

Perfect Control of Processed Surfaces and Edges

Deburring Rounding off edges Descaling Polishing Surface enhancement Grinding Profiling



Brushes, Geometries

Single-pass processing



BOTECH TECHNOLOGY

BOTECH has been developing, planning and producing industrial brush technology at the highest quality levels for more than 20 years. These specialized industrial brushes are commonly used in the metal, wood and synthetic workpiece finishing industries.

The company offers a comprehensive range of innovative, premium quality and flexible deburring products. A wide selection of brushing and grinding tools is produced to match customer specifications.

Thanks to our in-house production depth, even the smallest batches can be manufactured to order. Competence, on-time delivery and shortest possible lead times ensure customer satisfaction across the globe.

BOTECH is specialized in jointly defining ideal deburring and finishing solutions, invariably striving to satisfy customer needs and achieve process reliability.

Inclined brush filaments cutting opposite to rotation

BOTECH tools feature bundles of filaments, which are securely bonded at an angle to the tool body. This configuration generates an invaluable increase in cutting power, providing perfectly rounded edges as a bonus. In addition, tool life is increased considerably, an essential property when working with finer grained and/ or lighter gage filaments. To further optimize performance, brush characteristics are finetuned to the specific process requirements!

Inclined brush filaments cutting with rotation

When inclined BOTECH brushes are running coherent with the rotation direction, they become functionally more like polishing tools which provide discernible surface enhancement. Again, in dedicated applications the trimming geometry is carefully selected to match the specific requirements and geometry of the workpieces being processed.

- **1.** Initial workpiece condition with primary burr.
- As the brush impacts against the workpiece the filaments become elongated, significantly increasing the processing capacity applied to the edges.
- **3.** By drawing the filaments over the edges, perfect rounding off results.

Brush Filaments

Cutting Speeds and Grain Sizes



SILICON CARBIDE

The parent material of the bristles is a nylon heavily impregnated with abrasive SiC particles. During manufacturing, the individual filaments are specially treated to resist thermal aging. This material combination is particularly well suited to wet working conditions. Available filament strengths are 0.2 to 2.0 mm.

CERAMIC

The parent material of these bristles is again nylon based. However, the structure of the grains in the ceramic brush is generally more aggressive than in the SiC version. These tools achieve superior stock removal rates and hence larger radii on edges result. The material is particularly suited to wet working conditions.

ALUMINUM OXIDE

The structure of the aluminum oxide abrasive allows these brushes to work more gently then comparable SiC tools. The parent material of the filaments is also a nylon type polymer well suited to wet working conditions. This type of tool is primarily used on workpieces made of somewhat softer, often non-ferrous materials.

DIAMOND

Botech offers premium quality tools for achieving the highest finishing standards. With diamond bristles, the processing spectrum covers applications ranging from the largest possible edge rounding off to super finish surface polishing. The heat resistance of the parent material means that diamond brushes can be used in either wet or dry processing environments.

DURON

Here again, nylon is the parent substrate, but impregnated with an abrasive made up of specially sintered, triangular grains. Throughout the grinding process, microscopic particles of the abrasive break off continuously, regularly exposing fresh and invariably sharp cutting edges. This self-generating sharpening process clearly increases stock removal levels, while considerably enhancing tool life.

