARTEC PRO product line are produced exclusively with a newly developed specification that is adapted to high material removal rates with low wear.

Specification selection

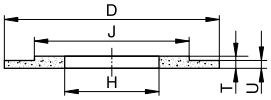
	STANDARD **Q'w ≤ 80 mm³/s mm**
Flute grinding	STARTEC PRO SP-A90 S4 B111
Relief grinding	

Standard range for flute grinding

Grinding wheels for standard flute grinding machines



Shape 1 FLUTE



Shape 38 FLUTE

	Shapes	D	T = U	H
	1 FLUTE	≤ 180	2 - 20	20 - 76.2
		180 < D ≤ 250	2.5 - 20	20 - 76.2
		250 < D ≤ 305	3 - 25	31.75 - 203.2
		305 < D ≤ 350	3 - 25	31.75 - 203.2
		350 < D ≤ 406	4 - 50	127 - 305
		406 < D ≤ 460	5 - 30	127 - 305
		460 < D ≤ 508	6 - 30	127 - 305

	Shapes	D	T	U	H
	38 FLUTE	≤ 180	3.5	1.5 - 2	20 - 76.2
		180 < D ≤ 250	4 - 9	1.5 - 6	20 - 76.2
		250 < D ≤ 305	4 - 9	1.5 - 6	31.75 - 203.2
		305 < D ≤ 350	4 - 9	1.6 - 6	31.75 - 203.2
		350 < D ≤ 406	3.8 - 9	1.6 - 6	127 - 305
		406 < D ≤ 460	3.8 - 9	2.4 - 6	127 - 305

U in 0.1 mm increments

Customer-specific grinding tools can be produced on request.
Delivery time on request.

Specification recommendation for flute grinding wheels

The specifications for flute grinding should be selected taking into account a number of factors. In addition to the workpiece to be ground, the material and machine used must be taken into account together with the cooling lubricant and grinding strategy.

Specification selection

Grain type	Grit size	Hardness	Structure	Bond	Note	Grain material
10A 52A 85A	80 100	P Q R S	4 5 6 8	B25	Standard vc max. = 80 m/s	Fused aluminium oxide
451A 454A 455A	80 100	Q R	4 5 6 8	B25	Standard vc max. = 80 m/s	Sintered aluminium oxide mixtures
10A 52A 69A 85A	80 90 100	P Q R	3 5 7	B16	Good cutting ability, ground flat, vc max. = 80 m/s	Fused aluminium oxide
451A 454A 455A	60 80 90 100	P Q R	3 4 5 7	B16	Good cutting ability, ground flat, vc max. = 80 m/s	Sintered aluminium oxide mixtures
707A	100	P Q R	3 4 5 7	B16	Good cutting ability, ground flat, vc max. = 80 m/s	Sintered aluminium oxide mixtures

In addition, we offer individual specifications tailored to your requirements.
Please send us a data sheet with information on your grinding process for this purpose.

Application recommendation

a. Application recommendation for dressing
The grinding tools for flute grinding are dressed in the machine using diamond tools.
Single-grain or multi-grain dressers as well as diamond profile rollers are used.

b. Application recommendation for flute grinding
For the use of our flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

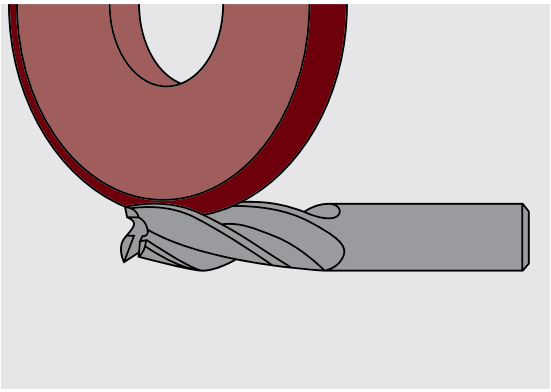
Product	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
STARTEC ICE	63 - 80	Full depth	900 - 6.000	x		Required	The feed depends on the profile depth
STARTEC PRO	63 - 80	Full depth	900 - 2.000	x		Required	The feed depends on the profile depth

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

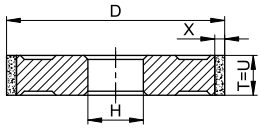
In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

2.5 STARTEC XP-P
Grinding tools for flute grinding

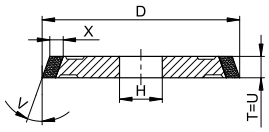
The high quality requirements for high-tech tungsten carbide stock removal tools and the sustained cost pressure require the efficient use of state-of-the-art CNC tool grinding machines. In order to fully exploit the advantages of CNC tool grinding machines, an innovative grinding tool is required. The STARTEC XP-P line offers improved profile retention and low power consumption. State-of-the-art raw material combinations and proven production sequences ensure optimum tool quality for our customers.



Standard range



Shape 1A1



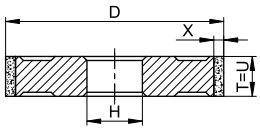
Shape 1V1

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	34540205	75	6	20	6	10		STARTEC XP-P B126-4-MXPP	●
		34540207	75	8	20	8	10		STARTEC XP-P B126-4-MXPP	●
		34540209	75	10	20	10	10		STARTEC XP-P B126-4-MXPP	●
		34540222	100	6	20	6	10		STARTEC XP-P B126-4-MXPP	●
		34540223	100	8	20	8	10		STARTEC XP-P B126-4-MXPP	●
		34540224	100	10	20	10	10		STARTEC XP-P B126-4-MXPP	●
		34540225	100	12	20	12	10		STARTEC XP-P B126-4-MXPP	●
		34540226	100	15	20	15	10		STARTEC XP-P B126-4-MXPP	●
		34540230	125	6	20	6	10		STARTEC XP-P B126-4-MXPP	●
		34540231	125	8	20	8	10		STARTEC XP-P B126-4-MXPP	●
		34540233	125	10	20	10	10		STARTEC XP-P B126-4-MXPP	●
		34540235	125	15	20	15	10		STARTEC XP-P B126-4-MXPP	●
		34540238	150	8	20	8	10		STARTEC XP-P B126-4-MXPP	●
		34451990	150	10	20	10	10		STARTEC XP-P B126-4-MXPP	●
	1V1	34540241	75	8	20	8	10	15	STARTEC XP-P B107-4-MXPP	●
		34540244	100	8	20	8	10	15	STARTEC XP-P B107-4-MXPP	●
		34442467	100	10	20	10	10	15	STARTEC XP-P B107-4-MXPP	●
		34540246	100	15	20	15	10	15	STARTEC XP-P B107-4-MXPP	●

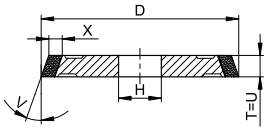
Customer-specific grinding tools can be produced on request. Delivery times on request.

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1V1	34540248	125	8	20	8	10	15	STARTEC XP-P B107-4-MXPP	●
		34540249	125	10	20	10	10	15	STARTEC XP-P B107-4-MXPP	●
		34540250	125	15	20	15	10	15	STARTEC XP-P B107-4-MXPP	●

Standard range



Shape 1A1



Shape 1V1

Shape	D	T	X	V°
1A1	50	5 – 15	6	
	75	5 - 18	6	
	100	5 – 20	6, 10, 15	
	125	5 – 20	6, 10, 15	
	150	5 – 18	6, 10, 15	
	200	10 – 15	6, 10, 15	
1V1	75	6 – 18	6	
	100	6 – 20	6	
	125	6 – 20	6	≤ 45°
	150	6 – 18	6, 10, 15	
	200	10 – 20	6, 10	

Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard specifications

Grain	Grit size	Concentration	Bond	Note
B	76 – 181	3, 4	MXPP	

Standard specification for straight grinding wheels: **B126-4-MXPP**
Standard specification for inclined grinding surfaces: **B107-4-MXPP**

Concentration selection

3 = medium concentration
4 = high concentration (standard)

Bond selection

MXPP = Standard metal bond

Customer-specific grinding tools can be produced on request. Delivery times on request.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition.

Find our dressing wheels assortment on page 112

b. Application recommendation for flute grinding
For the use of our STARTEC XP-P flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling
				Forward	Reverse	
Flute grinding	25 - 35	see Q'w table		x		Required
Face grinding	28 - 38	Full depth	100 - 200			Required

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC XP-P flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

		Q'w [mm3/s.mm]	
Product line	**vc [m/s]**	**Standard**	**TOP PERFORMANCE**
STARTEC XP-P CBN	26 -35	6 to 10	14 to 18

Feed vt [mm/min]

Profile depth ae [mm]	100	120	140	160	180	200	220	240	260	280	300	320	340	380	400	420
2.6												13.9	**14.7**	**16.5**	**17.3**	**18.2**
2.8											14.0	**14.9**	**15.9**	**17.7**	**18.7**	19.6
3.0										14.0	**15.0**	**16.0**	**17.0**	**19.0**	20.0	
3.2									13.9	**14.9**	**16.0**	**17.1**	**18.1**	20.3		
3.4								13.6	**14.7**	**15.9**	**17.0**	**18.1**	19.3			
3.6								14.4	**15.6**	**16.8**	**18.0**	**19.2**	20.4			
3.8							13.9	**15.2**	**16.5**	**17.7**	**19.0**	20.3				
4.0						13.3	**14.7**	**16.0**	**17.3**	**18.7**	20.0					
4.2						14.0	**15.4**	**16.8**	**18.2**	**19.6**	21.0					
4.4					13.2	**14.7**	**16.1**	**17.6**	**19.1**	20.5						
4.6					13.8	**15.3**	**16.9**	**18.4**	**19.9**	21.5						
4.8				12.8	**14.4**	**16.0**	**17.6**	**19.2**	20.8							
5.0				13.3	**15.0**	**16.7**	**18.3**	**20.0**	21.7							
5.5			12.8	**14.7**	**16.5**	**18.3**	**20.2**	22.0								
6.0			14.0	**16.0**	**18.0**	**20.0**	**22.0**	24.0								
6.5		13.0	**15.2**	**17.3**	**19.5**	**21.7**	23.8									
7.0		14.0	**16.3**	**18.7**	**21.0**	**23.3**	25.7									
7.5	12.5	**15.0**	**17.5**	**20.0**	**22.5**	25.0										
8.0	13.3	**16.0**	**18.7**	**21.3**	**24.0**	26.7										
8.5	**14.2**	**17.0**	**19.8**	**22.7**	25.5											

Calculation of values

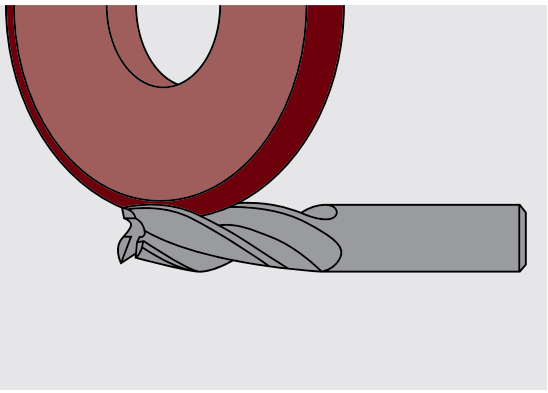
Q'w = ae x vt / 60
vt = Q'w x 60 / ae

vt standard STARTEC XP-P CBN

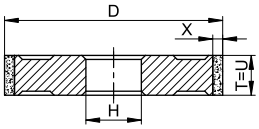
vt optimisation potential

2.5 STARTEC XP-P+
Grinding tools for flute grinding

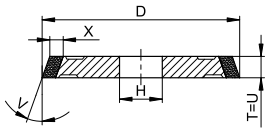
With the STARTEC XP-P+ product line, TYROLIT defines a new performance level for the flute grinding of tungsten carbide cutting tools. The diamond quality specially designed for high cutting performance combined with an innovative bond structure leads to a significant reduction of grinding forces while keeping high profile retention. The precision of the machined tools remains at the usual high level.



Standard range



Shape 1A1



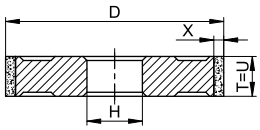
Shape 1V1

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1A1	34540285	75	10	20	10	10		STARTEC XP-P+ BZ107-3-M-2XPP+	●
		34540283	75	12	20	12	10		STARTEC XP-P+ BZ107-3-M-2XPP+	●
		34540286	100	10	20	10	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540287	100	12	20	12	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540288	125	10	20	10	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540289	125	12	20	12	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540290	125	15	20	15	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540291	150	10	20	10	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540292	150	12	20	12	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34540293	150	15	20	15	10		STARTEC XP-P+ BZ107-4-M-2XPP+	●
	1V1	34543485	75	8	20	8	6	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543486	75	12	20	12	6	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543487	100	6	20	6	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543488	100	8	20	8	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543489	100	10	20	10	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34379501	100	12	20	12	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543490	125	6	20	6	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543531	125	8	20	8	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●

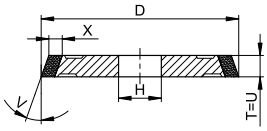
Customer-specific grinding tools can be produced on request. Delivery times on request.

	Shape	Type number	D	T	H	U	X	V°	Specification	Stock
	1V1	34543532	125	10	20	10	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543533	125	12	20	12	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543534	150	8	20	8	10	20	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543535	150	10	20	10	10	20	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34431036	150	10	20	10	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543536	150	12	20	12	10	20	STARTEC XP-P+ BZ107-4-M-2XPP+	●
		34543537	150	12	20	12	10	45	STARTEC XP-P+ BZ107-4-M-2XPP+	●

Standard range



Shape 1A1



Shape 1V1

Shape	D	T	X	V°
1A1	50	5 – 15	6	
	75	5 - 18	6	
	100	5 – 20	6, 10, 15	
	125	5 – 20	6, 10, 15	
	150	5 – 18	6, 10, 15	
	200	10 – 15	6, 10, 15	
1V1	75	6 – 18	6	
	100	6 – 20	6	
	125	6 – 20	6	≤ 45°
	150	6 – 18	6, 10, 15	
	200	10 – 20	6, 10	

Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard specifications

Grain	Grit size	Concentration	Bond	Note
BZ	76 – 181	3, 4	M-2XPP+	

Standard specification: **BZ107-4-M-2XPP+**

Concentration selection

3 = medium concentration
4 = high concentration (standard)

Bond selection

M-2XPP+ = Standard metal bond

Specially adapted dressing wheels are available ex stock for dressing. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition. If the diamond grinding wheel is trued with an aluminium oxide grinding wheel, roughening can be omitted.

Find our dressing wheels assortment on page 112.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Roughening with the sharpening stick before initial use is required, as the product is delivered in the unsharpened condition.

Find our dressing wheels assortment on page 112.

b. Application recommendation for flute grinding
For the use of our STARTEC XP-P+ flute grinding wheels, the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Flute grinding	26 - 40	see Q'w table		x		Required	
Face grinding	28 - 40	Full depth	100 - 300			Required	Shape 1V1

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC XP-P+ flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

		Q'w [mm3/s.mm]	
Product line	**vc [m/s]**	**Standard**	**TOP PERFORMANCE**
STARTEC XP-P+ CBN	16 - 22	6 to 8	8 to 12

Feed vt [mm/min]

Profile depth ae [mm]	100	120	140	160	180	200	220	240	260	280	300	320	340	380	400	420
2.6												13.9	**14.7**	**16.5**	**17.3**	**18.2**
2.8											14.0	**14.9**	**15.9**	**17.7**	**18.7**	19.6
3.0										14.0	**15.0**	**16.0**	**17.0**	**19.0**	20.0	
3.2									13.9	**14.9**	**16.0**	**17.1**	**18.1**	20.3		
3.4								13.6	**14.7**	**15.9**	**17.0**	**18.1**	19.3			
3.6								14.4	**15.6**	**16.8**	**18.0**	**19.2**	20.4			
3.8							13.9	**15.2**	**16.5**	**17.7**	**19.0**	20.3				
4.0						13.3	**14.7**	**16.0**	**17.3**	**18.7**	20.0					
4.2						14.0	**15.4**	**16.8**	**18.2**	**19.6**	21.0					
4.4					13.2	**14.7**	**16.1**	**17.6**	**19.1**	20.5						
4.6					13.8	**15.3**	**16.9**	**18.4**	**19.9**	21.5						
4.8				12.8	**14.4**	**16.0**	**17.6**	**19.2**	20.8							
5.0				13.3	**15.0**	**16.7**	**18.3**	**20.0**	21.7							
5.5			12.8	**14.7**	**16.5**	**18.3**	**20.2**	22.0								
6.0			14.0	**16.0**	**18.0**	**20.0**	**22.0**	24.0								
6.5		13.0	**15.2**	**17.3**	**19.5**	**21.7**	23.8									
7.0		14.0	**16.3**	**18.7**	**21.0**	**23.3**	25.7									
7.5	12.5	**15.0**	**17.5**	**20.0**	**22.5**	25.0										
8.0	13.3	**16.0**	**18.7**	**21.3**	**24.0**	26.7										
8.5	**14.2**	**17.0**	**19.8**	**22.7**	25.5											

Calculation of values

Q'w = ae x vt / 60
vt = Q'w x 60 / ae

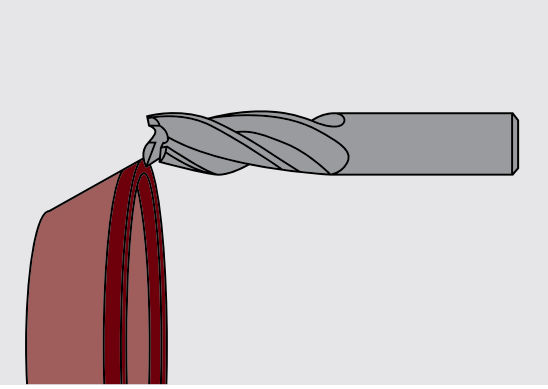
vt standard STARTEC XP-P+ CBN

vt optimisation potential

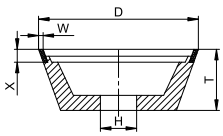
2.6 STARTEC XP-P
Cup wheels for grinding of face and clearance surfaces

STARTEC XP-P from TYROLIT stands for maximum efficiency and optimum tool quality in flute grinding. This high performance level is also achievable with the new cup wheels for machining clearance surfaces and face geometries on HSS stock removal tools.

