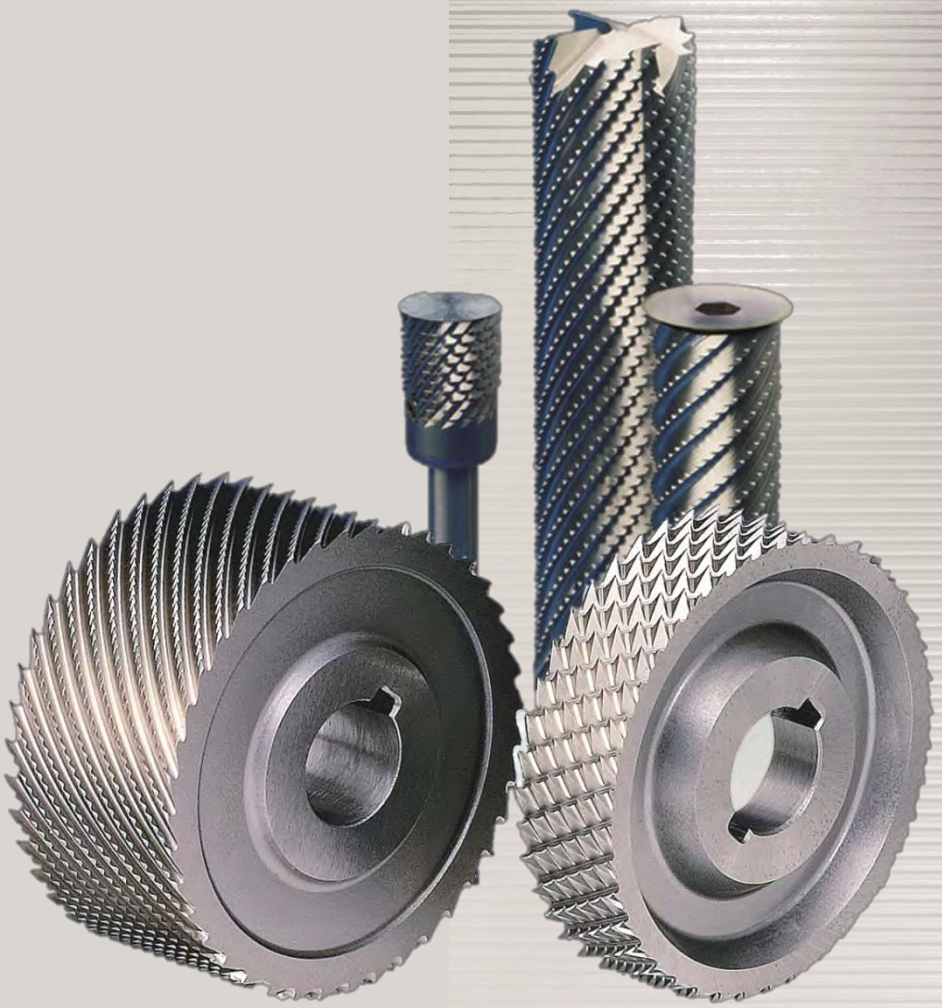
NEW!
DECORING CUT
Solid Carbide
(See section 7)

NEW!
FIBER CUT
(See section 8)

CONTROX-NEUHÄUSER
Precision Cutting Tools

CATALOG

Tools for the Machining of Composite Materials



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effective 12/2014

Tools for the machining of composite materials

The use of a high precision honeycomb core is growing not only in the aeronautical and space industries, but also in the nautical and automobile industries.

The honeycomb industry has developed well beyond the use of meta-aramid honeycombs combined with phenolic resin, such as Nomex. There are various metallic and non-metallic composite materials in combination with coatings, adhesive bonding and potting compounds in use today. These materials present many machining challenges for those needing to shape a honeycomb core.

Controx-Neuhäuser has developed and is continually developing a wide range of special order customer specific application tools to satisfy the tough requirements of our customers' honeycomb, finished honeycomb panel and composite laminate machining needs.
These special tools do not appear in our catalog but the technology developed by Controx-Neuhäuser is readily available to all of our customers upon their request. Eighty-five percent of our tool production is customer specific.

Our collection of tools for the machining of honeycomb and other composite materials consists of eight different tooling systems:

1 CORECUT

Comprehensive and flexible tooling system, mainly for the machining of honeycomb material with 5-axis CNC-machines. Different types of front-end tools and shredders can be combined to suit the demands of your specific application.

2 POCKET CUT

Shank tools with axial and radial teeth. Ideal for the machining of pockets and slots in honeycomb materials. Available with three different tooth geometries to suit your applications.

3 VALVE TYPE CUTTER

Tool combination of circular knife or saw blade and a valve-shaped shank. Ideal for cut-off operations and chamfering in any kind of honeycomb material.

®registered trademark

4 PROFILE CUT

Shank tools designed for profiling complicated honeycomb parts and structures.

The tools are available in centre cutting and ball nose end teeth. Plunge cuts into the honeycomb material are possible.

5 FOAM CUT

End Mills especially designed for the machining of technical foams. These cutters have axial and radial teeth. To create smooth radiuses as well as sharp edges on the parts the FOAM CUT tools are in both ball nose and square end available.

6 PANEL CUT

Shank tools with end teeth designed for profiling and drilling operations in sandwich panels. Enables extremely high feed rates due to the special tooth configurations.

7 DECORING CUT

Shank tools to undercut composite sandwich panels. Specially designed to drill perfectly clean holes and to undercut the panel skins in one step.

8 FIBER CUT

Solid Carbide routers for the machining of uni- and multi-directional layers as well as woven fabrics made out of CFRP (carbon-fiber-reinforced plastic) or GFRP (glass-fiber-reinforced plastic).

9 SPECIALS

Besides the standard tools for honeycomb applications introduced in the previous chapters there is a wide range of special tools engineered for specific applications. Those tools are available on demand and get produced according to your particular needs.

1 CORECUT

Comprehensive and flexible tooling system, mainly for the machining of honeycomb material with 5-axis CNC-machines. Different types of front-end tools and shredders can be combined to suit the demands of your specific application.