Chart for Circumferential Speed m/sec.											
Brush Diameter ø in mm											
rpm	20	40	60	80	100	115	120	150	180	190	230
400	0.4	0.8	1.3	1.7	2.1	2.4	2.5	3.1	3.8	4.0	4.8
600	0.6	1.3	1.9	2.5	3.1	3.6	3.8	4.7	5.7	6.0	7.2
800	0.8	1.7	2.5	3.4	4.2	4.8	5.0	6.3	7.5	8.0	9.6
1'000	1.0	2.1	3.1	4.2	5.2	6.0	6.3	7.9	9.4	9.9	12.0
1'200	1.3	2.5	3.8	5.0	6.3	7.2	7.5	9.4	11.3	11.9	14.5
1'400	1.5	2.9	4.4	5.9	7.3	8.4	8.8	11.0	13.2	13.9	16.9
1'600	1.7	3.4	5.0	6.7	8.4	9.6	10.1	12.6	15.1	15.9	19.3
1'800	1.9	3.8	5.7	7.5	9.4	10.8	11.3	14.1	17.0	17.9	21.7
2'000	2.1	4.2	6.3	8.4	10.5	12.0	12.6	15.7	18.8	19.9	24.1
2'200	2.3	4.6	6.9	9.2	11.5	13.2	13.8	17.3	20.7	21.9	26.5
2'500	2.6	5.2	7.9	10.5	13.1	15.1	15.7	19.6	23.6	24.9	30.1
3'000	3.1	6.3	9.4	12.6	15.7	18.1	18.8	23.6	28.3	29.8	36.1
3'500	3.7	7.3	11.0	14.7	18.3	21.1	22.0	27.5	33.0	34.8	42.1
4'000	4.2	8.4	12.6	16.8	20.9	24.1	25.1	31.4	37.7	39.8	48.2
4'500	4.7	9.4	14.1	18.8	23.6	27.1	28.3	35.3	42.4	44.8	54.2
5'000	5.2	10.5	15.7	20.9	26.2	30.1	31.4	39.3	47.1	49.7	60.2
6'000	6.3	12.6	18.8	25.1	31.4	36.1	37.7	47.1	56.5	59.7	72.3
8'000	8.4	16.8	25.1	33.5	41.9	48.2	50.3	62.8	75.4	79.6	96.3
10'000	10.5	20.9	31.4	41.9	52.4	60.2	62.8	78.5	94.2	99.5	120.4
15'000	15.7	31.4	47.1	62.8	78.5	90.3	94.2	117.8	141.4	149.2	180.6
20'000	20.9	41.9	62.8	83.8	104.7	120.4	125.7	157.1	188.5	199.0	240.9
Recommended non-cooled				Optir	nal settine	g, wet wo	rking	Maxi	mum in co	oled con	ditions

Working Speeds & Safety Limits (rpm)

On each product the maximum limit for safe operation is clearly indicated. This can be either an rpm value (min-1) or a circumferential speed in (m/sec). Such limits are fundamental for safety in the working environment. Under no circumstances shall these limits be exceeded.

Trimmed to Working Level

All Botech cup brushes are manufactured to precisely the same height. With identical bristle lengths, the brushes function uniformly from the outset. Each brush is measured during final inspection immediately before packing.

Grain Size

Grain size defines the physical dimensions of the abrasive particles embedded in the filaments.

Conversion Chart - Mesh # - Microns						
Grain	Grain Mesh # Micron µm		Compares to			
60	60	260	fine sand			
80	80	185				
120	140	109				
180	220	69	concrete			
240	325	44.5 ± 2	sludge			
320		29.2 ± 1.5				
500	400	12.8 ± 1	pollen			
600		9.3 ± 1				
800		6.5 ± 1				
1'000	1200	4.5 ± 0.8	red blood cells			
1'200		3.0 ± 0.5				
2'000	4200	1.2 ± 0.3	cigarette smoke			

Models - TBK / KBK / UBK / DTB (soft to medium stiffness)



TBK - Cup brushes

The TBK cup brush was developed to meet the highest requirements on rounding off even minimal contours. Combining solid bonding technology with our expertise in positioning bundles of bristles at given angles generates superb deburring results. Precise and accurate stock removal permits the use of finer grains. The bristles are nylon based and heavily impregnated with SiC content.

KBK - Cup brushes

Technically identical to the TBK brush model, but now loaded with abrasive ceramic grains. Typically the KBK brushes are used to remove secondary burrs under high throughput conditions.

UBK - Cup brushes

Again highly similar to the TBK and KBK brushes, except now the bristles are impregnated with aluminum oxide. This model is ideal for processes where optimal control of precision is key.

DTB - Cup brush

Yet another variant from the same product family. Unlike the other models, this brush works extremely well with even the hardest materials. Diamond brushes generate extralarge radii and also allow polishing operations.

РГе	CISIO	i Debur	ring w	icn i	BK:
Bef	⁻ оге /	After			

Defined edge radius on a precisely deburred workpiece with simultaneous surface finish enhancement.

LL TOK

Polishing with DTB: Before / After

Workpiece polished to a mirror finish with BOTECH Diamond brush. No polishing paste applied. As a result the surface is not only bright, but also features an incredibly even smoothness.