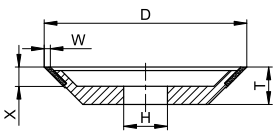
An innovative bond system, tailored CBN qualities and new manufacturing technologies guarantee extremely high edge stability, low cutting forces and the best surface finish on the ground tool.



Stock range



Shape 11V9

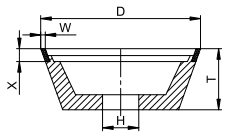


Shape 12V9

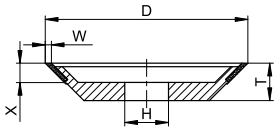
	Shape	Type number	D	T	H	W	X	V°	Specification for TC	Stock
	11V9	34211869	75	30	20	3	10	20	STARTEC-XP-P B107-BXPP	●
		34205432	100	35	20	3	10	20	STARTEC-XP-P B107-BXPP	●
		34184813	125	40	40	3	10	20	STARTEC-XP-P B107-BXPP	●
		34161553	150	50	20	3	10	20	STARTEC-XP-P B107-BXPP	●
	12V9	34163104	100	20	20	3	10	45	STARTEC-XP-P B107-BXPP	●
		34163105	125	25	20	3	10	45	STARTEC-XP-P B107-BXPP	●
		34211873	150	25	20	3	10	45	STARTEC-XP-P B107-BXPP	●

● ... Available ex stock

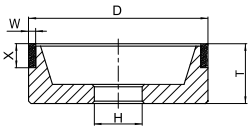
Standard range



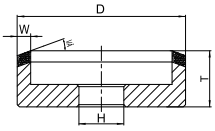
Shape 11V9



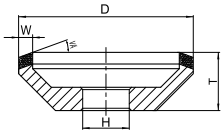
Shape 12V9



Shape 6A9



Shape 6V5



Shape 12V5

	Shape	Type number	D	T	H	W	X	V°	Specification for TC
	11V9	34203567	75	30	20	2	10	20	STARTEC-XP-P B107-BXPP
		34199311	100	35	20	2	10	20	STARTEC-XP-P B107-BXPP
	12V9	34207564	100	20	20	2	10	45	STARTEC-XP-P B107-BXPP
	6A9	34223700	75	30	20	3	10		STARTEC-XP-P B76-BXPP
		34223201	75	30	20	3	10		STARTEC-XP-P B107-BXPP
		34223771	100	30	20	3	10		STARTEC-XP-P B76-BXPP
		34223772	125	30	20	3	10		STARTEC-XP-P B76-BXPP
		34223178	125	30	20	3	10		STARTEC-XP-P B107-BXPP
	6V5	34223774	100	34	20	5	10	30	STARTEC-XP-P B76-BXPP
	12V5	34223775	100	25	20	10	6	20	STARTEC-XP-P B76-BXPP

Customer-specific grinding tools can be produced on request.
Delivery times on request. This assortment is only available in grit sizes B76, B107 and B151.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing.

Find our dressing wheels assortment on page 112.

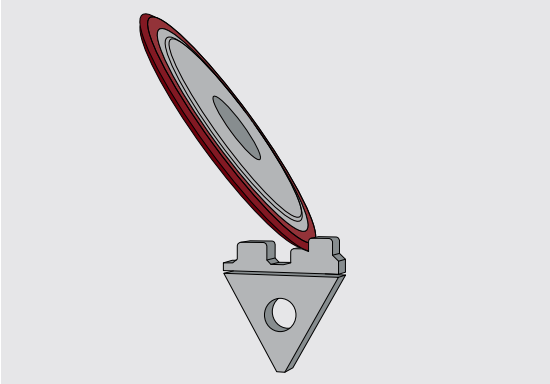
b. Application recommendation for grinding clearance and face surfaces
For the use of our grinding tools for clearance and face grinding,
the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling
				Forward	Reverse	
Clearance surfaces	28 - 32	0.5 - 2.0	120 - 250	x		Required
Face geometry	26 - 30	max. 1.5	100 - 170	x		Required
Face gap	26 - 30	Full depth	60 - 120	x		Required

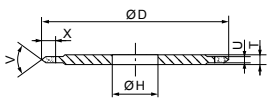
Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

2.8 Grinding Tools for Profile Grinding

This product range has been specially developed for profile grinding. High-strength diamond qualities in both the macro- and micro-grain range and an extremely stable, metallic bond system guarantee best edge stability in pre- and finish-grinding of complex geometries.



Stock range



Shape 14E1

	Shape	Type number	D	T	H	W	X	V°	Specification for TC	Stock	Note
	14E1	34541991	150	10	20	4	10	30	116B126 C125 M774 ST	●	Pre-grinding
		34541992	150	10	20	3	10	30	116B76 C125 M774 ST	●	Finish-grinding
		34541993	200	12	20	4	10	30	116B126 C125 M774 ST	●	Pre-grinding
		34541994	200	12	20	3	10	30	116B76 C125 M774 ST	●	Finish-grinding

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Standard range

Shape	D	T	U	X	V°
3V1 14V1	75	lt. Anfrage	4 - 6	6	≤ 45°
	100	lt. Anfrage	4 - 8	6, 10	
	125	lt. Anfrage	4 - 8	6, 10	
	150	lt. Anfrage	6 - 15	6, 10	
	200	lt. Anfrage	6 -12	10	
3E1 14E1	75	lt. Anfrage	3 - 5	10	30° - Umax. 5 45° - Umax. 8 90° - Umax. 15
	100	lt. Anfrage	3 - 8	10	
	125	lt. Anfrage	3 - 8	10	
	150	lt. Anfrage	4 - 15	10	
	200	lt. Anfrage	4 -12	10	

Customer-specific grinding tools can be produced on request. Delivery times on request.

Standard specifications

Grain	Grit size	Konzentration	Concentration	Note
116B	91 – 151	C125	M774	Pre-grinding
116B	46 – 64	C125	M774	Finish-grinding

Customer-specific grinding tools can be produced on request. Delivery times on request.

Application recommendation

a. Application recommendation for dressing
Specially adapted dressing wheels are available ex stock for dressing. Care should be taken when sharpening manually, as too much pressure can damage the sharpening profile, resulting in an undefined radius. If the diamond grinding wheel is trued with an aluminium oxide grinding wheel, roughening can be omitted.

Find our dressing wheels assortment on page 112.

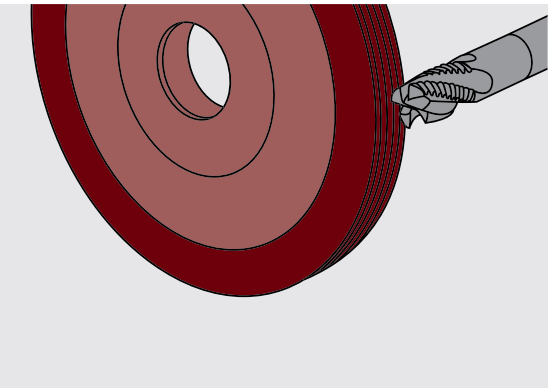
b. Application recommendation for profile grinding
For the use of our grinding tools for clearance and face grinding,
the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Cooling
Pre-grinding	22 - 28	bis zu 0.5	50 - 100	Required
Finish-grinding	22 - 28	0.1 - 0-2	80 - 80	Required

Please note that the application parameters presuppose optimum coolant supply
and workpiece clamping. Please observe the safety information on page 156.

2.9 Roughing teeth grinding
on end mills

For the production of roughing teeth on end mills, TYROLIT offers pre-profiled grinding wheels with adapted specifications. Various bond systems guarantee high profile retention and a good stock removal rate with low heat generation in order to achieve optimum quality of the cutting edge.



Range

We manufacture the grinding tools for roughing teeth grinding according to individual requirements. Please send us a detailed workpiece drawing and information on your grinding tool for this purpose.

Grinding process	Recommended specification	Cutting speed vc [m/s]	Benefits
Profile grinding	116B64 C125 M728	24 – 28	Metal bond, high profile retention, high stock removal rate
	51B91C100B42	28 – 32	Resin bond, low cutting-edge chipping, good surface finish
	60B91 XG36	28 - 32	Electroplated bond, very high profile retention

In addition, we offer individual specifications tailored to your requirements.
Please send us a data sheet with information on your grinding process for this purpose.

Application recommendation

a. Application recommendation for dressing

The metal- or resin-bonded grinding wheels are trued with a diamond forming roller or a corresponding crushing roller in flanged condition, externally or in the machine. If there is no possibility for truing, the use of an electroplated grinding wheel is recommended.

Eroding can be beneficial for truing metal-bonded grinding tools. This results in large grain releases, having a positive effect on the expected heat development during grinding and on the wear of the profile grinding wheel.

b. Application recommendation for profile grinding

For the use of our grinding wheels for the production of roughing teeth, the TYROLIT application engineers recommend the following parameters:

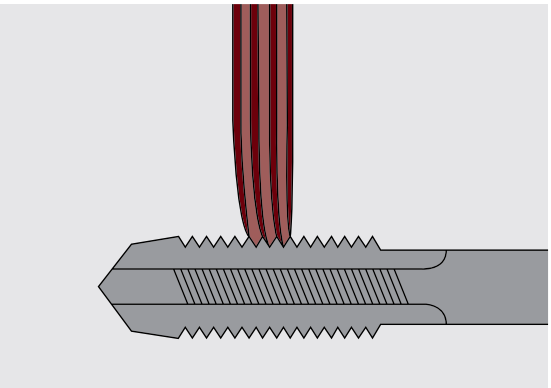
Grinding process	Cutting speed vc [m/s]	Infeed/ ae [mm]	Feed vt [mm/min]	Grinding direction	Cooling	Notes
Roughing teeth	24 - 32	Full profile depth	160 - 800	Against the cutting edge	Required	Cutting speed dependent on the selected bond system; feed dependent on control of A-axis

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.

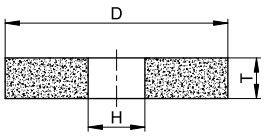
2.10 CSS ULTRA
Grinding tools for thread grinding

For the grinding of highly precise thread profiles, TYROLIT offers the CCS ULTRA product line, optimally adapted grinding tools with high profile retention, which generate low cutting forces during grinding. These can be used to produce high-quality thread-cutting tools in a stable process.



Range

Grinding wheels for standard thread grinding machines



Shape 1

Standard dimensions

	Shapes	D	T = U	H
	1 THREAD	≥200 <300	4 to 40	According to customer requirement
		≥300 <400	6 to 60	
		≥400 <500	8 to 60	
		≥500 <620	10 to 60	

Customer-specific grinding tools can be produced on request.
Delivery time on request.

Specification recommendation for thread grinding

Standard recommendation for standard metric threads:

Thread	Pitch	Radius	Standard recommendation
M1, M1.2	0.25	0.04	CS33A 500 HH3 VB1
M1.6	0.35	0.05	CS33A 500 HH3 VB1
M2	0.4	0.06	CS33A 400 HH3 VB1

Thread	Pitch	Radius	Grit size	Standard recommendation
M2.5	0.45	0.07	400	CS33A 400 HH3 VB1
M3	0.5	0.07	400	CS33A 400 HH3 VB1
M4	0.7	0.10	320	CS33A 320 HH3 VB1
M5	0.8	0.12	320	CS33A 320 HH3 VB1
M6	1.0	0.14	280	CS33A 280 HH3 VB1
M8	1.25	0.18	240	CS33A 240 HH3 VB1
M10	1.5	0.22	240	CS33A 240 HH3 VB1
M12	1.75	0.25	240	CS33A 220 HH3 VB1
M16	2.0	0.29	220	CS33A 220 HH3 VB1
M20	2.5	0.36	180	CS33A 180 HH3 VB1
M24	3.0	0.36	180	CS33A 180 HH3 VB1
M30	3.5	0.51	150	CS33A 150 HH3 VB1
M36	4.0	0.58	150	CS33A 150 HH3 VB1

The grinding tools are designed as single-profile or multi-profile wheels, depending on the requirements.

We also produce thread grinding wheels in a dual-layer version. These can be used to produce the point and threaded section using one grinding tool. Here, the layer with which the thread is cut is specified in accordance with the thread pitch. The layer for the point is designed for a high stock removal rate and surface finish, and remains unchanged.

In the case of dual-layer wheels, the relevant specification for the threaded section is combined with the following specification for the point.

- Specification for grinding the point: CS33A 120.2 FF3 VK1 – Bond colour WHITE
- Specification for thread grinding: Standard recommendation acc. to table – Bond colour BLUE

Application recommendation

a. Application recommendation for dressing

The grinding tools for thread grinding are dressed in the machine using diamond tools. Individually designed diamond profile rollers are used. These are available on request. Send us your workpiece or roller drawing for this purpose.

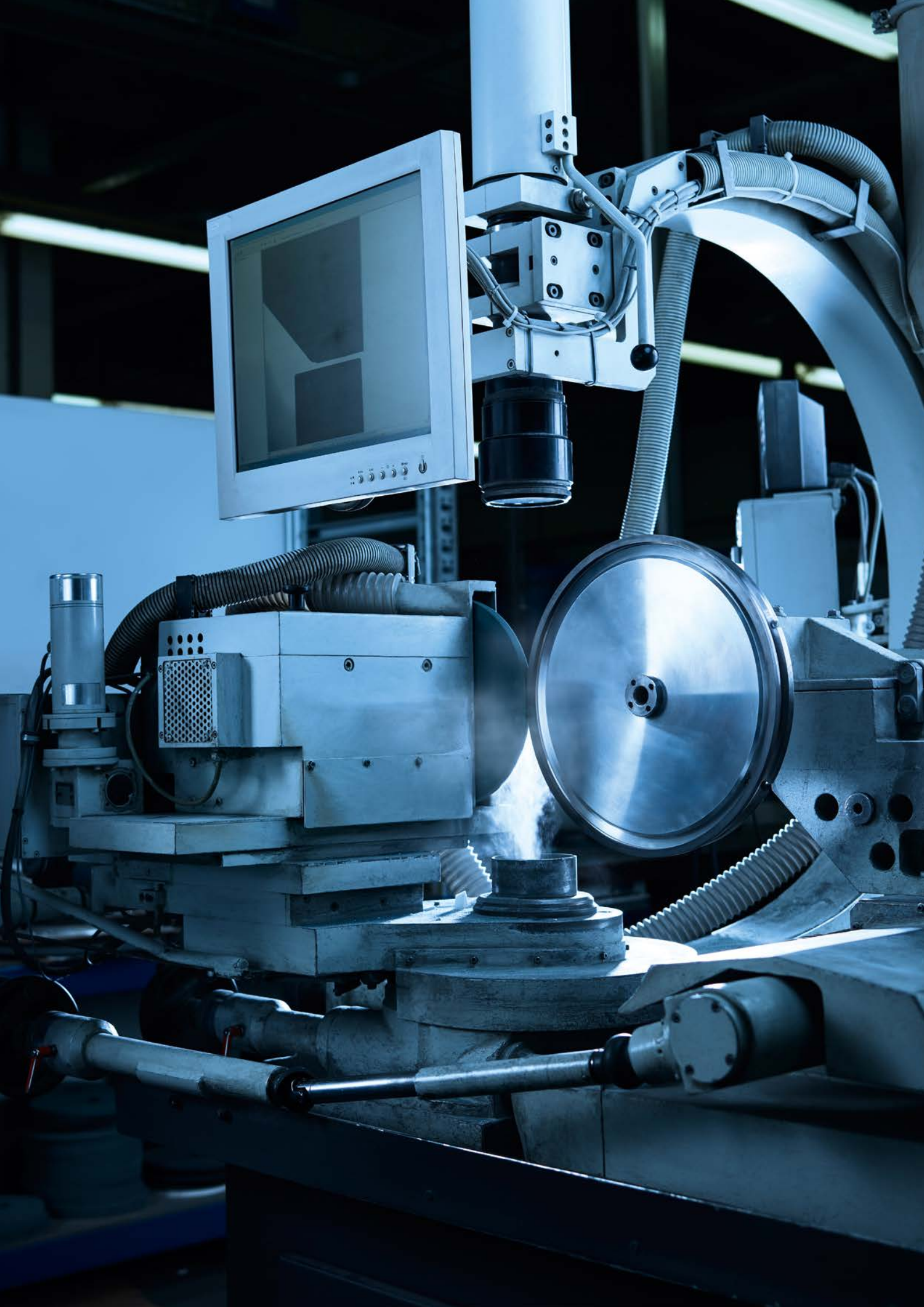
b. Application recommendation for thread grinding

For use of our thread grinding wheels, the TYROLIT application engineers recommend the following parameters:

Cutting speed vc [m/s]	Infeed/ae [mm]	Workpiece speed [RPM]	Grinding direction	Cooling	Note
30 - 80	Number of cutting passes	80 - 500	against the cutting edge	Required	

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

In order to achieve an optimum grinding process, our application engineers support you in defining your individual grinding solution.