CORECUT

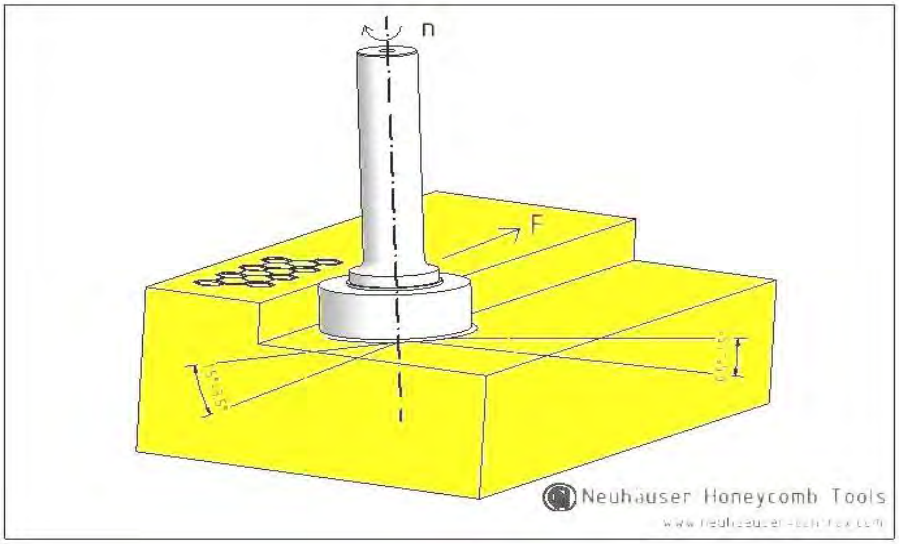
Tooling System for Honeycomb Applications

Introduction

The CORECUT Tooling System was designed for the various machining applications that arise in the 5-axis milling process of honeycomb materials. A high degree of flexibility is achieved by using different combinations of front-end tools, shredders and shanks to create the perfect solutions for the demanding requirements of honeycomb machining. The flexibility of the system makes it ideal for all kinds of honeycomb materials in use today.

While the front-end tool cuts the material and allows excellent surface finishes, the shredder crushes the cut-off material to powder, which can be evacuated by air. This way, the removed material cannot interfere with the machining process. Without the shredder, the material being removed may wrap around the rotating shaft and damage the material, or even pull the entire work piece off the machine table.

For the typical application of CORECUT tools in 5-axis machines, the spindle should be tilted between 1.5° to 3.5° in the feed direction and another 0.5° to 1.5° sideways (see figure). This way the machining forces point towards the machine table and best results can be achieved. For 3-axis machines where tilting the spindle is not possible, we recommend the POCKET CUT tools.



The most important dimension of composite cutters is the outer diameter of the front-end tool, which is relevant for programming. Therefore, we have named the CORECUT Tool Systems in correspondence with this dimension as stated in millimeters.

For small diameters, the CORECUT Tools combine a shank shredder and a front-end tool, which is available in either solid carbide or HSSCo (High Speed Steel Cobalt). For larger diameters, the CORECUT Tools combine a front-end tool, a shredder and a shank.

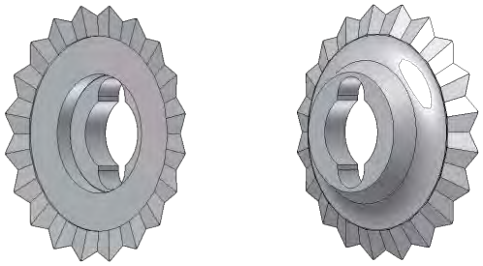
There are various tooth geometries for the shredders. These geometries are designed to produce maximum cutting performance with the best surface finishes. Additionally, performance and tool life are increased through the application of an appropriate coating: a single PVD coating (Physical Vapor Deposition) for wear protection or a PVD multi-layer coating to prevent sticking as well.

In the following section the individual components are described in detail. The tables give an overview for which tool systems the component is available.

Components and Applications

Front-End Tools

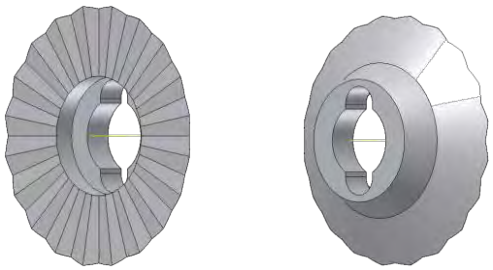
HSS Cobalt Wavy Cutter



These front-end knives are made of HSS Cobalt powdered metal (PM). With their special wavy teeth, they are best suited for NOMEX honeycomb applications.

Availability	**10**	**12.7 (½")**	**19.05 (¾")**	**25.4 (1")**	**38.1 (1½")**	**45**	**50.8 (2")**	**63**
HSSCo Wavy Cutter					●	●	●	●

Solid Carbide Wavy Cutter



These wavy cutters are made of solid carbide and have a multi-layer coating. This material and coating combination provides maximum tool life and thus increases cost-efficiency and reduces machining time. They are also suitable for highly abrasive materials, like heavy KEVLAR or Carbon Fiber honeycombs.

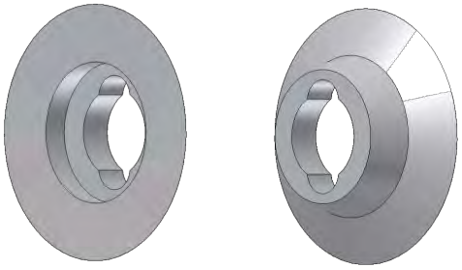
Availability	**10**	**12.7 (½")**	**19.05 (¾")**	**25.4 (1")**	**38.1 (1½")**	**45**	**50.8 (2")**	**63**
Solid Carbide Wavy Cutter						●		●

Circular Knives

These front-end knives made of solid carbide have a plain sharp cutting edge. The high quality solid carbide assures a long tool life.

For small outer diameters, the knives have a thread and can easily be mounted on the corresponding shank shredder using a screw driver or a coin.

Knives with larger outer diameter have an arbor hole and are mounted onto the shredder or shank using the corresponding mounting screw.



The circular knives made of solid carbide are available in an uncoated version and with a PVD multi-layer coating. The coating reduces wear to a minimum and prevents sticking of resin, adhesive and aluminum material.

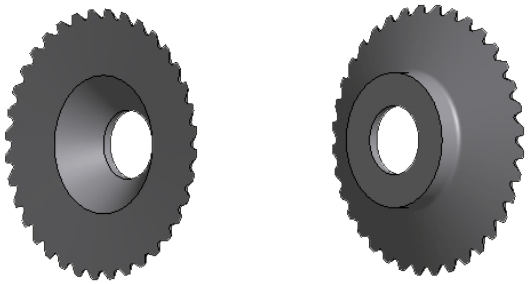
Its main application is the machining of NOMEX honeycomb material. For aluminum material, we recommend the coated version.