	ТВК	KBK	UBK	DTP		
	Silicon Carbide	Ceramic	Al Oxide	Diamond		
Primary Deburring	*	*	*	**		
Deburring	***	****	*	****		
Precision Edge Rounding	****	****	****	****		
Descaling	**	***	*	**		
Polishing	**	***	**	****		
Surface Enhancement	**	***	***	****		
Grinding	*	*	*	*		
Profiling / Levelling	*	*	*	****		
Grain Size / Mesh	45 - 1'000	60 - 320	320 - 600	200 - 16'000		
Angle Setting, Bundles	5	5 - 35° ° depending on requirements				
Working Length Bristles		12 - 50 mm				

Available Diameters / Types:	Compatible with:
ø 60, 80, 100,120 mm	manual use / CNC Machining Centers
ø 115, 120 mm	Hans Weber Machines (QDC version)
ø 150 mm	and similar
ø 190, 230 mm	Surfinsys, AFT, Löser, Diskus

Also valid for BOTECH cup tools on the following pages

CUP BRUSHES Models - HDG / HDGK / HDGD (medium to high stiffness)





HDG - Cup brushes

Technically, HDG type brushes build on the TBK expertise, but feature a higher filament density. These brushes are ideal for operations requiring outstanding performance. Both the parent material of the filaments and the impregnated SiC grains correspond to the TBK models.

HDGK - Cup brushes

HDGK type brushes are constructed in the same way as the HDG versions, only here, the filaments are impregnated with ceramic particles. Both HDG and HDGK brushes can be ordered with inclined filaments, both running directions, with or against the edge of the workpiece.

HDGD - Cup brushes

Technically similar to the standard HDG, but this variant features diamond fragments bonded to the filaments. An ideal option where mirror finishes are ultimately required.

	HDG	HDGK	HDGD
	Silicon Carbide	Ceramic	Diamond
Primary Deburring	**	**	**
Deburring	****	****	****
Precision Edge Rounding	**	**	****
Descaling	***	**	**
Polishing	**	***	*****
Surface Enhancement	***	***	****
Grinding	*	*	*
Profiling / Levelling	**	***	****
Grain Size	45 - 1'000	60 - 320	200 - 16'000
Angle Setting, Bundles	5 - 35° de	pending on requi	rements
Working Length Bristles		12 - 50 mm	

Special applications with HDG Brushes

Apart from the obvious uses for HDG brushes, other less conventional applications have been identified. During trials run in recent years, surprising technological insight has been gained on numerous occasions.

Protrusions and semi-piercings

Until very recently, three-dimensional workpieces were considered unsuitable for online deburring. In various trials, however, BOTECH has shown that spigots and coined features can be deburred using high density brushes. Once the ideal filaments were selected. it was demonstrated that the filaments will flow around protrusions. The edges of the features were barely rounded off, i.e. clearly less than might reasonably be expected. Under such conditions an average penetration depth of 3 to 4 mm is achieved, with no evident indication of reduced brush life. Such findings can have a positive influence on tool design and allow for more simplified progressive type tooling, without an absolute need to employ the less desirable vibratory deburring process.

Three-dimensional components

Many components include very light coining or forming features and flap discs may already be too hard to penetrate deep enough for adequate deburring. In such cases, the very dense HDG brushes are a welcome and effective alternative. Their large variety of specifically oriented filaments, in combination with the mass of the dense bundles, make HDG brushes highly effective, even in the lower, poorly accessible regions of the workpieces. Where TBK brushes are too soft and FSS flap discs too hard, the HGB brushes fill the process gaps.



FSS - Flap Disc

The flap discs of the FSS type have been developed to satisfy the highest demands on primary deburring. The nylon lamellae are heavily impregnated with SiC particles. This combination results in superb deburring capacity with outstanding tool life. Specific properties of BOTECH FSS flap discs provide removal of primary burrs without generating undesirable secondary burrs. Where certain process parameters exist, minimal or no brushing operations are required.

Flap discs are available in standard and hard versions. Standard hardness still allows for some tool flexibility, whereas the hard variant closely resembles a grinding wheel and is only used on two-dimensional surfaces.

FSK - Flap Disc

Technically identical to the FSS flap disc type. Ceramic grains, however, generate smoother surface finishes. FSK types are recommended when superior surface finishes are specified.

FSD - Flap Disc

D for DURON is a flap disc variant for specialpurpose applications. Functionally, FSD tools require high pressures, but cutting effectiveness is substantial, requiring careful process control. Longest tool life of all flap discs may be expected.

Precise Removal of Primary Burr with FSS Type: Before / After

The protruding primary burr is efficiently removed in a single process step. As no secondary burr is generated, workpieces are perfectly deburred and feature sharp edges. Where radii are required, brushing tools such as TBK or HDG types are the ideal complement.