3. Conditioning of Grinding Tools

3.1 Conditioning of grinding tools

In order to achieve an economical grinding process and the optimum quality of the ground part, it is necessary to prepare the grinding tools. The professional preparation for use is called "conditioning" and comprises the steps dressing, which in turn is subdivided into trueing and sharpening, cleaning and balancing.

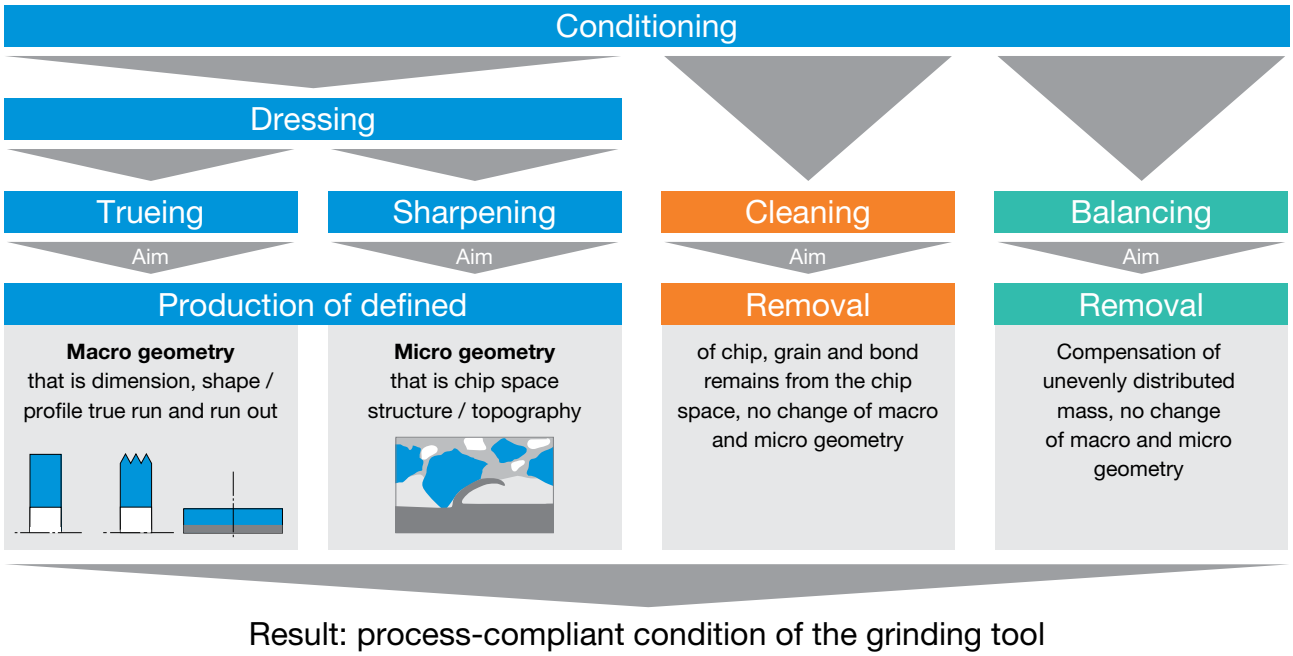


Figure 1: Conditioning - process steps

Dressing is an upstream work step in the grinding process, which is repeated after reaching the tolerance or wear limit or when process-relevant parameters, such as grinding forces or temperature, are exceeded.

Cleaning can take place during the grinding process or after a certain number of ground parts. The macro and micro geometry of the grinding tool are not changed by this.

Balancing the grinding tools is also recommended before being used because then the occurrence of centrifugal forces is minimised. This reduces vibration in the grinding process which results in a reduction of wear and surface defects. Likewise, the load on the grinding spindle is minimised.

In the following we concentrate on the dressing of diamond and CBN grinding wheels when used for tool grinding.

3.2 Overview of the dressing and sharpening methods

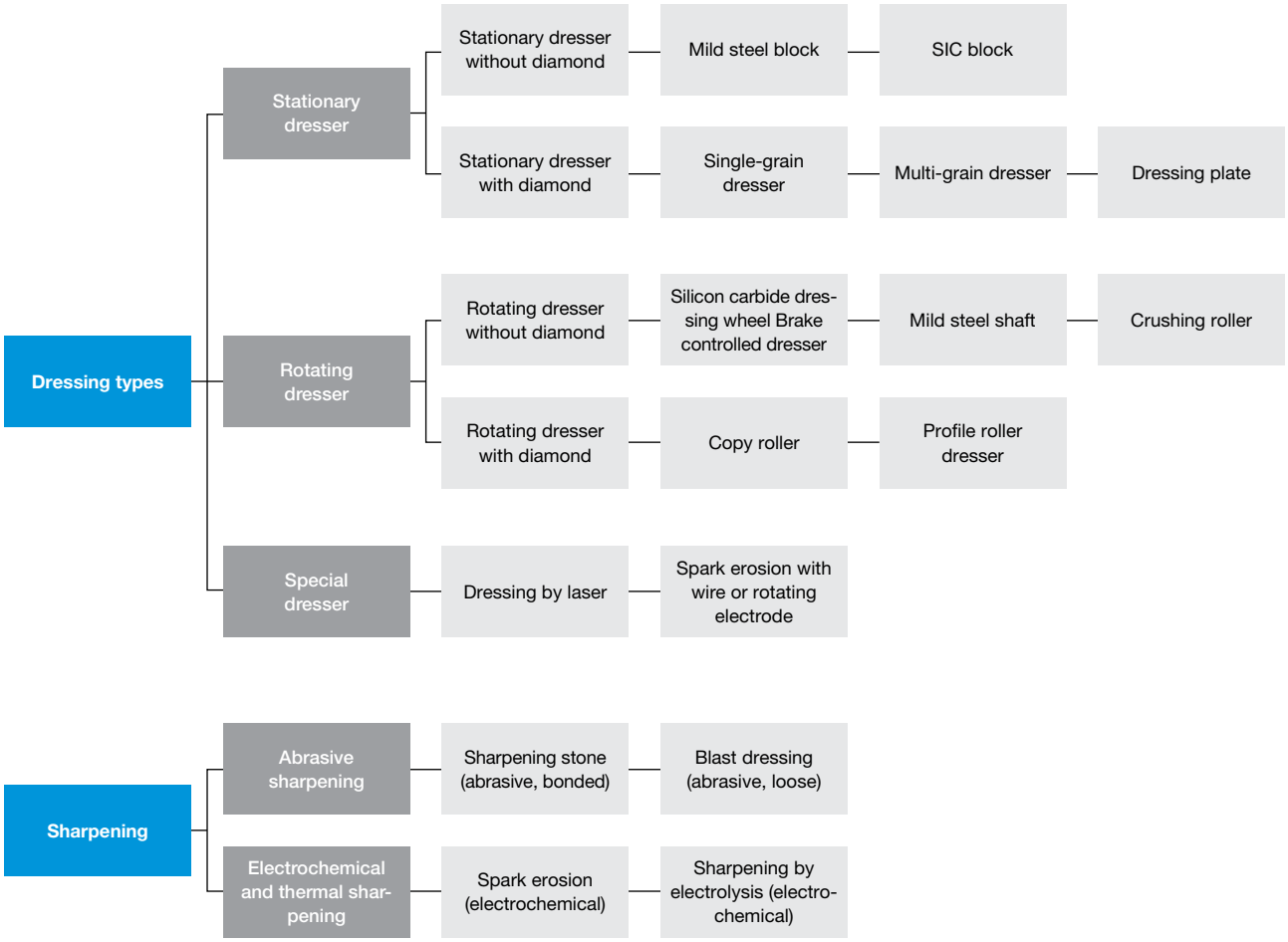


Figure 2: Overview of the dressing and sharpening methods

Trueing

For trueing, i.e. for creating the macro geometry, of diamond and CBN grinding wheels for tool grinding mainly rotating dressers without diamond are used. Vitrified-bonded dressing wheels with silicon carbide or aluminium oxide as the abrasive are most commonly used and deliver reliable results. Especially for electrically conductive grinding tools, trueing by spark erosion is gaining in importance. The advantages of this method are high flexibility in the profile design, creating complex geometries that cannot be achieved by grinding (concave radii), and the high grain release, leading to very low grinding forces and thus reducing thermal damage and wheel wear.

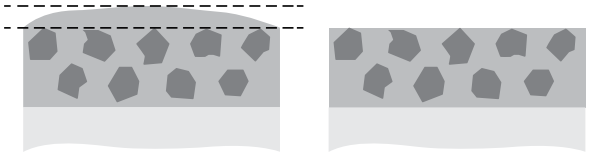


Figure 3: Aim of the trueing - Creation of a macro geometry

Figure 4: Vitrified-bonded dressing wheels with silicon carbide and aluminium oxide

Sharpening

For sharpening, i.e. for creating a process-appropriate micro geometry on the grinding wheel surface, stationary tools are usually used. These are vitrified-bonded aluminium oxide stones that are brought to the rotating grinding tool. By selectively resetting the bond, a sufficient grain clearance is created that significantly reduces the grinding forces and provides enough space for the removal of chips and material particles. If the dressing is done by spark erosion, there is no need for sharpening since the desired grain exposure takes place simultaneously to the profiling.

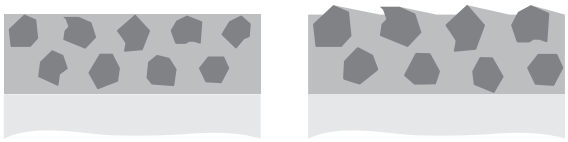


Figure 5: Aim of the sharpening - Creation of grain overhang (micro geometry)

Figure 6: Sharpening stone vitrified-bonded with aluminium oxide

The choice of the appropriate trueing and sharpening tool depends on the following factors:

- Bond system of the grinding wheel
- Grit size of the grinding wheel
- External dressing or dressing in the machine
- Rotational direction of grinding and dressing tool
- Speed ratio q_d
- Dressing infeed a_e
- Crossfeed v_t
- Dressing strategy (process management)

3.3 Trueing and Sharpening Recommendations

Trueing

The optimum interaction of the process parameters during trueing is required for high precision on the grinding tool.

Figure 7: Trueing on an external machine

Specification selection for dressing wheels

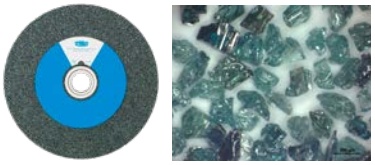
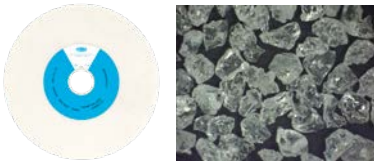
In practice, vitrified-bonded dressing wheels are dominating. Resin-bonded dressing wheels are very rare and are only used in special cases. The dressing of electrically conductive grinding tools by spark erosion is becoming more and more important.

	Bond system of the dressing wheel		Option
Bond system of the grinding wheel	**Vitrified-bonded**	**Resin-bonded**	**Spark erosion**
Resin-bonded	Recommended	Not recommended	Not possible
Metal-bonded	Recommended	Possible	Possible if electrically conductive
Vitrified-bonded	Recommended	Not recommended	Not possible

Selection of the grain type and grit size for dressing

Basically, silicon carbide or aluminium oxide are suitable as abrasives for dressing wheels. Silicon carbide has established itself as the standard due to its good stock removal rate and its higher stability compared to dressing wheels with aluminium oxide.

However, dressing wheels with aluminium oxide show advantages especially when high-precision grinding wheel profiles and low cutting forces are required. Dressing wheels with aluminum oxide are also recommended in case sharpening should be avoided due to process optimisation.

	Silicon carbide SiC	Aluminium oxide Al_2O_3
Time required	Low	High
Wear	Low	High
Actual surface roughness	Low	High
Grinding forces	High	Low
Sharpening	Required	Not required

Figure 8: Difference between silicon carbide and aluminium oxide dressing wheels

The following table shows the recommendations of TYROLIT application engineers depending on the grit size of the grinding tool that has to be dressed.

Classification grit sizes	Grit size DIA or CBN grinding tool	Grit size dressing tools	TYROLIT specification	
	[µm]	[mesh]	Sharpening required	No sharpening
Micro grain	1 - 12	800	Not recommended	A 800 G5 V
	15 - 20	400	C400 H7 V	A 400 H5 V
Macro grain	20 - 35	240	C240 H7 V	A 240 M5 V
	35 - 54	120	C120 J5 V	A 120 M5 V
	54 - 181	80	C80 J5 V	A 80 M5 V
	>181	60	C60 J5 V	A 60 M5 V

Recommended parameters for dressing

In addition to the correct selection of the dressing wheel, the dressing parameters are also crucial for an optimal result. For an economic dressing process the speed ratio $q_d = v_r / v_s$ between the grinding wheel to be dressed and the dressing wheel is decisive.

$q_d = v_r / v_s$ Recommendation : $v_r > v_s$

v_r … Peripheral speed of the dressing wheel in m/s
v_s … Peripheral speed of the grinding wheel in m/s
q_d … Speed ratio

q_d Standard values for dressing diamond and CBN grinding wheels with conventional dressing wheels:

q_d = +/- 1,4 to 5

The rotational direction and the crossfeed also have a significant influence on the quality of the macro geometry produced.

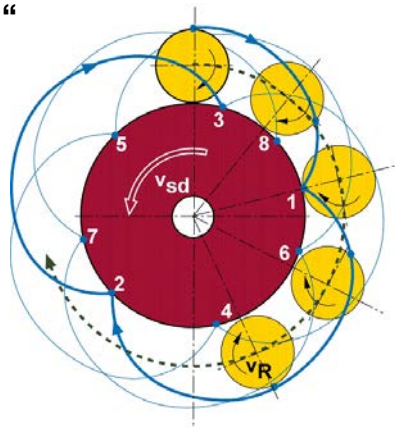
Same direction symbol „ + “

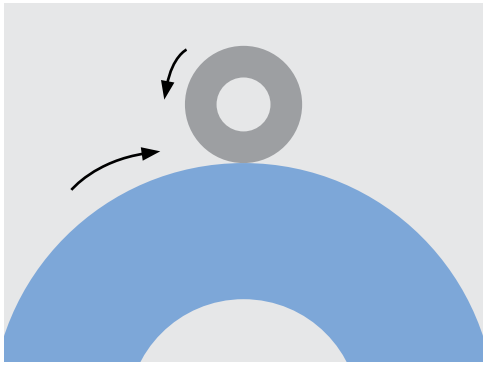
Grain contact

+ Hacking
+ Impacting

Effects

+ Rough surface
+ Easy cutting wheel
+ High dressing forces
+ Low grinding forces





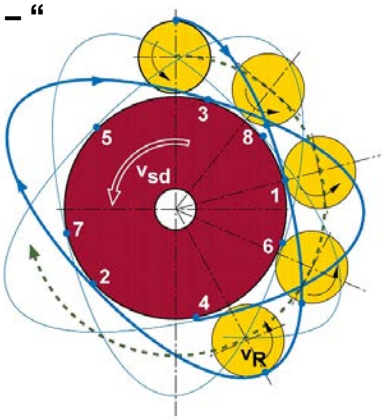
Counter direction symbol „ – “

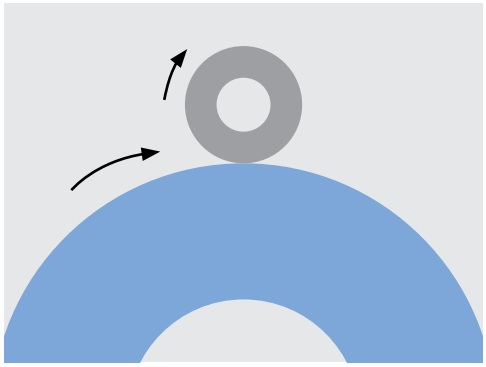
Grain contact

+ Stroking
+ Touching

Effects

+ Fine surface
+ Plane wheel
+ Low dressing forces
+ Higher grinding forces





Overview of the rotational direction during dressing

	SAME DIRECTION „ + “	COUNTER DIRECTION „ - “
Time required	High	Low
Dressing forces	High	Low
Actual surface roughness	Large	Small
Profile accuracy	High	Low

The dressing strategy also influences the geometry produced on the diamond or CBN grinding wheel. The following recommendations will reliably lead to an optimal result.

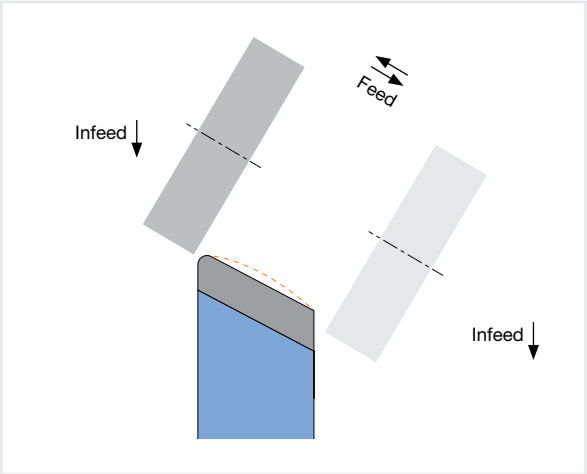


Figure 10: Application example "Convex"

When trueing in the counter direction, a high material removal is achieved.

If the infeed of the dressing wheel is outside of the abrasive layer, a convex flank is produced due to the abrupt wear of the dressing wheel. At the same time an undesired rounding at the edge of the grinding wheel is created.