Besides the front-end knives out of solid carbide, there is a version made out of HSS cobalt powdered metal (PM), which is covered with a PVD multi-layer coating. It is characterized by its extremely sharp cutting edge and unbeatable cutting capability.

Availability	**10**	**12.7 (½")**	**19.05 (¾")**	**25.4 (1")**	**38.1 (1½")**	**45**	**50.8 (2")**	**63**
Solid carbide, uncoated				●	●	●	●	●
Solid carbide, coated	●	●	●	●	●	●	●	●
HSSCo, coated			●					

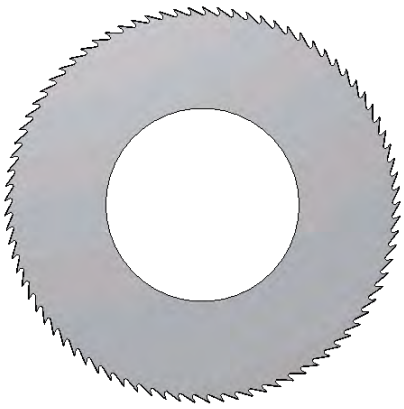
Solid Carbide Knife with Teeth

The solid carbide knife with teeth is created to machine lightweight honeycombs. The special teeth interrupt the cut and prevent a pushing of the cell walls in that way.



Availability	10	12.7 (½")	19.05 (¾")	25.4 (1")	38.1 (1½")	45	50.8 (2")	63
Solid Carbide Knife with teeth				●				

HSS Cobalt Saw Blade



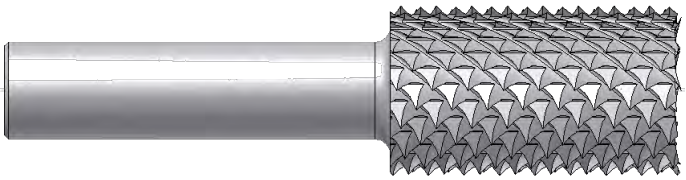
These saw blades are made out of HSS Cobalt and have helical teeth with a width of 0.3 mm (approx. 0.0118"). They are mounted on a shank using the corresponding mounting set, described further below (see section Accessories).

They are designed to give the best surface finish on the most difficult fine core shapes in fragile honeycomb structures. Especially thin core layers with smooth and low angles, combined with large cell sizes create machining problems. This tool concept is then often the only possible choice for the 5-axis milling of meta- and para-aramide fiber honeycombs (for example NOMEX and KEVLAR) or Aluminum and Carbon honeycomb.

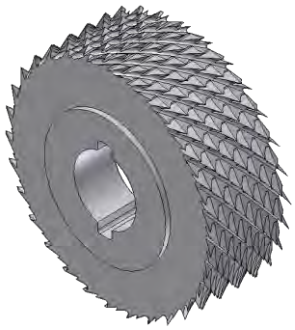
Availability	10	12.7 (½")	19.05 (¾")	25.4 (1")	38.1 (1½")	45	50.8 (2")	63
HSS Cobalt Saw					●	●	●	●

Shredders

The CORECUT tool family offers a wide range of shredder tools. They differ in outer diameter, in maximum cutting depth or in tooth geometries. For small outer diameters (up to CORECUT 25.4) the shredders are designed as shank shredders.

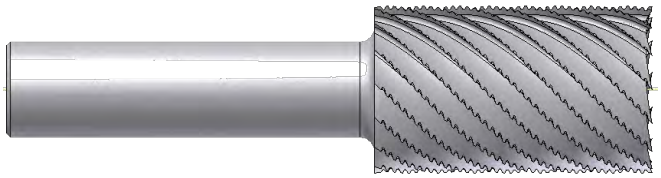


For larger outer diameters (from CORECUT 38.1) the shredders have an arbor hole and a similar shape like plain milling cutters. They are mounted onto the separately available shank, and thus can easily be exchanged.

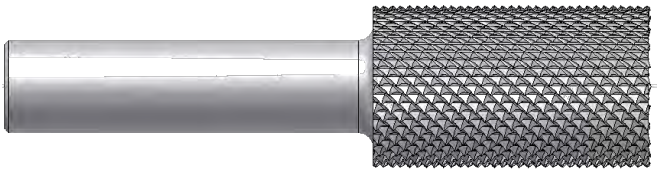


All shredders are made out of HSS cobalt powdered metal (PM). Depending on the application, different tooth geometries are available, which allow for maximum performance and best surface finishes. Besides the universal diamond-shaped teeth, there is a special tooth shape for the machining of meta-aramid fiber honeycombs (like NOMEX). To reduce wear and increase tool life, it has a PVD coating.

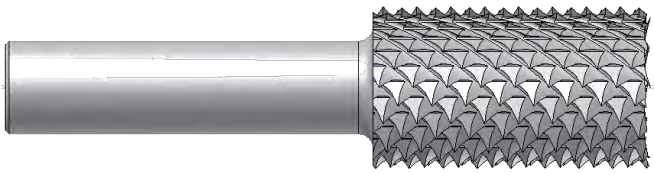
The diamond-shaped teeth are best for the machining of any meta- or para-aramid fiber honeycomb material. This patented tooth geometry is designed especially for all advanced KEVLAR, Aluminum, Carbon Fiber and NOMEX honeycomb applications. The tools with diamond-shaped teeth have a PVD multi-layer coating. With its wear resistance, it increases the tool life significantly and it prevents sticking of resin, adhesive and aluminum material.



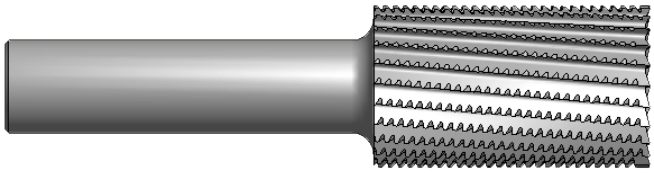
Teeth for Nomex



Fine diamond-shaped teeth - patented -



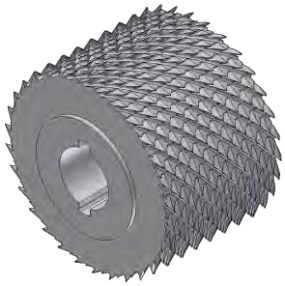
Coarse diamond-shaped teeth - patented –



Teeth for Nomex, helix 5°

Some of the plain milling cutter-like shredders (CORECUT 45 and 63) are available in the common short version as well as in a long version. The short version allows for a cutting depth up to approx. 17 mm (0.67"). The long version allows for a cutting depth up to approx. 31 mm (1.22"). According to that, there are also short and long versions of shanks. So please make sure, that you choose the right shank length to match your shredder!