	FSS	FSK	FSD
	Silicon Carbide	Ceramic	Duron
Primary Deburring	****	****	*****
Deburring	*	*	*
Precision Edge Rounding	-	-	-
Descaling	***	****	****
Polishing	***	***	***
Surface Enhancement	****	****	****
Grinding	***	***	****
Profiling / Levelling	****	****	****
Grain Size	60 - 120	60 - 120	80
Trim Height		15 - 35 mm	

Brushing Wheels



Customized Products

Continuous improvement programs are standard procedure in all production facilities; manufacturers of deburring tools are no exception. BOTECH endeavors to generate solutions tailored to the specific needs of its individual customers, a spectrum ranging from basic research to target oriented development is covered. The entire team strives to generate solutions for extending tool life, while aiming to increase the effectiveness of our products, ultimately leading to higher stock removal rates per unit of time. Invariably, cost per piece is the factor against which our customers calculate the efficiency of the entire process. BOTECH has defined its benchmark at achieving the ideal amount of deburring capacity to trim edges and finish surfaces. Reliable, repeatable and cost-effective processes dedicated to satisfying customer expectations.

Brushing Tools Type S-15

Another recently launched BOTECH development is the S-15 family of tools geared towards the processing of stainless steel and non-ferrous workpieces. Lacking the benefits of magnetic clamping force, BOTECH is aligning the filaments in its tools in ways that increase downforce on workpieces without losing the stock removal capacity of its standard hi-tech products. Selective configurations of filament strength, abrasion material and brush geometry may well result in dedicated onetime only application specific brushes. BOTECH occasionally produces and ships tools which run in only one application for a given customer. Whereas in the production environment needs may be similar, the associated upstream and downstream processes frequently vary somewhat. Those minor differences can, however, generate a need for customized tools.

Brushing Wheels

Given the consistent developments in the stamping and fineblanking industries the need for extremely soft but still effective "deburring" tools is on the rise. While cup type brushes on planetary heads can flex over smaller three-dimensional features, there are natural limits to penetration when using planetary heads.

For these new applications BOTECH has entered the market for wheel brushes. Brushing wheels generate entirely different angles of attack for the elongated filaments. As BOTECH brushes employ the same high quality filaments that are found in their other brushes, the brushing wheels are commonly used in wet working conditions.

To allow varying wheel brush hardnesses, BOTECH has innovated with inclined filaments set into a roller body. This ability to now vary not only filament density, but also filament angles of inclination, significantly widens the range of potential applications.

Always one step ahead in technology!

TX Type Tools



Bonded Diamond Discs

The hardest tools offered by BOTECH! This dedicated development offers greater scope in surface finishing solutions. Bonded discs have no flexibility, and limit penetration to hundredths of a millimeter only. Consequently, stock removal is minimal but highly accurate. TX discs are ideal solutions when surfaces require further levelling after double-disc grinding. Whereas softer tools will not be able to remove sufficient stock to eliminate deep scoring, TX tools will complete the job. For this same reason, TX tools can be deployed under certain circumstances for calibration applications.

Caution is called for, as not all planetary deburring equipment on the market is capable of using such hard tools. When planning to use TX tools it is advisable to contact the machine maker to verify its suitability for the application. For perfect results, not only is good bearing support essential, but also the height adjustment of all spindles in a head must obviously be significantly more accurate than when soft tools are installed.

Applications using bonded grinding discs

Be aware that these dedicated tools should only be used after careful evaluation. Bonded discs will only provide positive results when all operating parameters and conditions are optimized. This is a specific difference to when the softer versions of BOTECH tools are deployed.

Valve plates or comparable workpieces

Smaller components with very strict specifications on face parallelity and flatness are a target application for TX grinding discs, particularly when superb surface finishes are required. As an upstream process, double-disc grinding will establish the basic prerequisites. The TX discs then will finish off (stock removal around 0.02 to 0.03 mm) the workpieces, most of which require processing of both sides. A brushing operation will eliminate any secondary burrs.

Calibration during the deburring process

Upstream blanking processes often include coining and semi-piercing operations, making the control of material displacement extremely challenging. Maintaining consistent overall height of such parts imposes unwanted demands on the blanking or fineblanking dies. TX discs can be used to calibrate such features while consistently holding workpiece tolerances within a narrow bandwidth. It must be considered, however, that such calibration operations are only feasible at slow feeding speeds. Flap discs are already too soft for such operations rather than cutting them to a specified height.





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