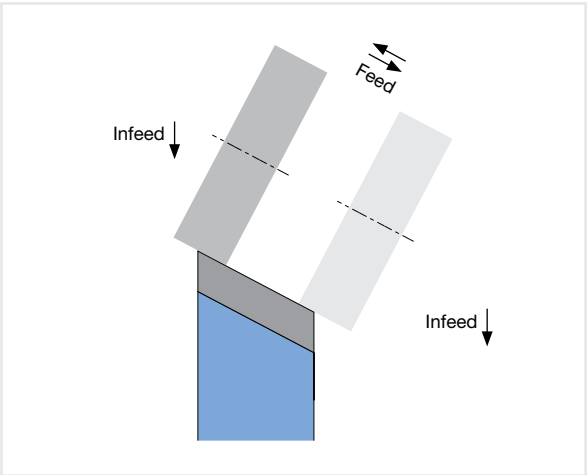


Figure 11: Application example "Straight Flank"

When trueing in the same direction, a relatively low material removal is achieved.

If the infeed of the dressing wheel is within the abrasive layer, a straight flank on the grinding tool and an almost sharp edge is produced. At the same time the wear of the dressing wheel is reduced.

Sharpening

The precise adaption of the process parameters during sharpening guarantees the highest precision and optimum cutting performance in the grinding process.

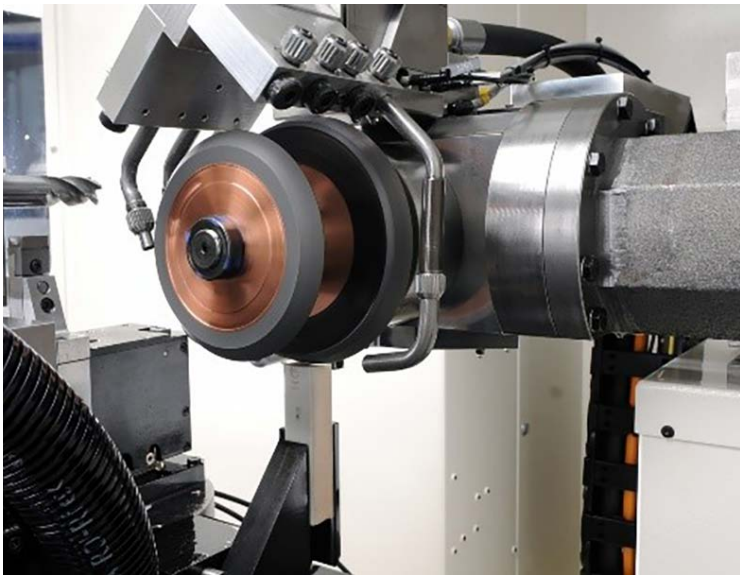


Figure 12: Sharpening of the diamond grinding wheel

Specification selection of the sharpening sticks

In practice, vitrified-bonded aluminium oxide sticks have proven their worth for sharpening diamond and CBN grinding wheels.

The following table shows the recommendations of TYROLIT application engineers depending on the grit size of the grinding tool that has to be dressed.

Recommended sharpening sticks

Classification grit sizes	Grit size DIA or CBN grinding tool	Grit size dressing tools	TYROLIT specification
	[µm]	[mesh]	
Micro grain	1 – 6	800	89A800 H5 AV83
	6 – 25	600	89A600 -25 V83
	20 – 39	400	83A400 H7 V217
Macro grain	39 - 107	240	89A240 J7 AV217
	107 - 181	120	89A120 H7 AV17

In order to achieve optimum results the following recommendations have to be considered.

The rotational direction of the grinding wheel during sharpening has to correspond to the rotational direction during grinding.

Rotational direction sharpening = rotational direction grinding

The sharpening block has to be saturated with lubricants.

Figure 13: Application sharpening

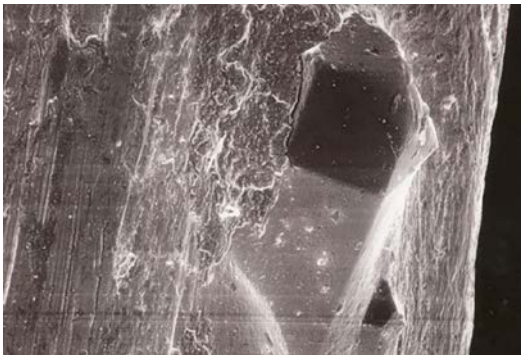


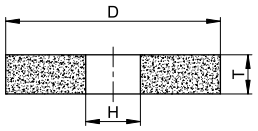
Figure 14: grain exposure / grain support

Stock assortment dressing wheels

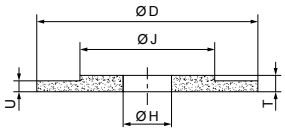
The dressing wheels recommended below are suitable for trueing the following bond systems and product lines:

Bond system of grinding wheel	Product line	Silicon carbide	Aluminium oxide	Option eroding
Resin-bonded	DIAGO, AMIGO	●	●	Not possible
	STARTEC BASIC	●	●	
	STARTEC CG	●	●	
	STARTEC XP-P cup wheels	●	●	
	STARTEC XP-F		●	
	STARTEC MT-2	●	●	
Metal-bonded	STARTEC PG-1	●		Possible
	STARTEC PG-2	●		Conditionally possible
	STARTEC XP-P	●	●	Possible
	STARTEC XP-P+	●	●	
	STARTEC XP-P+ cup wheels	●	●	Conditionally possible
	STARTEC RC	●	●	Possible
	STARTEC HP	●	●	
	STARTEC MT-1		●	Conditionally possible
	SKYTEC-BASIC	●		Not possible
Vitrified-bonded	STARTEC PG-1	●		

Stock assortment



Shape 1



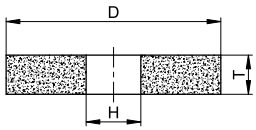
Shape 38

	Shape	Type number	D	T	H	J	U	Vs	Specification for CC	Stock	Note
	1	78685	100	10	20			40	C120 H5 AV18	●	For grit sizes < 64
		34070884	100	20	20				C240 I5 V15	●	Für Korngröße ≤ 54
		40596	100	20	20				C120 J5 V15	●	For grit sizes < 64
		287880	100	25	20			40	C120 J5 AV15	●	For grit sizes < 64
		2658	150	20	20			40	C80 J5 V15	●	Harder than standard, For grit sizes 151 - 64
		34531564	175	12	31,75				C80 J5 AV15	●	Für Korngröße 151 - 64
		34531324	175	12	31,75				89A120 M5 AV217	●	For grit sizes 54 - 46
		34531565	175	12	31,75				C120 J5AV 15	●	Harder than standard, For grit sizes 54 - 46
		34531566	175	12	31,75				C240 H5AV 18	●	For grit sizes 35 - 20
		34531562	175	12	31,75				89A400 H5 AV83	●	For grit sizes KG >15µm
		34062526	200	10	32				C120 H5 AV18	●	For grit sizes < 64
		179680	200	10	32				C240 H5 AV18	●	For grit sizes ≤ 54
		513035	200	10	32				C80 J7 V18	●	Für Korngröße 151 - 64
		520149	200	10	32				A240 M5 AV217	●	For grit sizes D35 - D20
		34049397	200	10	32				A400 H5 AV83	●	For grit sizes KG >15µm
		7348	200	20	20				C80 J5 V15	●	Dressing rough cleaning wheel D91 in the machine
		34163206	200	20	20				C120 J5 V15	●	External dressing wheel in D54/ D46
		3135	200	20	32				C80 J5 V15	●	Dressing rough cleaning wheel D91 in the machine
		88099	200	20	32				C240 I5 AV18	●	For grit sizes ≤ 54
		189322	200	20	32				A400 H5 AV217	●	For grit sizes KG >15µm
		34061809	250	10	51			35	A400 H5 AV	●	For grit sizes KG >15µm
		34157690	250	10	51			20	A800 G5 AV	●	For grit sizes KG ≤15µm

● … *Availabe ex stock*

	Shape	Type number	D	T	H	J	U	Vs	Specification for CC	Stock	Note
	1	619701	250	12	51			35	C80 J5 V15	●	Harder than standard, For grit sizes 151 - 64
		250491	250	12	51			35	C80 H8 V15	●	Standard hardness, For grit sizes 151 - 64
		889495	250	12	51				C120 J5 V15	●	External dressing wheel in D54/ D46
		413027	250	12	51			35	C120 H5 AV18	●	For grit sizes < 64
		631579	250	12	51				C240 H5 AV18	●	External dressing finishing wheel in D46
		708196	250	12	51			35	A120 M5 AV217	●	Alternative to SIC for grit sizes < 64
		34047880	300	10	76,2				C80 J5 V15	●	External dressing rough cleaning wheel in D91
		34066742	300	10	76,2				C120 J5 V15	●	External dressing rough cleaning wheel in D54/D46
		57814	300	10	76,2				C240 H5 AV18	●	External dressing finishing wheel in D46
		34023725	300	10	76,2			35	A120 M5 AV217	●	
		34023726	300	10	76,2			35	A240 M5 AV217	●	
		34023728	300	10	76,2			35	A400 H5 AV	●	For grit sizes KG>15µm
		34157689	300	10	76,2			20	A800 G5 AV	●	For grit sizes KG≤15µm
	38	34023732	300	10	76,2	140	6	20	A400 H5 AV83	●	

Stock assortment

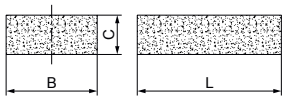


Shape 1

	Shape	Type number	D	T	H	J	U	Vs	Specification for CC	Note
	1	34261485	100	10	20	4		40	C80 H5 AV18	For grit size 151 - 64, Dressing within the machine
		10974	100	10	20	3		40	A80 M5 AV217	For grit size 151 - 64, Dressing within the machine
		372459	100	10	20	3		40	C240 H5 AV18	For grit size ≤ 54, Dressing within the machine
		178029	100	10	20	3		40	A240 M5 AV217	For grit size ≤ 54, Dressing within the machine
		746089	140	20	20	3		40	C80 J5 V15	Dressing on SF40

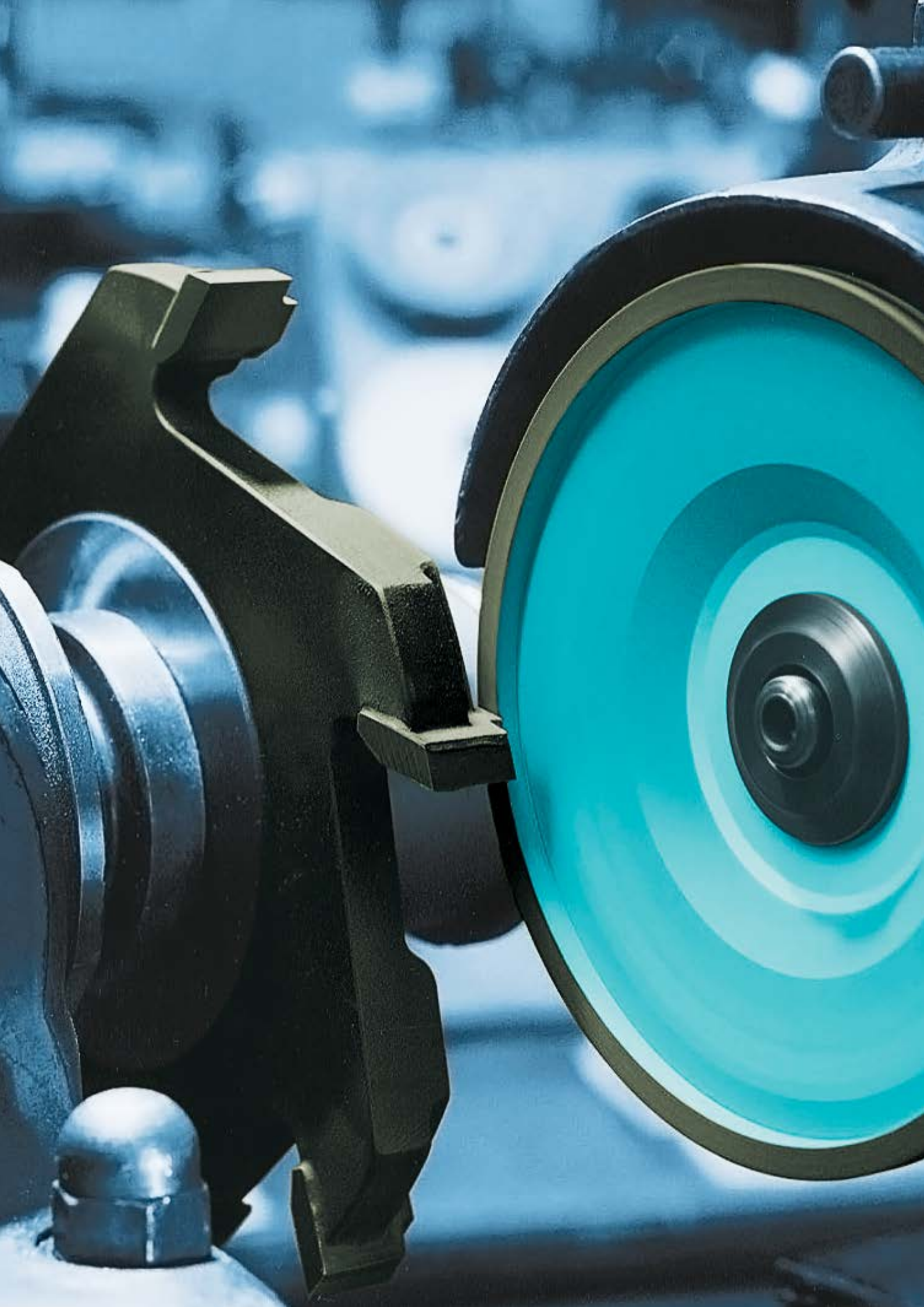
Shape	Type number	D	T	H	J	U	Vs	Specification for CC	Note
	34381321	150	10	20	3		40	C80 H8 V15	Standard hardness, For grit sizes 151 - 64
	34317906	150	10	20	4		40	C80 J5 V15	Harder than standard, For grit sizes 151 - 64
	34381313	150	10	20	3		40	C120 H5A V18	Standard hardness, For grit sizes 54 - 46
	34381322	150	10	20	4		40	C120 J5 V15	Harder than standard, For grit sizes 54 - 46
	34381315	150	10	20	3		40	C240 H5 AV18	For grit sizes 35 - 20
	34381326	150	10	20			40	A120 M5 AV217	For grit sizes 54 - 46
	34381328	150	10	20			40	A240 M5 AV217	For grit sizes 35 - 20
	34304382	150	10	20			40	A400 H5 AV83	For grit sizes KG < 20µm
	34381312	150	20	20			40	C80 H8 V15	Standard hardness, For grit sizes 151 - 64
	34381317	150	20	20			40	C120 H5 AV18	Standard hardness, For grit sizes 54 - 46
	34381314	150	20	20			40	C120 J5 V15	Harder than standard, For grit sizes 54 - 46
	34381320	150	20	20			40	C240 H5 AV18	For grit sizes 35 - 20
	34381324	150	20	20			40	A120 M5 AV217	For grit sizes 54 - 46
	34304383	150	20	20			40	A240 M 5AV217	For grit sizes 35 - 20
	34279644	150	20	20			40	A400 H5 AV83	For grit sizes KG < 20µm
	34531323	175	12	31,75				C80 H5 AV18	Standard hardness, For grit size 151 - 64 Cleveland Maschine
	34531325	175	12	31,75				C120 H5 AV18	For grit sizes < 64 Cleveland Maschine
	34531559	175	12	31,75				89A240 M5 AV217	For grit sizes 35 - 20
	34531563	175	12	31,75				89A800 G5 AV83	For grit sizes KG≤15µm
	34033629	250	10	51				A240 M5 AV217	For grit sizes D35 - D20
	128601	300	20	76,2			35	A120 M5 AV217	
	34023730	300	20	76,2			35	A240 M5 AV217	

Stock assortment



Shape 90AS

	Shape	Type number	B	C	L	Specification for CC	Stock	Note
	90AS	845594	24	13	100	89A120 J7 AV217	●	For grit size ≥ 126
		678952	24	13	100	A240 STARTEC	●	For STARTEC XP-P, XP-P+, RC and HP
		678953	24	13	200	A240 STARTEC	●	For STARTEC XP-P, XP-P+, RC and HP
		845595	24	13	100	89A240 J7 AV217	●	For STARTEC XP-P, XP-P+ and HP, harder type
		213930	24	13	200	89A240 J7 AV217		For STARTEC XP-P, XP-P+ and HP, harder type
		283422	24	13	100	89A240 J7 AV217		For STARTEC XP-P, XP-P+ and HP, harder type
		34204258	24	13	200	89A240 J7 AV217		For STARTEC XP-P, XP-P+ and HP, harder type
		932780	25	13	200	89A240 H7 AV83	●	For grit sizes > 46
		577953	24	13	200	89A600 J5 AV283	●	For grit sizes <= 46
		395773	50	25	200	89A120 H7 AV17	●	For grit sizes ≥ 126
		460976	50	25	200	89A120 J7 AV217	●	For grit sizes ≥ 126
		464290	50	25	200	89A240 J7 AV17	●	For grit sizes > 46
		33531	25	13	100	89A600-25 V83	●	For grit size <=46
		251584	50	25	200	89A600-25 V83	●	For grit size <=46
		112055	50	25	200	50C220 C4 B22	●	For grit size > 46 and <= 126 resin-bonded

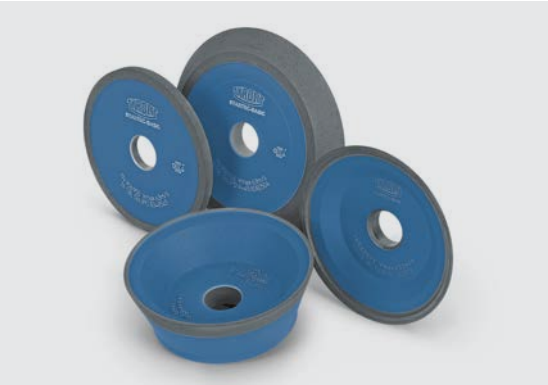


4. Regrinding of shaft tools

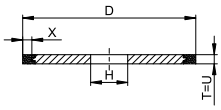
4.1 STARTEC BASIC
Diamond grinding tools for wet grinding

For the professional regrinding of tungsten carbide shaft tools, TYROLIT offers grinding tools especially adapted for wet grinding. The STARTEC BASIC diamond grinding tools are characterised by a high stock removal rate and excellent profile retention. This results in an outstanding surface finish, optimum cutting edge quality and maximum profile accuracy of the ground tools.