Short version



Long version

Availability	10	12.7 (½")	19.05 (¾")	25.4 (1")	38.1 (1½")	45	50.8 (2")	63
Teeth for Nomex	●	●	●	●	●	●*	●	●*
Teeth for Nomex, flat Helix				●				
Fine diamond-shaped teeth			●	●				
Coarse diamond-shaped teeth			●	●	●	●*	●	●*

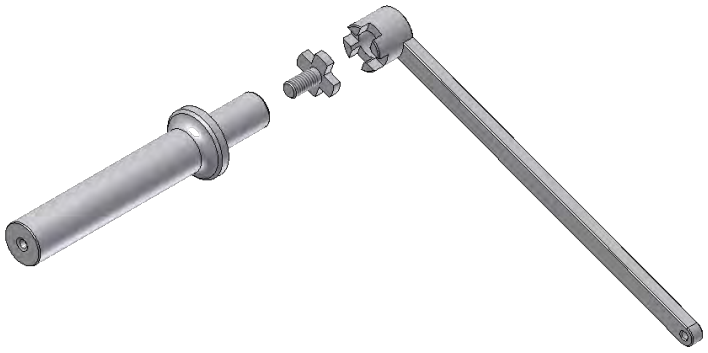
* also available as long version

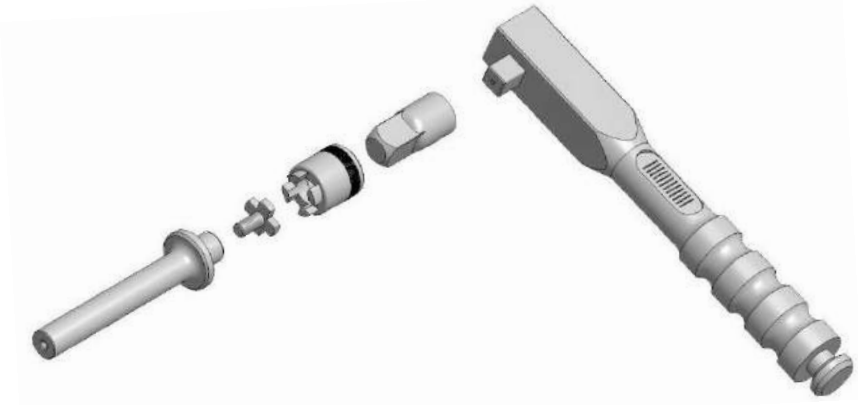
Accessories

In this section, you will find the shanks for the CORECUT system and the mounting set for the HSS Cobalt saw blades mentioned above.

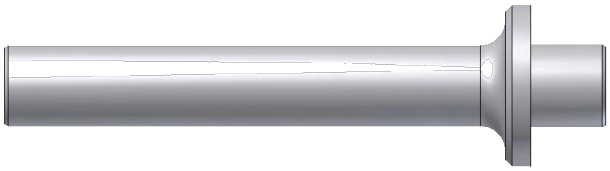
Shanks

Controx shanks are made out of HSS and ground to h6 tolerance to fit shrinking chucks. All shanks are available in sets, each containing a shank, a suitable mounting screw and wrench. All parts are deliverable as spare parts as well.

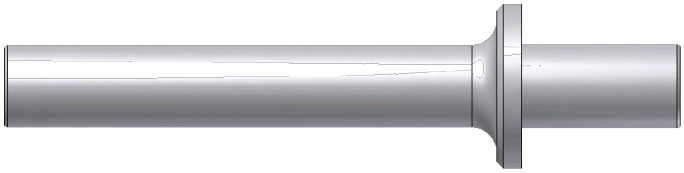




There are shanks in various diameters – metric and imperial. For CORECUT 45 and CORECUT 63 short and long versions of shanks are deliverable. The short versions are suitable for shredders with a cutting depth up to approx. 17 mm (0.67"; short version). The long versions are suitable for shredders for cutting depths up to approx. 31 mm (1.22", long version).



Short version



Long version

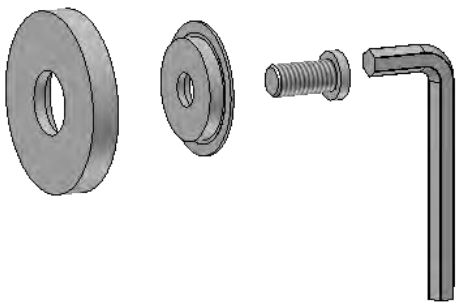
The shanks for CORECUT 38.1 and CORECUT 45 (short version) are identical and thus may be used with shredders and front-end tools of either size. Also the shanks CORECUT 50.8 und CORECUT 63 (short version) are identical.

Availability	10	12.7 (½")	19.05 (¾")	25.4 (1")	38.1 (1½")	45	50.8 (2")	63
Shank ø 1/2"					●	●*	●	●*
Shank ø 5/8"					●	●*	●	●*
Shank ø 16mm					●	●*	●	●*
Shank ø 20mm					●	●*	●	●*

* also available as long version

Mounting Set for Saw Blade

This mounting set is necessary for the usage of the above mentioned HSS Cobalt saw blades of the CORECUT system and assures accurate fitting. It consists of a centering washer (to assure centered position of the saw), a spring washer (to clamp the saw blade in hollow position), a screw and corresponding wrench. The individual parts can also be ordered separately.



Availability	10	12.7 (½")	19.05 (¾")	25.4 (1")	38.1 (1½")	45	50.8 (2")	63
Mounting set					●	●	●	●

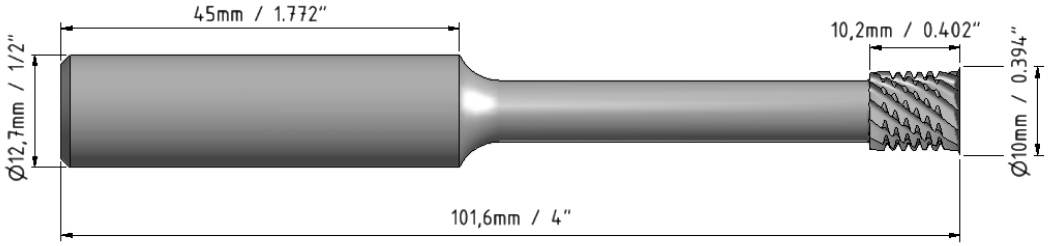
Technical Specifications

Corecut 10

Front-End Tools		Cutting Dia		Overall Width	Arbor Dia	Mat.	**EDP#** / Item #
Solid carbide knife with thread, AWAC3-coated	mm	10	±0.1	9	M4	SC	**170000** 7125-010-009-23-00
	inch	0.394	±0.004	0.354	M4		