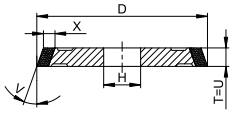
Positive side effect: the STARTEC BASIC diamond grinding tools are also suitable for the manufacture of shaft tools.



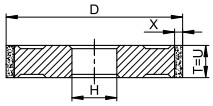
Stock range



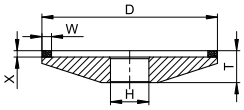
Shape 1A1R



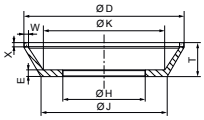
Shape 1V1



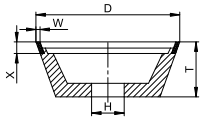
Shape 1A1



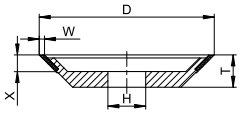
Shape 4A2



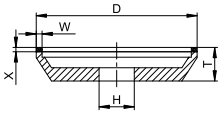
Shape 11A2



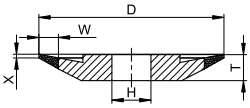
Shape 11V9



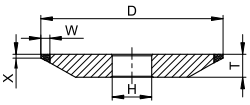
Shape 12V9



Shape 12A2D



Shape 4BT9



Shape 4ET9

	Shape	Type number	D	T	H	U	W	X	V°	Specification	Stock
	1A1R	73837*	100	1	20	1		5		D151 C100 B53	●
		175978*	150	1	20	1		7		D151 C100 B53	●
		34412734*	150	1	22	1		7		D151 C100 B53	●
		145778*	200	1,2	22	1,2		7		D126 C100 B53	●
		129754*	200	1,2	30	1,2		7		D126 C100 B53	●
	1V1	34220157*	100	10	20	10		10	20	STARTEC-BASIC DE64 3BS	●
		719724*	125	12	20	12		10	20	STARTEC-BASIC DE64 3BS	●
	1A1	34412732*	100	10	20	10		3		D126 C75 B48	●
		437298	100	10	20	10		6		STARTEC-BASIC DE64 3BS	●
		34227733*	100	10	20	10		10		STARTEC-BASIC DE64 3BS	●
		401514*	125	12	20	12		10		STARTEC-BASIC DE64 3BS	●

● ... Available ex stock / * *TYROLIT recommendation*

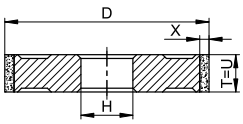
Customer-specific grinding tools can be produced on request.
Delivery times on request.

Shape	Type number	D	T	H	U	W	X	V°	Specification	Stock
4A2	213274*	125	10	20		5	2		D64 C50 B53	●
11A2	34412733*	100	30	20		8	2		D64 C50 B48	●
11V9	390970	75	30	20		2	10		STARTEC-BASIC DE64 3BS	●
	34166294*	100	35	20		2	10		STARTEC-BASIC DE126 3BS	●
	357223	100	35	20		2	10		STARTEC-BASIC DE64 3BS	●
	34296485*	100	35	20		3	10		STARTEC-BASIC DE126 3BS	●
	532514*	100	35	20		3	10		STARTEC-BASIC DE64 3BS	●
	34412731*	100	35	20		3	10		STARTEC-BASIC DE54 3BS CNC	●
12V9	495020	75	20	20		2	6		STARTEC-BASIC DE64 3BS	●
	613634*	100	20	20		2	10		STARTEC-BASIC DE126 3BS	●
	532510*	100	20	20		2	10		STARTEC-BASIC DE64 3BS	●
	532529	100	20	20		3	10		STARTEC-BASIC DE64 3BS	●
	588699*	125	25	20		2	10		STARTEC-BASIC DE126 3BS	●
	363993	125	25	20		2	10		STARTEC-BASIC DE64 3BS	●
	532540	125	25	20		3	10		STARTEC-BASIC DE64 3BS	●
	631183*	125	25	20		3	10		STARTEC-BASIC DE54 3BS	●
12A2D	34412676*	100	25	20		10	3		D64 C75 B48	●
	34412677*	100	25	20		10	3		D126 C75 B48	●
	495044	125	25	20		15	3		D54 C75 B48	●
	34412678*	150	25	20		10	3		D126 C75 B48	●
4BT9	941157*	100	10	20		10	1		D91 C75 B53	●
4ET9	897024	150	14	32		10	1		D126 C100 B	●

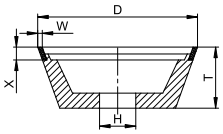
● ... Available ex stock / * *TYROLIT recommendation*

Customer-specific grinding tools can be produced on request.
Delivery times on request.

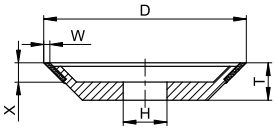
Standard range



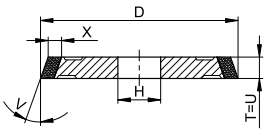
Shape 1A1



Shape 11V9



Shape 12V9



Shape 1V1

	Shape	Type number	D	T	H	U	W	X	V°	Specification	Note
	1A1	34301110	75	4	20	4		6		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34285810	75	10	20	10		6		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301114	100	8	20	8		6		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301120	100	12	20	12		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301132	100	18	20	18		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301133	100	20	20	20		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301135	125	8	20	8		6		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301137	125	12	20	12		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301139	125	18	20	18		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301140	125	20	20	20		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301142	150	15	20	15		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301143	150	20	20	20		10		STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
	1V1	34301147	100	10	20	10		10	30	STARTEC BASIC DE54-3-BS	Suitable for regrinding and production, gashing
		34301154	125	6	20	6		10	15	STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301156	125	10	20	10		10	30	STARTEC BASIC DE54-3-BS	Suitable for regrinding and production, gashing
		34301158	125	15	20	15		10	15	STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
		34301161	150	12	20	12		10	15	STARTEC BASIC DE54-3-BS	Suitable for regrinding and production
	11V9	34301162	75	30	20		2	10		STARTEC BASIC DE46-4-BS	Suitable for regrinding and production
		34301165	125	40	20		3	10		STARTEC BASIC DE46-4-BS	Suitable for regrinding and production
	12V9	34301170	125	25	20		2	10		STARTEC BASIC DE46-4-BS	Suitable for regrinding and production
		34301182	150	25	20		3	10		STARTEC BASIC DE46-4-BS	Suitable for regrinding and production

Customer-specific grinding tools can be produced on request. Take longer delivery times into account.

Application recommendation

a. Application recommendation for dressing
For dressing especially designed dressing wheels are available ex stock. Find our assortment on page 112.

b. Application recommendation for flute grinding
For the use of our STARTEC BASIC flute grinding wheels,
the TYROLIT application engineers recommend the following parameters:

Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Flute grinding	20 - 25	see Q'w table		x		Required	
Face grinding	24 - 30	Full depth	40 - 100			Required	

Please note that the application parameters presuppose optimum coolant supply
and workpiece clamping. Please observe the safety information on page 156.

Q'w table

The values in the following table provide information on performance during the Q'w grinding process. Via the infeed ae (profile depth), you can find the optimum feed vt for use with the STARTEC BASIC flute grinding wheels. The achieved feed values depend on the workpiece diameter, the spiral angle of the chip flutes, the cooling lubricant used and the machine-tool output available.

Standard values for flute grinding

		Q'w [mm3/s.mm]
Product line	**vc [m/s]**	**Standard**
STARTEC BASIC	20-25	1,3 to 2,6

Feed vt [mm/min]

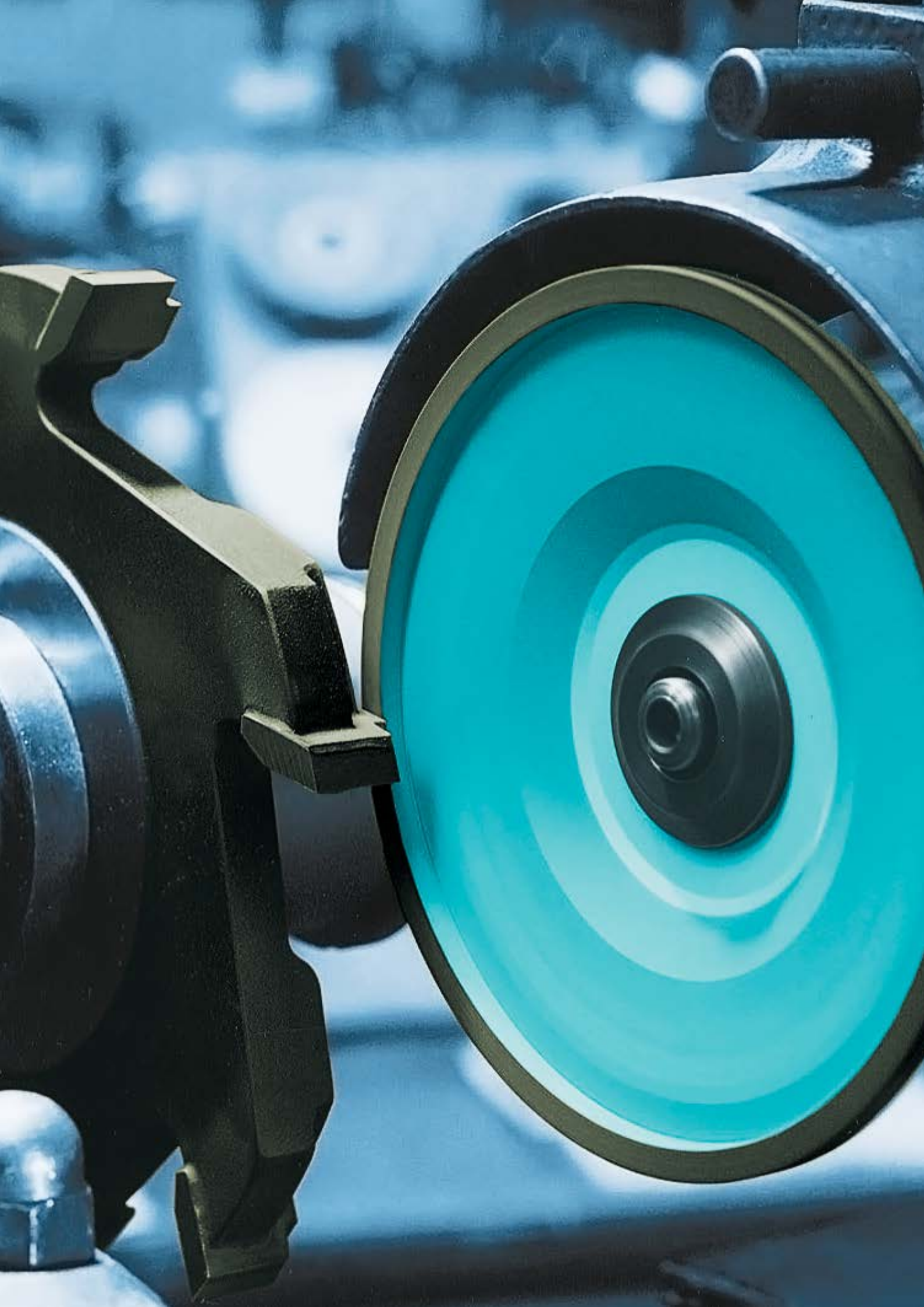
Profile depth ae [mm]	**30**	**40**	**50**	**60**	**70**	**80**	**100**	**120**	**140**
1,0					1,2	**1,3**	**1,7**	**2,0**	2,3
1,2				1,2	**1,4**	**1,6**	**2,0**	2,4	
1,4			1,2	**1,4**	**1,6**	**1,9**	2,3		
1,6			1,3	**1,6**	**1,9**	**2,1**	2,7		
1,8		1,2	**1,5**	**1,8**	**2,1**	2,4			
2,0		1,3	**1,7**	**2,0**	**2,3**	2,7			
2,2	1,1	**1,5**	**1,8**	**2,2**	2,6				
2,4	1,2	**1,6**	**2,0**	**2,4**	2,8				
2,6	1,3	**1,7**	**2,2**	**2,6**	3,0				
2,8	**1,4**	**1,9**	**2,3**	2,8					
3,0	**1,5**	**2,0**	**2,5**	3,0					

Calculation of values

Q'w = ae x vt / 60
vt = Q'w x 60 / ae

vt standard STARTEC BASIC

vt optimisation potential

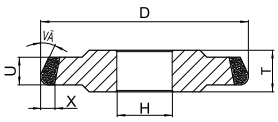


STARTEC BASIC
Diamond grinding tools for wet grinding

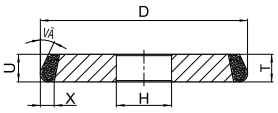
TYROLIT offers shape-adapted grinding tools with specifications tailored specifically to the regrinding of high-performance drilling tools.

The profiles of the grinding tools are optimally adapted to the relevant drill types and to the machining task. The grinding wheels impress due to their high stock removal rates as well as their excellent profile retention.

Standard range for Kennametal SE and HP drills



14FV1



1FV1

Shape	Type number	Drill type	Application	D	T	H	W	U	X	R1	R2	V°	Specification
14FV1	34157285	KSEGW03-04FP	Face grinding/ point grinding	125	8	20		6	6	0.4	0.4	20	DE543PD STARTEC BASIC
1FV1	34039308	KSEGW03-06FP	Face grinding/ point grinding	125	8	20		8	8	0.8	0.5	20	DE543PD STARTEC BASIC
	34039309	KSEGW06-08FP	Face grinding/ point grinding	125	10	20		10	6	1.2	0.8	20	DE543PD STARTEC BASIC
	34039310	KSEGW08-11FP	Face grinding/ point grinding	125	12	20		12	6	1.7	1	20	DE543PD STARTEC BASIC
	34157288	KSEGW11-15FP	Face grinding/ point grinding	125	16	20		16	6	2.3	1.3	20	DE543PD STARTEC BASIC
	34039351	KSEGW15-20FP	Face grinding/ point grinding	125	22	20		22	6	3	1.7	20	DE543PD STARTEC BASIC
	34157289	KSEGW20-25FP	Face grinding/ point grinding	125	25	20		25	5	4.2	2.2	20	DE543PD STARTEC BASIC
	34157275	KSEGW25-32FP	Face grinding/ point grinding	125	28	20		28	7.1	5	3	20	DE543PD STARTEC BASIC

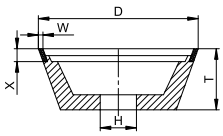
The grinding tools for the SE and HP drill types are profiled with a face angle V° of 20° and two different radii R1 and R2.

Standard range for Kennametal TF drills

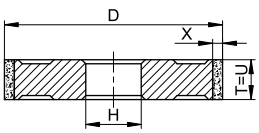
Shape	Type number	Drill type	Application	D	T	H	W	U	X	R1	R2	V°	Specification
14FV1	34157276	KTFGW03-07F	Face grinding	125	8	20		6	5	0.2		24	DE543PD STARTEC BASIC
1FV1	34157277	KTFGW07-11F	Face grinding	125	8	20		8	5	0.5		24	DE543PD STARTEC BASIC
	34157278	KTFGW11-20F	Face grinding	125	13	20		13	6	1		24	DE543PD STARTEC BASIC
	34157279	KTFGW20-25F	Face grinding	125	16	20		16	6	1.5		24	DE543PD STARTEC BASIC
14FV1	34161162	KTFGW03-07P	Point grinding	125	8	20		6	5	0.2		15	DY323PD STARTEC BASIC
	34161163	KTFGW07-11P	Point grinding	125	8	20		8	5	0.5		15	DY323PD STARTEC BASIC
	34161172	KTFGW11-20P	Point grinding	125	13	20		13	6	1		15	DY323PD STARTEC BASIC
	34157284	KTFGW20-25P	Point grinding	125	16	20		16	6	1.5		15	DY323PD STARTEC BASIC

The grinding tools for the TF drill type are designed for face grinding at a face angle V° of 24° and for point thinning at a face angle V° of 15°. A radius R corresponding to the drill profile is used on the smaller grinding wheel diameter.

Standard range for Kennametal TF drills



11V9



1A1

Shape	Type number	Drill type	Application	D	T	H	W	U	X	R1	R2	V°	Specification
11V9	881915	KTXGW03-25F	Face grinding	100	35	20	2		10			20	DE463PD STARTEC BASIC
1A1	34157274	KTXGW03-12F	Face grinding	100	5	20		5	6				DE763PD STARTEC BASIC
	34157273	KTXGW03-25F	Face grinding	100	5	20		10	6				DE763PD STARTEC BASIC

Customer-specific grinding tools for further drill types can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
For dressing especially designed dressing wheels are available ex stock. Find our assortment on page 112.

b. Application recommendation for regrinding
For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

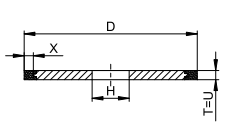
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Regrinding of Kennametall TC drill types SE, HP, TF and TX	22 - 24	Correction dimension	80 - 150	x		Required	In the case of coated drills, an infeed which is larger than the layer thickness must be selected. Special Kennametal software available

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

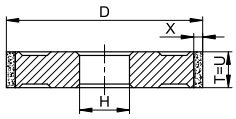
4.2 STARTEC BASIC
CBN grinding tools for wet grinding

For the professional regrinding of HSS shaft tools, TYROLIT offers grinding tools especially adapted for wet grinding. The STARTEC BASIC CBN grinding tools are characterised by a high stock removal rate and excellent profile retention. This results in an outstanding surface finish, optimum cutting edge quality and maximum profile accuracy of the ground tools.

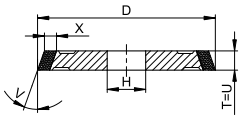
Stock range



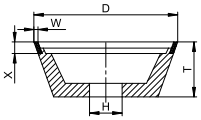
Shape 1A1R



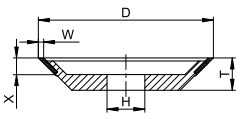
Shape 1A1



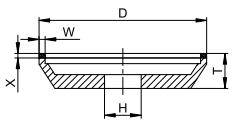
Shape 1V1



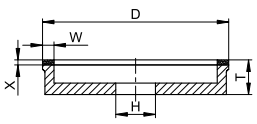
Shape 11V9



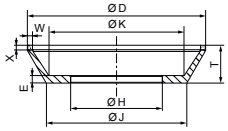
Shape 12V9



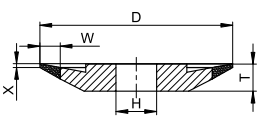
Shape 12A2D



Shape 6A2



Shape 11A2



Shape 4BT9

	Shape	Type number	D	T	H	U	X	V	Specification	Stock
	1A1R	486834*	100	1	20	1	5		B126 C100 B53	●
	1A1	906950	100	6	20	6	6		STARTEC-BASIC BL126 3PD	●
		906951	100	10	20	10	6		STARTEC-BASIC BL126 3PD	●
		34412847*	100	10	20	10	60		B126 C75 B42	●
		906954	125	10	20	10	6		STARTEC-BASIC BL126 3PD	●

** TYROLIT recommendation*

	Shape	Type number	D	T	H	W	X	V	Specification	Stock
	1V1	906946	125	12	20	12	6	45	STARTEC-BASIC BL126 3PD	●
		906947	150	6	20	6	6	15	STARTEC-BASIC BL126 3PD	●
	11V9	75669	75	30	20	2	10		STARTEC-BASIC BL126 3PD	●
		494983	75	30	20	2	10		STARTEC-BASIC BL76 3PD	●
		110170*	100	35	20	2	10		STARTEC BASIC BL126 3 PD	●
		494985	100	35	20	2	10		STARTEC-BASIC BL76 3PD	●
		86883*	100	35	20	3	10		STARTEC BASIC BL126 3 PD	●
		532564	100	35	20	3	10		STARTEC-BASIC BL76 3PD	●
	12V9	75679	100	20	20	2	10		STARTEC BASIC BL126 3 PD	●
		453755*	100	20	20	2	10		STARTEC BASIC BL126 3 PD CNC	●
		532571	100	20	20	2	10		STARTEC BASIC BL76 3 PD	●
		75685	125	25	20	2	10		STARTEC BASIC BL126 3 PD	●
		496542*	125	25	20	2	10		STARTEC BASIC BL126 3 PD CNC	●
		495027	125	25	20	2	10		STARTEC BASIC BL76 3 PD	●
	12A2D	495046	100	25	20	5	3		B91 C100 B	●
		173082	125	25	20	15	3		B91 C100 B	
		34231631*	150	25	20	10	3		B126 C75 B75	
	6A2	495038	125	30	20	5	3		STARTEC BASIC BL91 3PD	●
		495037	150	35	20	5	3		STARTEC BASIC BL91 3PD	
	11A2	34412848*	100	30	20	8	2		B64 C50 B48	●
	4BT9	886140*	100	10	20	10	1		B126 C75 B53	●
		495058	125	10	20	10	1		STARTEC-BASIC BL126 3PD	●

** TYROLIT recommendation*

Available ex stock.
Customer-specific grinding tools can also be produced on request.
Take longer delivery times into account.

Application recommendation

a. Application recommendation for dressing
For dressing especially designed dressing wheels are available ex stock. Find our assortment on page 112.

b. Application recommendation for regrinding
For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

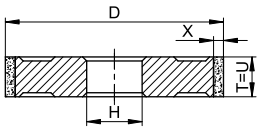
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Regrinding of HSS tools, wet	24 - 30	Correction dimension	80 - 150	x		Required	In the case of coated tools, an infeed that is larger than the layer thickness must be selected.

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping. Please observe the safety information on page 156.

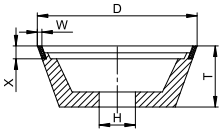
4.3 DIAGO
Diamond grinding tools for dry grinding

For the professional regrinding of tungsten carbide shaft tools, TYROLIT offers grinding tools especially adapted for dry grinding. Optimum heat dissipation from the grinding area and high stock removal rates as well as excellent profile retention characterise the diamond grinding tools of the DIAGO product line. This results in an outstanding surface finish, optimum cutting edge quality and maximum profile accuracy of the ground tools.

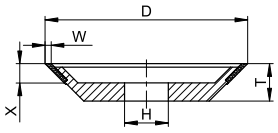
Stock range



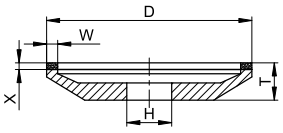
Shape 1A1



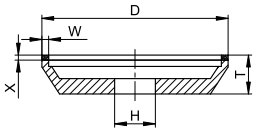
Shape 11V9



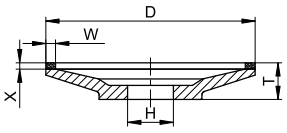
Shape 12V9



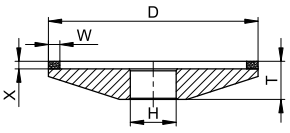
Shape 12A2



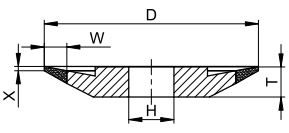
Shape 12A2D



Shape 12A2F



Shape 4A2



Shape 4BT9

	Shape	Type number	D	T	H	W	X	Specification	Stock
	1A1	640978	100	10	20	10	6	D64 C50 B	●
	11V9	249717	75	30	20	2	6	D125 C75 B	●
		679634	75	30	20	2	10	DIAGO D126 C75 B	●
		721301	75	30	20	2	10	DIAGO D64 C50 B	●
		676589	100	35	20	2	10	DIAGO D181 C75 B	●
		46198	100	35	20	3	10	DIAGO D181 C75 B	●
		675309	100	35	20	2	10	DIAGO D126 C75 B	●
		335803	100	35	31,75	2	10	DIAGO D126 C75 B	●
		681915	100	35	20	2	10	DIAGO D91 C75 B	●
		675272	100	35	20	2	10	DIAGO D64 C50 B	●

	Shape	Type number	D	T	H	W	X	Specification	Stock
	11V9	576021	100	35	20	2	10	D126 C75 B	●
		5028	100	35	20	3	10	D126 C75 B	●
		561390	100	35	20	3	10	D126 C75 B	●
		675318	100	35	20	3	10	DIAGO D126 C75 B	●
		721303	100	35	20	3	10	DIAGO D64 C50 B	●
		679946	125	40	20	3	10	DIAGO D126 C75 B	●
	12V9	696324	75	20	20	2	6	DIAGO D126 C75 B	●
		721319	75	20	20	2	6	DIAGO D64 C50 B	●
		689930	100	20	20	2	10	DIAGO D126 C75 B	●
		311250	125	25	20	2	10	D126 C75 B	●
		90998	125	25	20	2	6	D54 C65 B	●
		194540	100	20	20	2	10	DIAGO D91 C75 B	●
		43588	100	20	20	2	10	D91 C75 B	●
	12A2	19220	125	16	20	6	2	D126 C75 B	●
		291603	150	18	20	5	3	D91 C75 B	●
	12A2D	104376	100	25	20	5	3	D91 C75 B	●
		28162	100	25	20	6	2	D126 C75 B	●
		38012	100	25	20	6	2	D64 C50 B	●
		462949	100	27	20	6	4	D64 C50 B	●
		779789	100	25	20	10	3	D91 C75 B	●
	12A2F	102902	125	23	20	5	4	D126 C50 B	●
		842923	125	23	20	5	4	D151 C75 B	●
		731399	125	23	20	5	4	D151 C75 B	●
		731387	125	23	20	5	4	D64 C50 B	●
		97868	125	23	20	5	4	D64 C50 B	●
		416671	150	22	20	4	3	D64 C50 B	●
		679671	150	23	20	5	4	D126 C75 B	●

	Shape	Type number	D	T	H	W	X	Specification	Lager
	4A2	86734	125	10	20	5	2	D64 C50 B	●
		480500	125	10	20	5	2	D126 C75 B	●
		215813	150	12	20	5	2	D126 C50 B	●
		436472	150	12	20	5	2	D64 C50 B	●
	4BT9	255835	100	10	20	10	1	D91 C75 B	●

● *… Available ex stock*

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
For dressing especially designed dressing wheels are available ex stock. Find our assortment on page 112.

b. Application recommendation for regrinding
For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

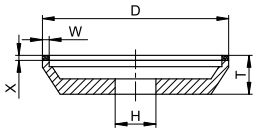
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Regrinding of TC tools, dry	16 - 22	Correction dimension	50 - 120	x			In the case of coated tools, an infeed that is larger than the layer thickness must be selected.

Please note that the application parameters presuppose optimum workpiece clamping.
Please observe the safety information on page 156.

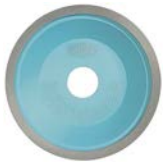
Diamond Grinding Tools for Dry Grinding on EWAG WS11

TYROLIT offers adapted diamond grinding tools specially for grinding tungsten carbide precision tools on EWAG WS11 machines. Optimised specifications ensure excellent cutting edges and a perfect surface finish on the ground tools.

Standard range



Shape 12A2D

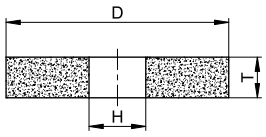
	Shape	Type number	D	T	H	W	X	Specification	Note
	12A2D	201729	75	22	20	3	3	D126 C75 B	Pre-grinding, rapid stock removal
		34032701						D46 C75 B	Medium stock removal
		15226						D20 C75 B	Improved cutting edges
		15211						D15 C75 B	Fine grinding
		642021						D7 C50 B	Polish grinding

Customer-specific grinding tools can be produced on request.
Delivery times on request.

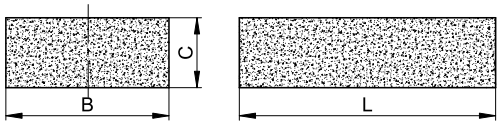
Application recommendation

a. Application recommendation for dressing

We recommend the specially adapted dressing wheels for dressing in the machine.



Shape 1



Shape 90AS

	Shape	D	T	H	Specification	Type number	Stock	Note
 	1	100	10	20	A120M5V	34023777		For grit sizes ≤ D126
					A240M5V	178029		For grit sizes ≤ D46 and ≥ D15
					A600G5V	34070169		For grit sizes ≤ D7
					C120H5V	78685	●	For grit sizes ≤ D126
					C240H5V	372459		For grit sizes ≤ D46 and ≥ D20
					C600H5V	606366		For grit sizes ≤ D15

	Shape	B	C	L	Specification	Type number	Stock	Note
	90AS	24	13	100	A120H7V	845593	●	For grit sizes ≤ D126
		24	13	100	A240J7V	845595	●	For grit sizes ≤ D46 and ≥ D20
		25	13	100	A600-25V	33531	●	For grit sizes ≤ D15

● ... Available ex stock

Customer-specific grinding tools can be produced on request.
Delivery times on request.

b. Application recommendation for regrinding

For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

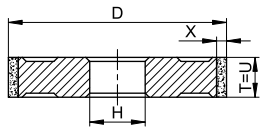
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Note
Regrinding of TC tools, dry	18 - 20	0.2-0.007	Manual	The maximum infeed ae depends on the grit size used

Please note that the application parameters presuppose optimum workpiece clamping.
Please observe the safety information on page 156.

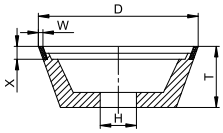
4.4 AMIGO
CBN grinding tools for dry grinding

For the professional regrinding of HSS shaft tools, TYROLIT offers grinding tools especially adapted for dry grinding. Optimum heat dissipation from the grinding area and high stock removal rates as well as excellent profile retention characterise the CBN grinding tools of the AMIGO product line. This results in an outstanding surface finish, optimum cutting edge quality and maximum profile accuracy of the ground tools.

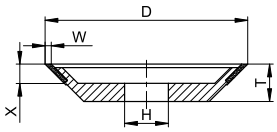
Stock range



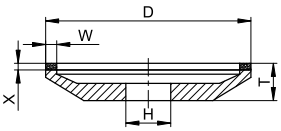
Shape 1A1



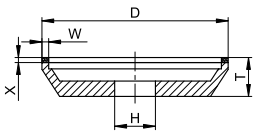
Shape 11V9



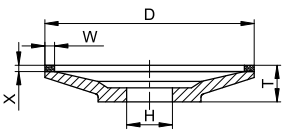
Shape 12V9



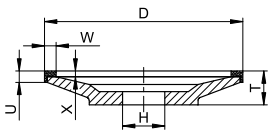
Shape 12A2



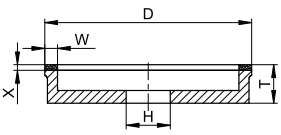
Shape 12A2D



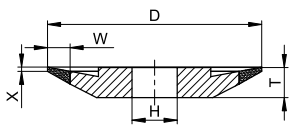
Shape 12A2F



Shape 12C2F



Shape 6A2



Shape 4BT9

Shape	Type number	D	T	H	U	X	Specification
1A1	620464	100	10	20	10	6	B126 C50 B54 BA

	Shape	Type number	D	T	H	W	U	X	Specification
	11V9	640777	75	30	20	2		10	AMIGO B126 C75 B
		666288	100	35	20	2		10	AMIGO B181 C75 B
		561391	100	35	20	2		10	B151 C75 B
		617388	100	35	20	2		10	AMIGO B126 C75 B
		644514	100	35	20	2		10	AMIGO B91 C75 B
		636398	100	35	20	3		10	AMIGO B126 C75 B
		649723	100	35	32	2		10	AMIGO B126 C75 B
		641854	125	40	20	2		10	AMIGO B126 C75 B
		644532	125	40	20	2		10	AMIGO B91 C75 B
	12V9	703242	75	20	20	2		6	AMIGO B126 C75 B
		636658	100	20	20	2		10	AMIGO B126 C75 B
		840506	125	25	20	2		10	AMIGO B126 C75 B
	12A2	436484	150	18	20	5		2	B126 C50 B
		124644	150	18	20	5		3	B126 C50 B
		337051	150	18	20	4		3	B126 C75 B
		649692	175	20	20	6		2	B151 C75 B
	12A2D	217976	100	25	20	6		2	B126 C50 B
		666137	100	25	20	6		3	B126 C50 B
	12A2F	69502	125	23	20	5		4	B126 C50 B
	12C2F	646778	125	23	20	5	5	4	AMIGO B91 C75 B
		641839	125	23	20	5	5	4	AMIGO B151 C75 B
		641842	150	23	20	5	5	4	AMIGO B151 C75 B
	6A2	735896	100	30	20	3		6	B126 C75 B
	4BT9	119325	100	10	20	10		1	B126 C75 B

● ... Available ex stock

Customer-specific grinding tools can be produced on request.
Delivery times on request.

Application recommendation

a. Application recommendation for dressing
For dressing especially designed dressing wheels are available ex stock. Find our assortment on page 112.

b. Application recommendation for regrinding
For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

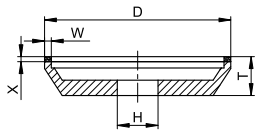
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Grinding direction		Cooling	Note
				Forward	Reverse		
Regrinding of HSS tools, dry	20 - 25	Correction dimension	50 - 120	x			In the case of coated tools, an infeed that is larger than the layer thickness must be selected.

Please note that the application parameters presuppose optimum workpiece clamping.
Please observe the safety information on page 156.

CBN Grinding Tools for Dry Grinding on EWAG WS11

TYROLIT offers adapted CBN grinding tools specially for grinding HSS precision tools on EWAG WS11 machines. Optimised specifications ensure excellent cutting edges and a perfect surface finish on the ground tools.

Standard range



Shape 12A2D

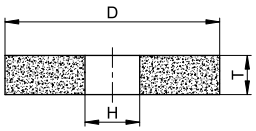
	Shape	Type number	D	T	H	W	X	Specification	Note
	12A2D	206511	75	22	20	3	3	B126 C75 B	Pre-grinding, high stock removal
		206513						B54 C75 B	Medium stock removal
		770469						B30 C75 B	Fine grinding
		770467						B15 C75 B	Polish grinding

Customer-specific grinding tools can be produced on request.
Delivery times on request.