Shank shredders		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	**EDP#** / Item #
Shank shredder, AWC2-coated	mm	8.9	±0.1	10	101.6	12.7	h6	PM	**170001** 7300-008-010-05-00
	inch	0.35	±0.004	0.394	4	1/2	-0.0005		

SC=Solid Carbide, PM=Powdered Metal

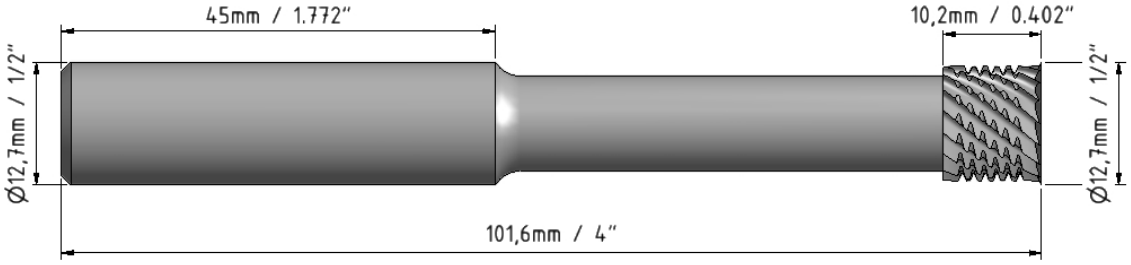


Corecut 12.7 (½")

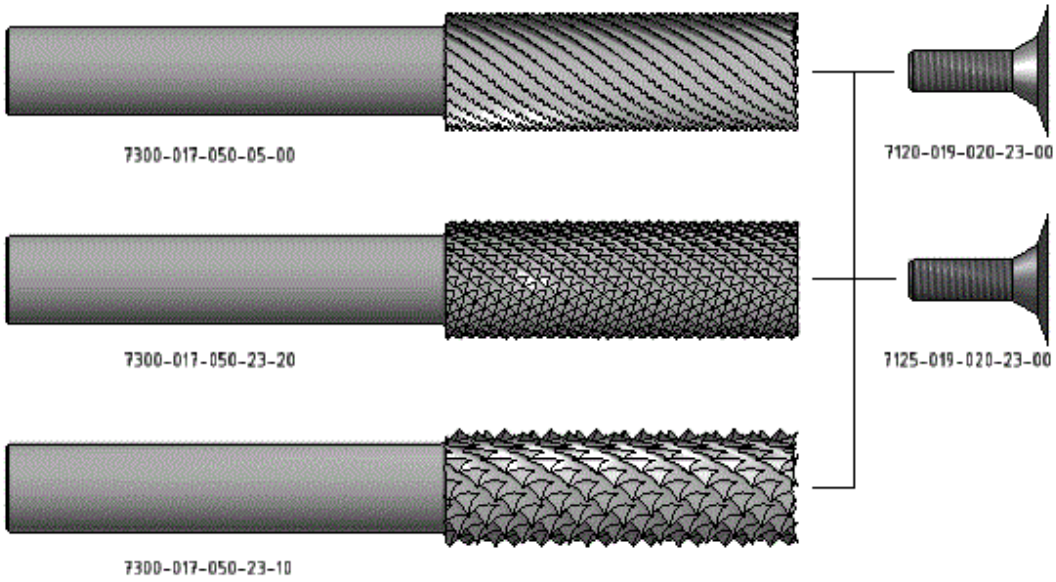
Front-End Tools		Cutting Dia		Overall Width	Arbor Dia	Mat.	**EDP#** / Item #
Solid carbide knife with thread, AWAC3-coated	mm	12.7	±0.1	11	M5	SC	**170002** 7125-012-011-23-00
	inch	1/2	±0.004	0.433	M5		

Shank shredders		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	**EDP#** / Item #
Shank shredder, AWC2-coated	mm	11.9	±0.1	10	101.6	12.7	h6	PM	**170003** 7300-011-010-05-00
	inch	0.469	±0.004	0.394	4	1/2	-0.0005		

SC=Solid Carbide, PM=Powdered Metal



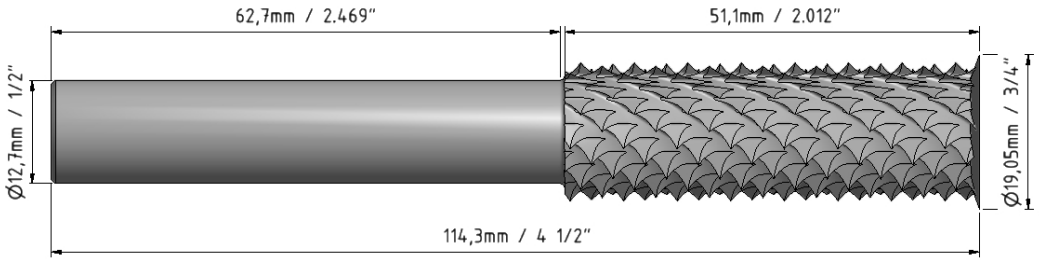
Corecut 19.05 (¾")



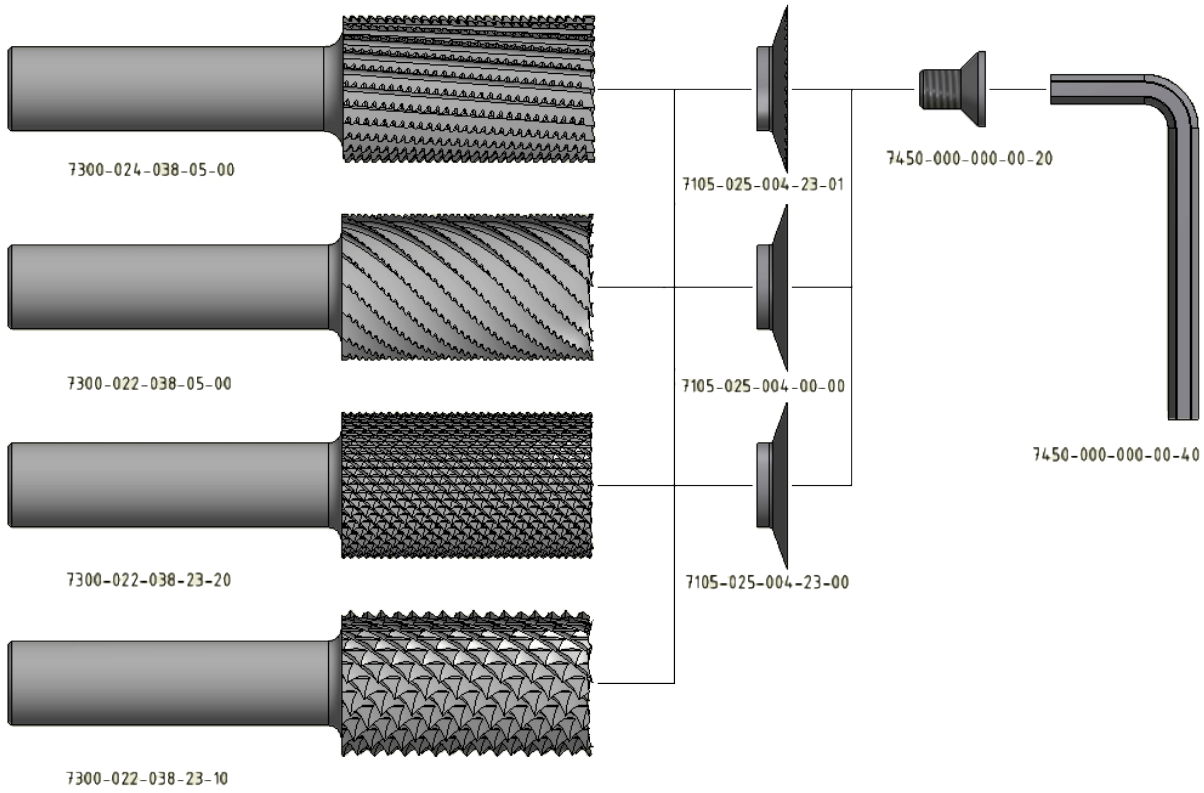
Front-End Tools		Cutting Dia		Overall Width	Arbor Dia	Mat.	**EDP#** / Item #
HSS cobalt knife with thread, AWAC3-coated	mm	19.05	±0.1	20	M6	PM	**170004** 7120-019-020-23-00
	inch	3/4	±0.004	0.787	M6		
Solid carbide knife with thread, AWAC3-coated	mm	19.05	±0.1	20	M6	SC	**170005** 7125-019-020-23-00
	inch	3/4	±0.004	0.787	M6		

Shank shredders		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	**EDP#** / Item #
Shredder with teeth for Nomex, AWC2-coated	mm	17	±0.2	50.8	114	12.7	h6	PM	**170006** 7300-017-050-05-00
	inch	0.669	±0.009	2	4.49	1/2	-0.0005		
Shredder fine diamond-shaped teeth, AWAC3-coated	mm	17	±0.2	50.8	114	12.7	h6	PM	**170007** 7300-017-050-23-20
	inch	0.669	±0.009	2	4.49	1/2	-0.0005		
Shredder coarse diamond-shaped teeth, AWAC3-coated	mm	17	±0.2	50.8	114	12.7	h6	PM	**170008** 7300-017-050-23-10
	inch	0.669	±0.009	2	4.49	1/2	-0.0005		

SC=Solid Carbide, PM=Powdered Metal



Corecut 25.4 (1")



Front-End Tools		Cutting Dia		Overall Width	Arbor Dia	Mat.	**EDP#** / Item #
Solid carbide knife, uncoated	mm	25.4	±0.1	4.5	6.5	SC	**170009** 7105-025-004-00-00
	inch	1	±0.004	0.177	0.256		
Solid carbide knife, AWAC3-coated	mm	25.4	±0.1	4.5	6.5	SC	**170010** 7105-025-004-23-00
	inch	1	±0.004	0.177	0.256		
Solid carbide knife with teeth, AWAC3-coated	mm	25.4	±0.1	4.5	6.5	SC	**170304** 7105-025-004-23-01
	inch	1	±0.004	0.177	0.256		

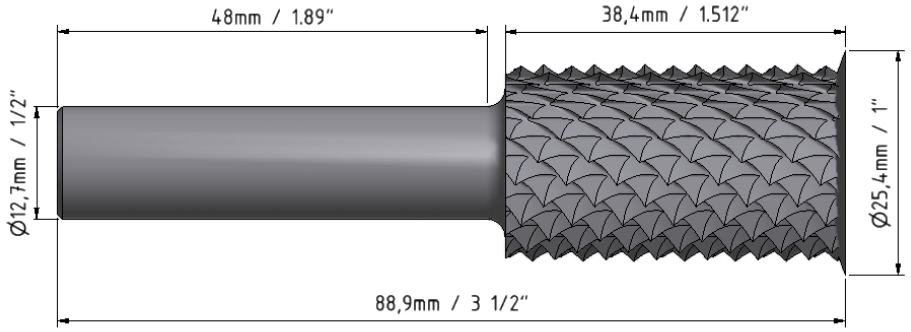
Shank shredders		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	**EDP#** / Item #
Set with shredder with teeth for Nomex, AWC2-coated, incl. screw and wrench	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170112** 7400-022-038-05-00
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Set with shredder with fine diamond-shaped teeth, AWAC3- coated, incl. screw and wrench	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170113** 7400-022-038-23-20
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Set with shredder with coarse diamond-shaped teeth, AWAC3-coated, incl. screw and wrench	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170114** 7400-022-038-23-10
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Set with shredder with teeth for Nomex, helix 5°, AWC2-coated, incl. screw and wrench	mm	24.638	±0.2	38.1	88.9	12.7	h6	PM	**170125** 7400-024-038-05-00
	inch	0.97	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Shredder with teeth for Nomex, AWC2-coated *	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170011** 7300-022-038-05-00
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Shredder with fine diamond-shaped teeth, AWAC3-coated *	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170012** 7300-022-038-23-20
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Shredder with coarse diamond-shaped teeth, AWAC3-coated *	mm	22.225	±0.2	38.1	88.9	12.7	h6	PM	**170013** 7300-022-038-23-10
	inch	7/8	±0.008	1 1/2	3 1/2	1/2	-0.0005		
Shredder with teeth for Nomex, helix 5°, AWC2-coated *	mm	24.638	±0.2	38.1	88.9	12.7	h6	PM	**170036** 7300-024-038-05-00
	inch	0.97	±0.008	1 1/2	3 1/2	1/2	-0.0005		