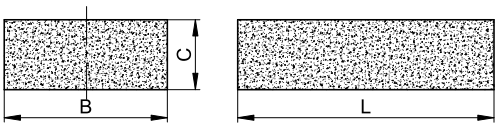
Application recommendation

a. Application recommendation for dressing

Specially adapted dressing wheels are available ex stock for dressing.



Shape 1



Shape 90AS

	Shape	B	T	H	Specification	Type number	Stock	Note
	1	100	10	20	A120M5V	34023777		For grit sizes ≤ B126
					A240M5V	178029		For grit sizes ≤ B46 and ≥ B15
					A600G5V	34070169		For grit sizes ≤ B7
					C120H5V	78685	●	For grit sizes ≤ B126
					C240H5V	372459		For grit sizes ≤ B46 and ≥ B20
					C600H5V	606366		For grit sizes ≤ B15

	Shape	B	C	L	Specification	Type number	Stock	Note
	90AS	24	13	100	A120H7V	845593	●	For grit sizes ≤ B126
		24	13	100	A240J7V	845595	●	For grit sizes ≤ B46 and ≥ B20
					A600-25V	33531	●	For grit sizes ≤ B15
		25	13	100				

● ... Available ex stock

Customer-specific grinding tools can be produced on request.
Delivery times on request.

b. Application recommendation for regrinding

For use of our grinding tools for regrinding, the TYROLIT application engineers recommend the following parameters:

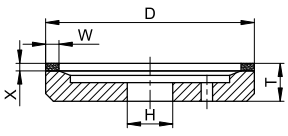
Grinding process	Cutting speed vc [m/s]	Infeed/ae [mm]	Feed vt [mm/min]	Note
Regrinding of TC tools, dry	18 - 20	0,007-0,2	Manual	The maximum infeed ae depends on the grit size used

Please note that the application parameters presuppose optimum workpiece clamping.
Please observe the safety information on page 156.

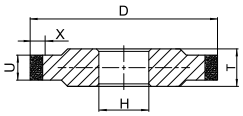
4.5 SKYTEC BASIC+
Grinding of PCD and CBN cutting tools

An extensive range of grinding tools is available especially for sharpening shaft tools with PCD or PCBN cutting edges. The SKYTEC PCD-BASIC+ product line represents all that is best in grinding tools. Lowest levels of cutting-edge chipping and an increased stock removal rate guarantee shorter grinding times and longer dressing intervals. These offer a major improvement in comparison to conventional grinding tools.

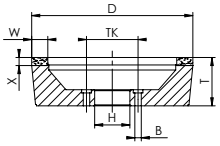
Stock range



Shape 6A2T



Shape 14A1



Shape 11A2B

	Shape	Type number	D [mm]	T [mm]	H [mm]	W/U [mm]	X [mm]	Specification	C100	New C125
	6A2H	735142				4	5	D9VB+	●	
		735143				4	5	D15VB+	●	
		617338				6	8	D15VB+	●	
		702920				5	6	D64VB+		●
		735144				10	10	D9VB+	●	
		735147	150	40	40	10	10	D15VB+	●	
		34205081				10	10	D46VB+		●
		617337				20	10	D15VB+	●	
		735148				20	10	D20VB+	●	
		735150				20	10	D32VB+	●	
		683341				20	10	D64VB+		●

	Shape	Type number	D [mm]	T [mm]	H [mm]	W/U [mm]	X [mm]	Specification	C100	New C125
	14A1	34464677	350	20	127	4	5	D12VB+	●	
		34464677				6	10	D12VB+	●	
	11A2B	165927	200	57	50	4	6	D9VB+		●
		165050				10	10	D9VB+		●
		165055				20	8	D9VB+		●
		166628				4	6	D15VB+		●
		166631				10	10	D15VB+		●
		168325				20	10	D15VB+		●
		165056	250	70	60	5	6	D9VB+		●
		165093				8	10	D9VB+		●
		165100				10	10	D9VB+		●
		165105				20	8	D9VB+		●
		166656				10	10	D15VB+		●
		168327				20	8	D15VB+		●

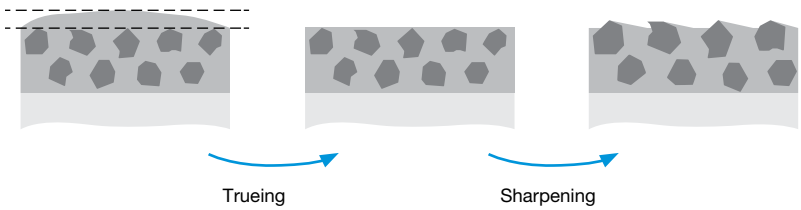
● ... Available ex stock

Customer-specific grinding tools can be produced on request.
Delivery times on request.

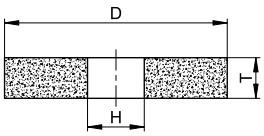
Application recommendation

a. Application recommendation for dressing

In addition to the correct choice of specification, dressing and sharpening are also important factors. Dressing is carried out using a ceramic SiC wheel that produces the geometry and evenness of the abrasive layer. Following trueing, sharpening is performed using a ceramic aluminium oxide or ceramic SiC sharpening stick that resets the bond and exposes the diamonds again.



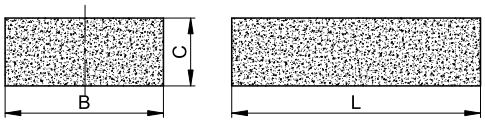
Recommended dressing wheel – shape 1



Shape 1

	Shape	Material number	D	T	H	Specification	Stock
	1	473304	75	20	12.7	C120J5V15	●

Recommended sharpening stick – shape 90AS



Shape 90AS

	Shape	Material number	B	C	L	Specification	Stock
	90AS	845595	25	13	100	89A240J7AV17	●
		33531	25	13	100	89A600-25V83	●
		703371	25	13	100	1C40014AV18	

b. Application recommendations for PCD/PCBN grinding
For the use of our grinding tools for PCD/PCBN grinding, the TYROLIT application engineers recommend the following parameters:

PCD peripheral grinding

Application	Requirements for cutting edges and surface	Standard values for achievable chipping	Specification
Pre-grinding	Low	>20µm	**D25VB+**
Universal grinding	Medium	10-20µm	**D15VB+**
Finish grinding	High	<10µm	**D9VB+**
Fine grinding	Very high	<8µm	**D6VB+**

Suitable for use on manual or CNC-controlled EWAG or Coborn machines.

PCBN peripheral grinding

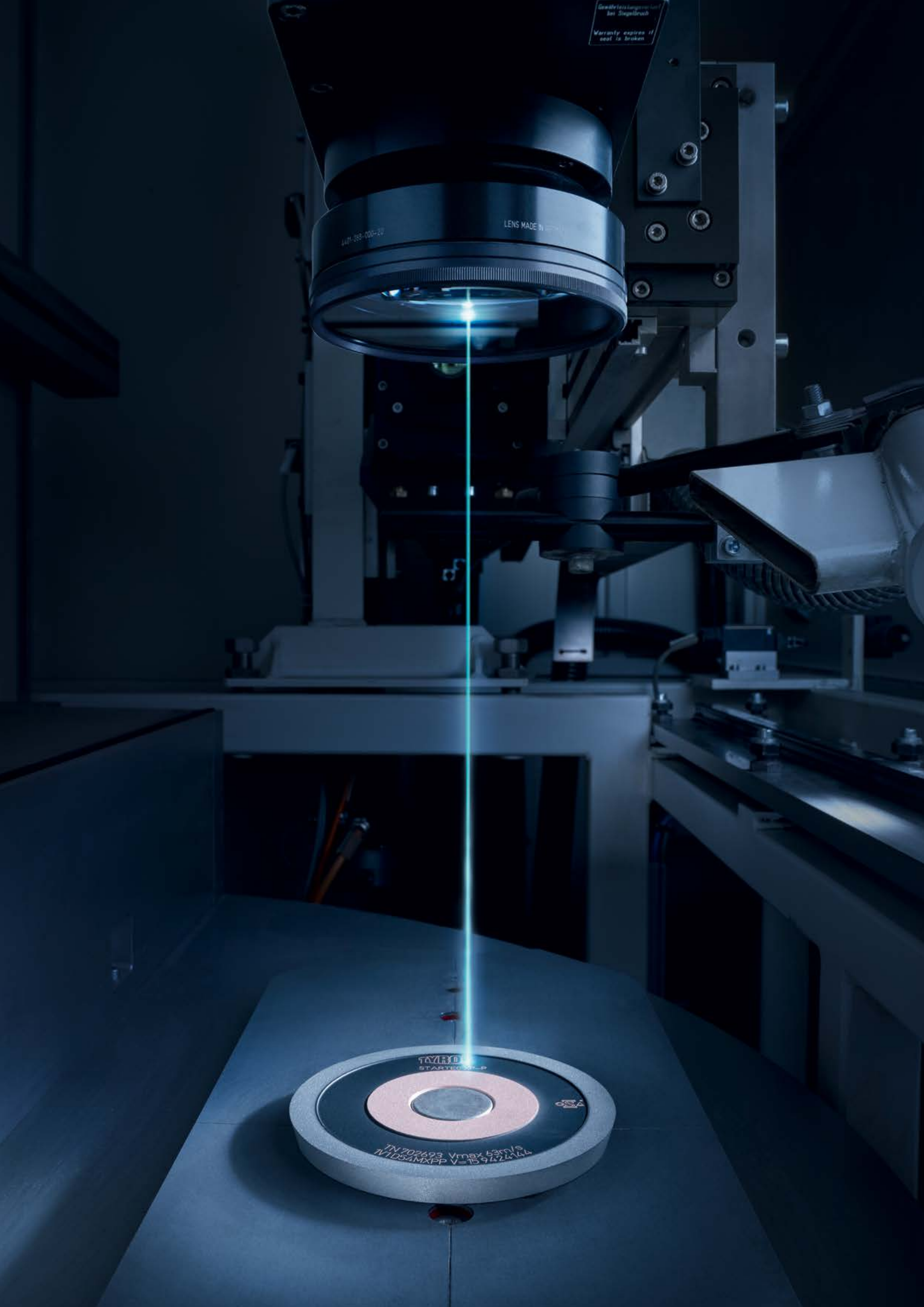
Application	Requirements for cutting edges and surface	Standard values for achievable chipping	Specification
Pre-grinding	Low	>20 µm	DU46K53VB
Universal grinding	Medium	10-20 µm	**D32VB+**
Finish grinding	High	>10 µm	**D20VB+**

Suitable for use on manual or CNC-controlled EWAG or Coborn machines.

Peripheral grinding of tools with PCD and PCBN cutters

Parameter	
Cutting speed [vc]:	15-25 m/s
Oscillation / no. of strokes:	40-120 passes/min
Pressure: RS09, RS15, EWAMATIC RS12	2.5-3.5 bar position 1-3

Please note that the application parameters presuppose optimum coolant supply and workpiece clamping.
Please observe the safety information on page 156.

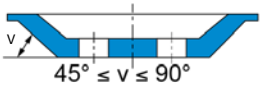
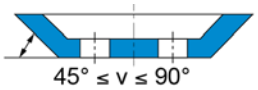
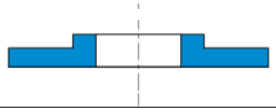
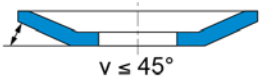
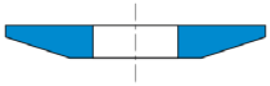
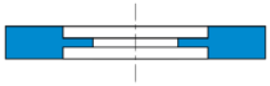

Warranty expires if seal is broken
LENS MADE IN
TN 702693 Vmax 63m/s
1V1D54MXPP V=15 9424144

5. Basics

5.1 Shape designation
of grinding tools with superabrasives

In order to reliably identify grinding tools with superabrasives based on their basic shape and the arrangement of the grinding layer, these tools are described in accordance with the FEPA shape designation at TYROLIT. These shape designations always include a description of the carrier shape, the coating shape and the arrangement of the grinding layer on the carrier.

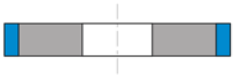
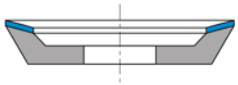
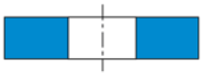
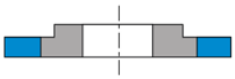
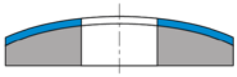
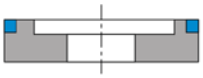
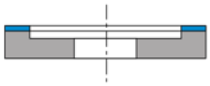
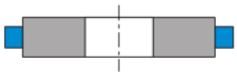
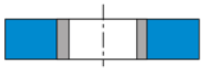
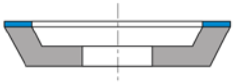
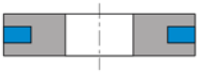
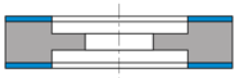
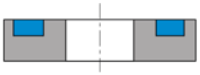
Basic shapes

Shape		Description	Shape		Description
1		straight wheel without recess	11		tapered pot with cylindrical collar
2		ring	11		tapered pot without collar
3		straight wheel, recessed on one side	12		plate
4		straight wheel, conical on one side	14		straight wheel, recessed on both sides
6		straight wheel with one recess	15		dual taper pot
9		straight wheel with two recesses			

Coating shapes

Shape		Shape		Shape		Shape	
A		DU		FE		M	
B		E		FF		Q	
BT		EE		FV		S	
C		ER		G		U	
CH		ET		K		V	
D		F		L		Y	
DD		FB		LL			

Grinding layer arrangements on core

Shape		Shape		Shape	
1		4		8	
		5		9	
2		6		10	
					
3		7			

Example of a complete grinding wheel designation according to FEPA

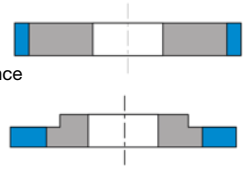
Basic form 1 +

Shape	Description
1 	straight wheel without recess

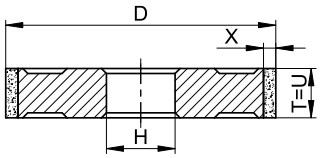
Grinding layer shape A +

Shape
A 

Arrangement 1

Shape
1 at circumference 

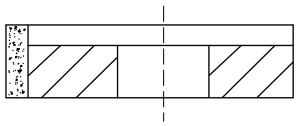
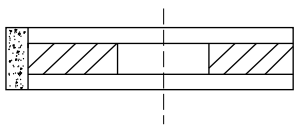
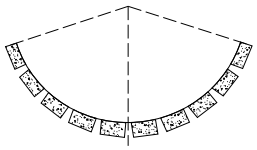
= shape 1A1



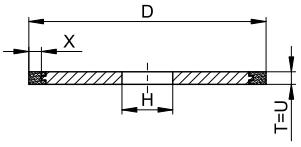
Additional information

In addition to the shape designations, a special core design may be specified, for example a double-sided exposed grinding layer on cut-off saws or mounting bores and threaded bores.

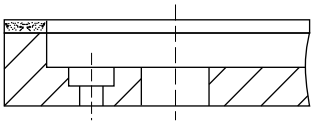
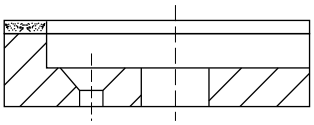
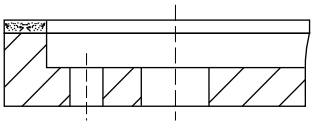
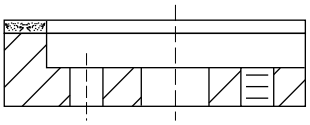
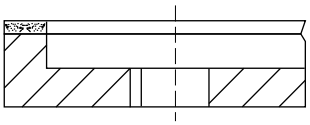
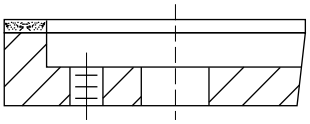
Description of the carrier design

Shape	Description
P 	Free rotation on one side of the wheel. The width of the carrier is less than the thickness of the abrasive layer.
R 	Free rotation on two sides of the wheel. The width of the carrier is less than the thickness of the abrasive layer.
S 	Grinding layer is interrupted (grinding segments)

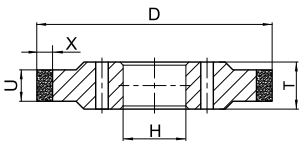
Example: 1A1R: cut-off saw with freely rotating grinding layer on both sides



Description of mounting bores in the carrier

Shape	Description
B 	Flat countersunk mounting bores in the carrier
C 	Conical countersunk mounting bores in the carrier
H 	Cylindrical mounting through-bores in the carrier
M 	Mounting bores and threaded bores in the carrier
N 	Keyway in the carrier bore
T 	Threaded bores in the carrier

Example: 14A1H: Straight grinding wheels, recessed on both sides with cylindrical mounting bores in the carrier

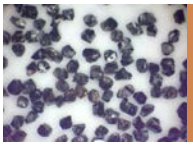


5.2 Specification

In grinding technology, the term "specification" refers to the composition of the grinding layer, which always comprises an abrasive medium and a corresponding bonding agent. The abrasive medium is the grinding material which performs the stock removal work.

The bonding agent is the binder which holds the abrasive in the matrix until the predominant wear mechanism has become dull and breaks out so that new abrasive is used.