* Single components for the shank sets

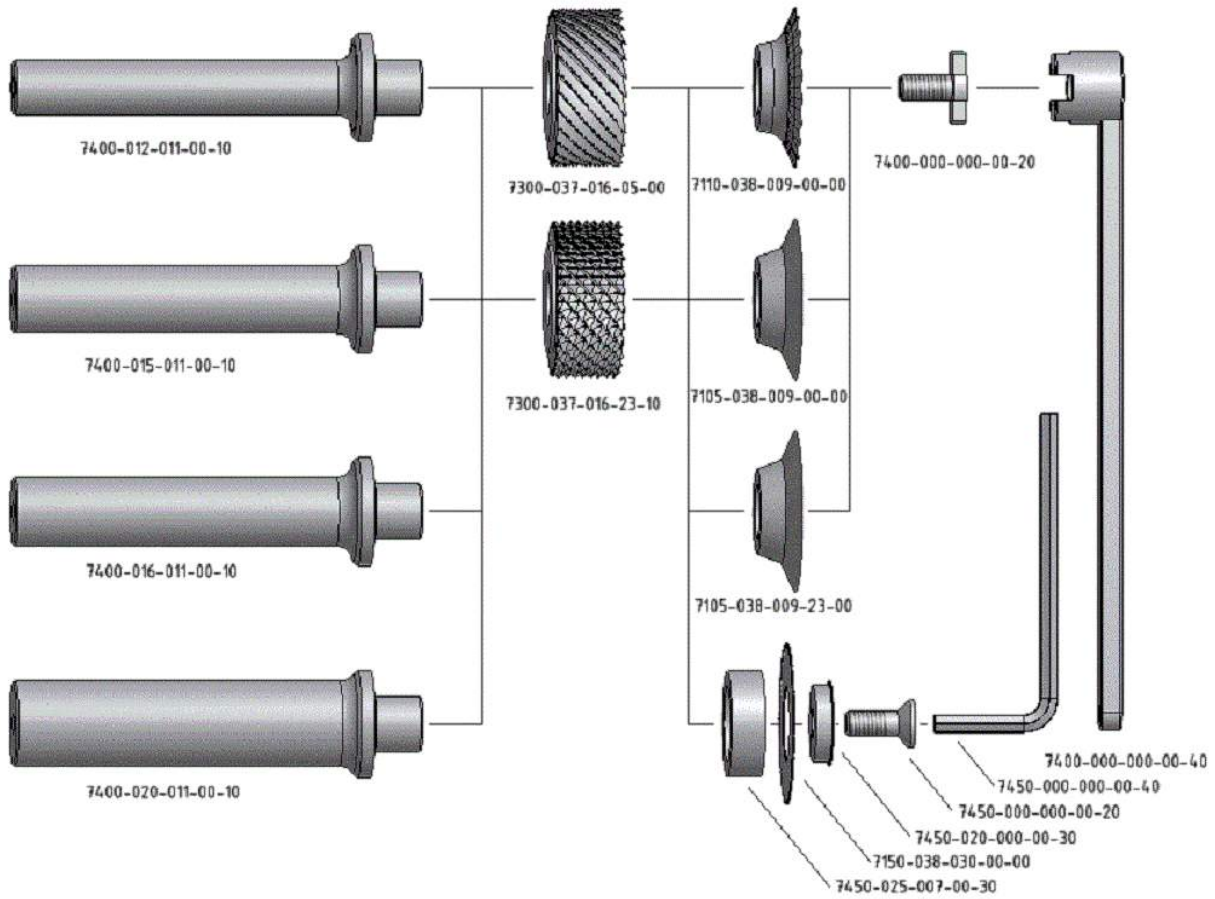
Accessories	Mat.	**EDP#** / Item #.
Screw *	Steel	**170108** 7450-000-000-00-20
Allen wrench (SW 4) *	Steel	**170109** 7450-000-000-00-40

* Single components for the shank sets

SC=Solid Carbide, PM=Powdered Metal



Corecut 38.1 (1½")



Front-End Tools		Cutting Dia		Overall Width		Arbor Dia		Mat.	**EDP#** / Item #
HSS Cobalt wavy cutter, uncoated, T=20	mm	38.1	±0.1	9		13	H7	PM	**170014** 7110-038-009-00-00
	inch	1 1/2	±0.004	0.354		0.5118	+0.0008		
Solid carbide knife, polished, uncoated	mm	38.1	±0.1	9		13	H7	SC	**170015** 7105-038-009-00-00
	inch	1 1/2	±0.004	0.354		0.5118	+0.0008		
Solid carbide knife, polished, AWAC3-coated	mm	38.1	±0.1	9		13	H7	SC	**170016** 7105-038-009-23-00
	inch	1 1/2	±0.004	0.354		0.5118	+0.0008		
Saw blade, helical toothing T=80 *	mm	38.1	±0.1	0.3	±0.02	22	H7	HSSCo	**170017** 7150-038-030-00-00
	inch	1 1/2	±0.004	0.0118	±0.0008	0.8661	+0.0008		

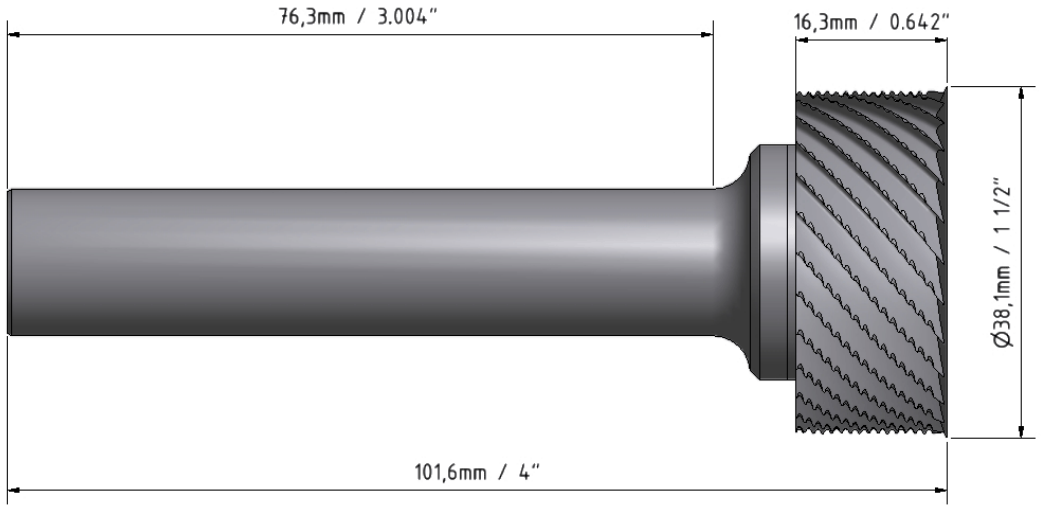
* requires a mounting set (see accessories)