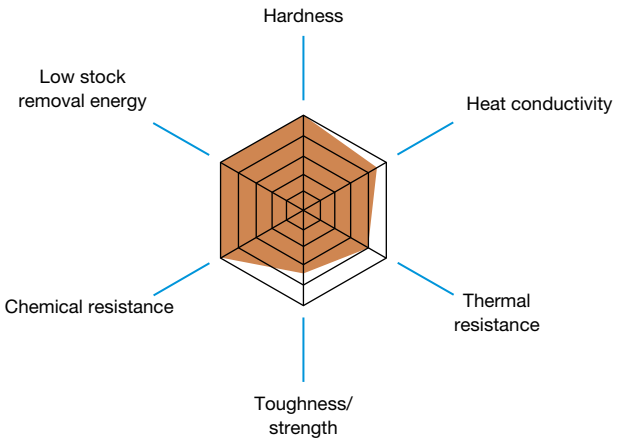
Overview of grain types

Conventional abrasives		Superabrasives		
	**A** Aluminium oxide		**B** CBN	for long-chipping, ductile materials, e.g. steels, super alloys
	**C** Silicon carbide		**D** Diamond	for short-chipping, brittle materials, e.g. stone, glass, tungsten carbide, grey cast iron

In the tool manufacturing industry, tungsten carbides are primarily used as a tool material. The preferred type of abrasive for this material group is diamond. For HSS materials, high-performance aluminium oxides or CBN are used as abrasives.

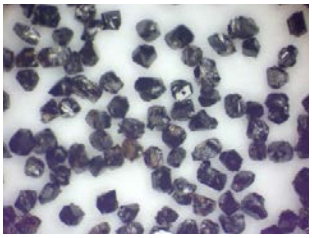
Silicon carbide is primarily used on dressing wheels for diamond or CBN grinding wheels. The individual abrasives are used in different quality classes and in standard grit sizes for the production of grinding and dressing tools.

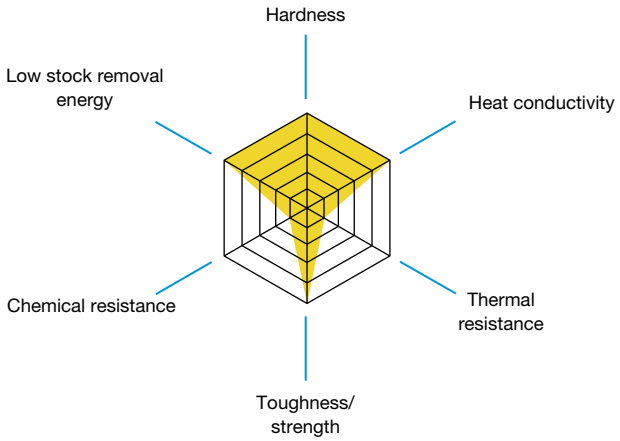
Properties of CBN



Properties of CBN – cubic boron nitride

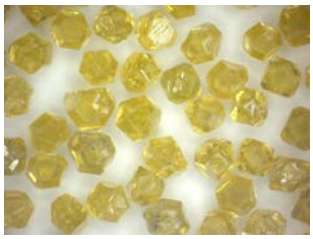
Code: B
Knoop hardness: 47 Gpa
Chemical composition: BN





Properties of diamond

Code: D
Knoop hardness: 80 Gpa
Chemical composition: C plus catalysts



The efficiency of a grinding tool primarily depends on the quality and quantity of the abrasive used.
The type of bonding of the abrasive also significantly determines its performance.

Overview of bond types

Bond types for conventional grinding wheels

- Vitrified bond –
  standardized bond designation V
- Resin bond –
  standardized bond designation B
- Elastic bond –
  standardized bond designation BE

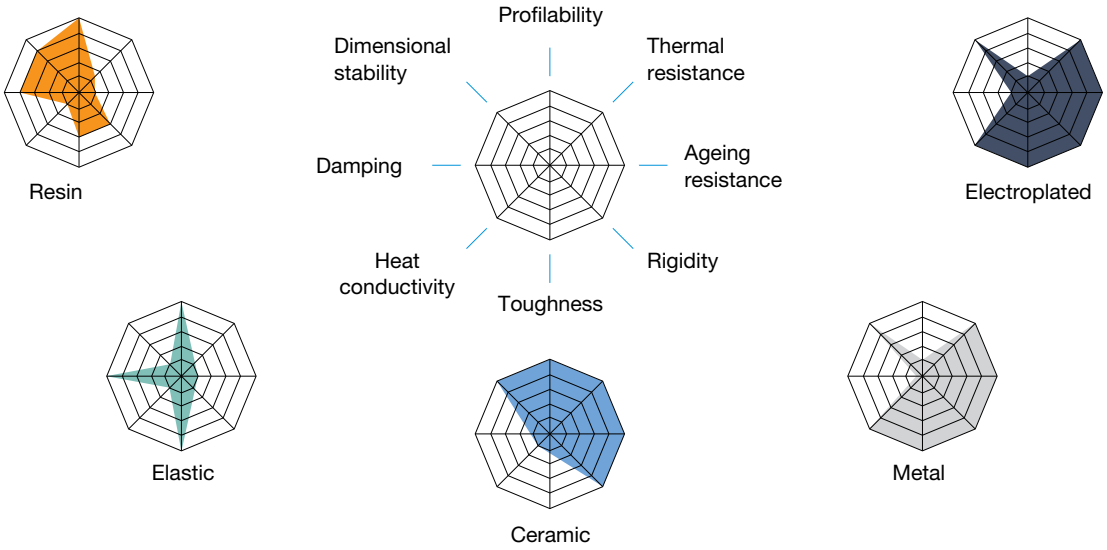
Grain types used: aluminium oxide and silcon carbide

Bond types for grinding wheels with diamond or CBN

- Vitrified bond –
  standardized bond designation V
- Resin bond –
  standardized bond designation B
- Metal bond –
  standardized bond designation M
- Electroplated bond –
  standardized bond designation G

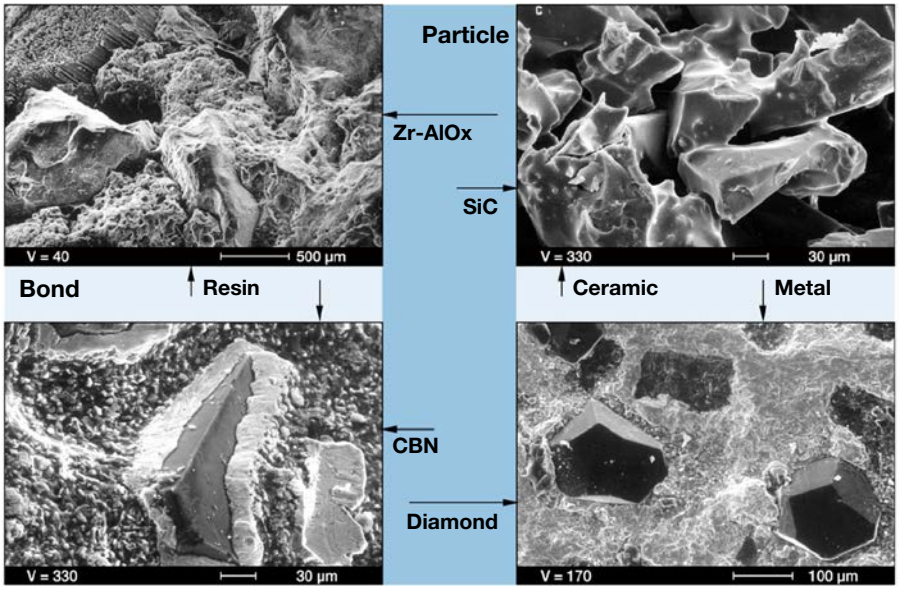
Grain types used: CBN and diamond

Overview of the various bond types with their specific properties



The type of bond is selected in accordance with the abrasive used and its grit size, which is adapted to the machining task, and the grinding process.

Overview of the bonding of conventional abrasives and of diamond and CBN in different bonds.

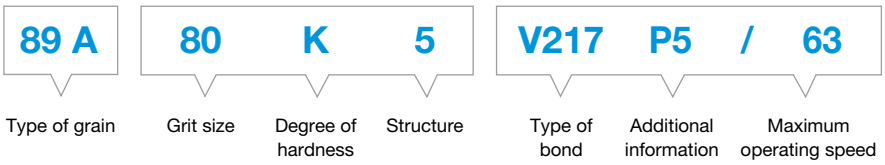


Description of the specification

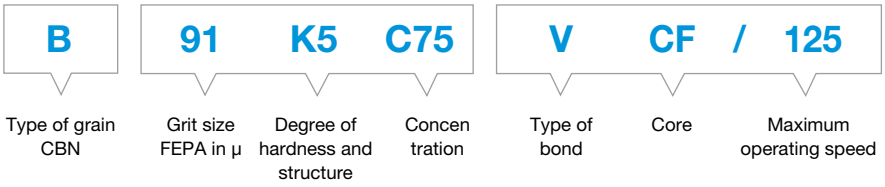
The specification essentially includes the type of abrasive and its grit size, which is indicated in mesh for conventional abrasives and in µm for superabrasives. The following digits indicate the hardness and structure. In the case of grinding tools with superabrasives, the concentration replaces the indications of hardness and structure. The bond used is indicated by means of a standard code and the manufacturer's designation. Further information may also be included.

In order to clarify the TYROLIT specifications an explanation based on a conventional and CBN specification is given below.

– **Conventional grinding tools**
Specification: 89A80 K 5 V217 P5/63

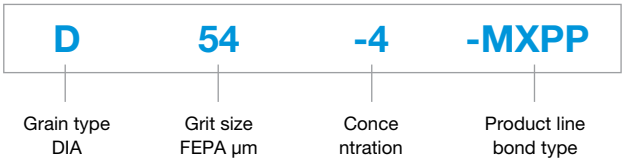


– **Grinding tools with CBN or diamond**
Specification: B91 C75 V



The specification is indicated in a special form for the product lines.

– **Specification for the STARTEC XP-P product line**
Specification: D54-4-MXPP



5.3 Cooling
during tool grinding

Enhanced performance thanks to optimum cooling

In addition to selection of the correct grinding wheel and the correct process parameters, the productivity of a grinding process essentially depends on optimum supply of the cooling lubricant. An increase in performance through optimisation of the cooling lubricant supply requires that the necessary quantity of cooling lubricant is available in the grinding area. Here, the coolant pressure, design and positioning of the coolant nozzles play a decisive role.

Through optimisation of the cooling, performance increases can be achieved in the process (Figure 1) and power consumption can be significantly reduced during the grinding process (Figure 2).

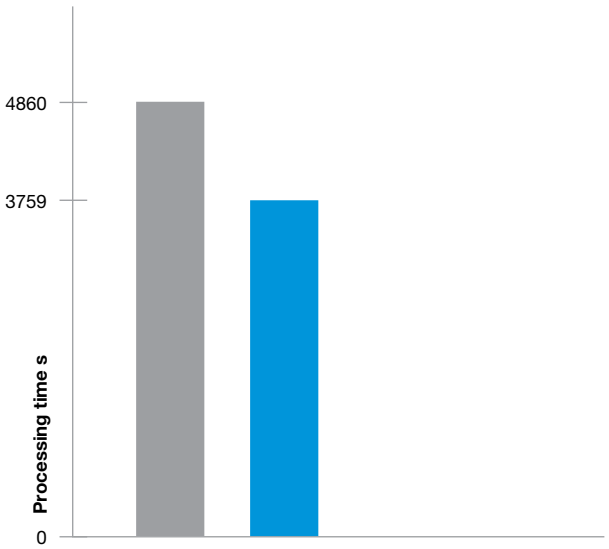


Figure 1: Time saving of 20% through optimised cooling

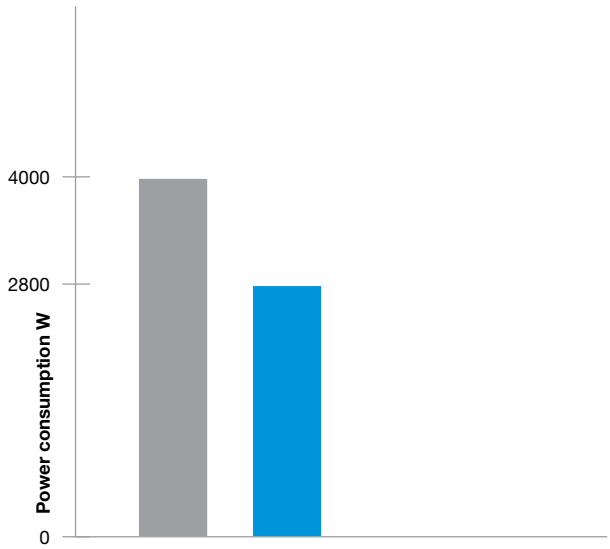


Figure 2: Reduction of power consumption by 30% through optimised cooling

Example:

Milling cutter d = 20 mm, 4 flutes l = 68 mm, dk = 10 mm, ae = 5 mm, batch size 30 units

At 60L/6 bar max. spec. stock removal rate Q'w = 9
Feed during flute grinding 108 mm/min

At 100 L/8 bar max. spec. stock removal rate Q'w = 12
Feed during flute grinding 144 mm/min

Our application engineers will support you with their expertise during optimisation of the cooling lubricant supply.

5.4 Safety during grinding

TYROLIT quality management system

The TYROLIT quality management system has been certified to ISO 9001:2000 for the entire production area by an external authorised body. Production is carried out in accordance with European standards:

- EN12413 for grinding wheels made of bonded abrasives
- EN13236 for grinding wheels made of diamond and boron nitride

Due to the fact, that in the approval principles, very high demands on the grinding tools are specified via defined safety parameters, TYROLIT supplies all grinding tools in accordance with these principles. In this way, we guarantee a consistently high level of safety, even in deliveries to countries without official approval requirements.

Dos

- Handle and store grinding tools carefully; use the oldest tools first.
- Prior to mounting or use, grinding wheels must be cleaned and undergo a visual check for cracks or possible damage.
- Ceramic bonded grinding tools must undergo a sound check or "ring test" before mounting.
- Make sure that the operating speed (m/s) or rotational speed (RPM) of the machine (RPM) does not exceed the maximum operating speed (m/s) or rotational speed (RPM) specified on the packaging or on the abrasive.
- Ensure that the bore of the grinding tool — with or without thread — fits the shaft of the machine perfectly and that the wheel flanges are clean, flat, the same size and suitable for the grinding tool to be clamped.
- As intended or supplied, use the intermediate layers (blotters) between the grinding wheel and wheel flanges.
- Only use machines with protection/guards and ensure their proper condition and fixture before the machine is switched on.
- After each mounting, carry out a test run for at least one minute at the operating speed and ensure machine guard is mounted correctly. In doing so, hold the machine in such a way that any fragments would not be able to hit you or someone else in the event of a possible breakage.
- Eye protection is always recommended for all grinding processes. For off-hand grinding, protective goggles or a safety mask is recommended.
- When working with cut-off or roughing wheels, ensure that the air supply and protective measures sufficiently correspond with the material to be processed. Suitable extraction systems should be fitted for all dry grinding processes.
- Before stopping the machine, cut off the supply of cooling lubricant and remove the excess cooling lubricant from the grinding wheel.

Donts

- × Do not use abrasives that are exposed to particularly humid/wet conditions or high temperatures prior to mounting.
- × Never use abrasives that have been dropped, damaged or that look like they would not be fit for purpose.
- × Never exceed the maximum permissible operating speed specified.
- × Do not use wheel flanges with surfaces that are not free of foreign bodies (e. g. grinding swarf), flat or burr-free.
- × Do not over-tighten the work-holding device or wheel flange.
- × Do not use recessed wheel flanges or flanges with recesses for cup wheels or cones.
- × Never use force when clamping and do not make any changes to the grinding tool.
- × Only switch on the machine when the protection cover is correctly and securely fixed (machine guards or covers should be set in such a way that they divert sparks and grinding particles away from the body).
- × Only start the machine if there is no contact between the workpiece and the grinding tool.
- × Never work with grinding tools without sufficient air supply (never without breathing apparatus and ear protection, particularly in enclosed spaces) and without personal safety equipment (see pictogram).
- × Use a suitable grinding tool – an unsuitable product can generate excessive grinding particles and dust.
- × Avoid mechanical damage to the grinding wheel as a result of force effects, impacts or heating.
- × Never use grinding machines in an improper condition or that contain faulty components.
- × Never mount more than one grinding tool on one shaft.

Summary

The most important points for safe use of grinding wheels are summarised again below:

- Compliance of machine data with designation data
- Checking of grinding wheels prior to clamping
- Mounting carried out by skilled persons
- Checking of the functionality of the machine protection
- Test run of grinding wheels prior to grinding jobs
- Suitable personal protective equipment

Precision data sheet			Recorded by: on:	
Customer	ATDB no.		**Country:**	
	Target group:		**Product family:**	
	Item requirements:			
	Customer: *		Classification:	
	Department:		Customer no.:	
	Contact:		Tel. / fax	
Customer	**Shape: ***		**1 set = item.:**	
	Dimensions (mm): *			
	Dimensions (mm):		Tolerance:	
	Specification:			
	Manufacturer:		**Current price:**	
	Vs max. (m/s) *		Order quantity:	
Customer	**Grinding process:**			
	Machine manufacturer:			
	Vs (m/s):			
	Coolant / lubricant:			
	Dressing tool:			
	Dressing cycle:		Dressing amount:	
Workpiece	**Workpiece: ***		**Dimensions (mm): ***	
	Material group: *		**Stock (mm):**	
	Condition: *		**Hardness: ***	
Aim	**Surface roughness:**		**Contact time:**	
	Lifetime:			
	Addition:			
Probe	Specification:			
	Specification:			
	Specification:			
Info			Drawing:	
Distributor:				

* COMPULSORY fields are marked in grey

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