Shredders		Cutting Dia		Cutting Length	Arbor Hole Dia		Mat.	**EDP#** / Item #
Shredder with teeth for Nomex, AWC2-coated	mm	37	±0.2	16	13	H6	PM	**170021** 7300-037-016-05-00
	inch	1.457	±0.009	0.63	0.5118	+0.0005		
Shredder with diamond-shaped teeth, AWAC3-coated	mm	37	±0.2	16	13	H6	PM	**170022** 7300-037-016-23-10
	inch	1.457	±0.009	0.63	0.5118	+0.0005		

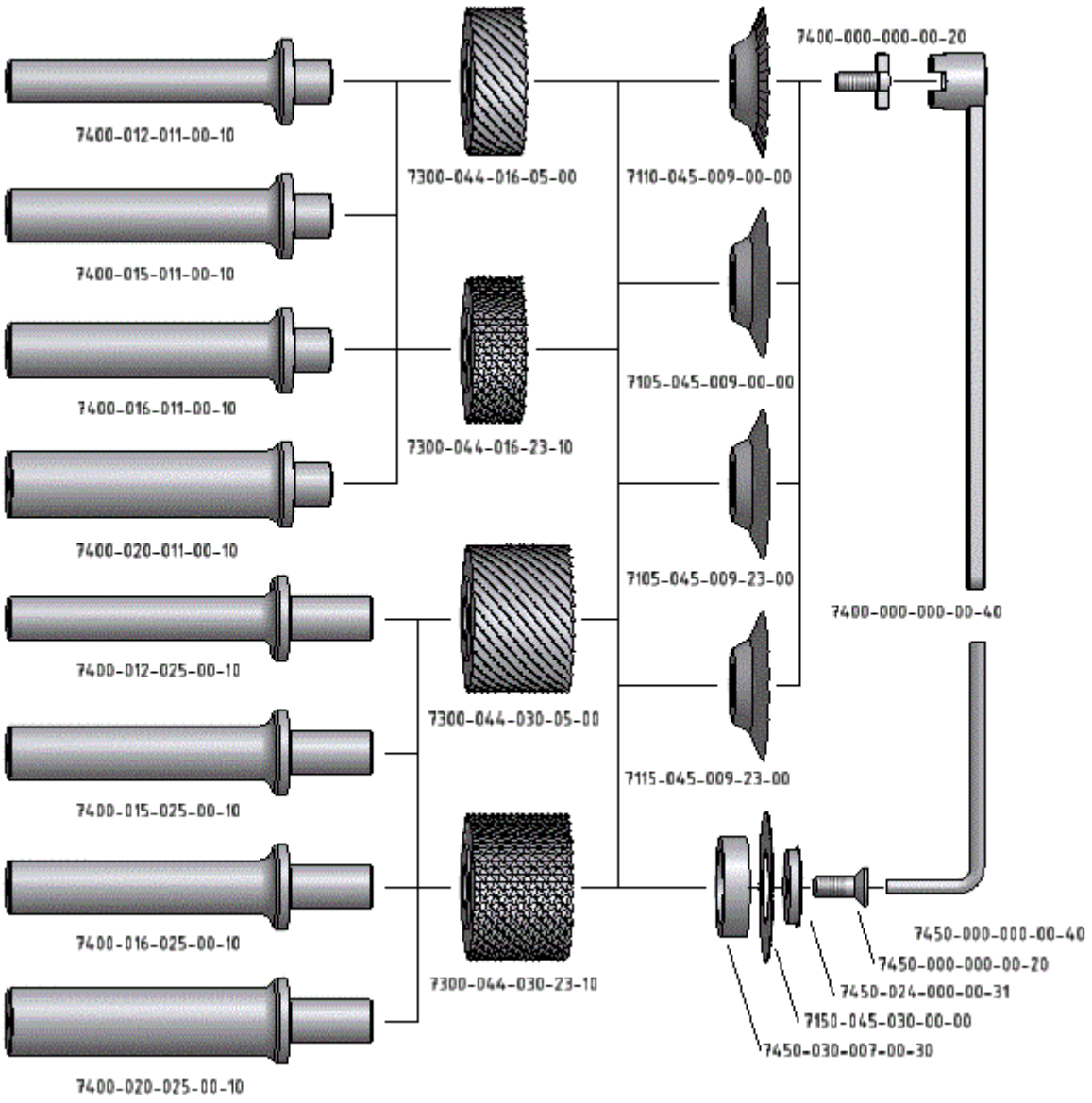
Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	EDP# / Item #
Shank set, ø 1/2" (incl. screw and wrench)	mm	12.7	h6	13	-0.011	96.2	HSS	**170047** 7400-012-011-00-00
	inch	1/2	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 5/8" (incl. screw and wrench)	mm	15.875	h6	13	-0.011	96.2	HSS	**170049** 7400-015-011-00-00
	inch	5/8	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 16mm (incl. screw and wrench)	mm	16	h6	13	-0.011	96.2	HSS	**170051** 7400-016-011-00-00
	inch	0.63	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 20mm (incl. screw and wrench)	mm	20	h6	13	-0.011	96.2	HSS	**170053** 7400-020-011-00-00
	inch	0.7874	-0.0005	0.5118	-0.0005	3.787		
Shank* ø 1/2"	mm	12.7	h6	13	-0.011	96.2	HSS	**170046** 7400-012-011-00-10
	inch	1/2	-0.0005	0.5118	-0.0005	3.787		
Shank*, ø 5/8"	mm	15.875	h6	13	-0.011	96.2	HSS	**170048** 7400-015-011-00-10
	inch	5/8	-0.0005	0.5118	-0.0005	3.787		
Shank*, ø 16mm	mm	16	h6	13	-0.011	96.2	HSS	**170050** 7400-016-011-00-10
	inch	0.63	-0.0005	0.5118	-0.0005	3.787		
Shank*, ø 20mm	mm	20	h6	13	-0.011	96.2	HSS	**170052** 7400-020-011-00-10
	inch	0.7874	-0.0005	0.5118	-0.0005	3.787		
Screw *							Steel	**170035** 7400-000-000-00-20
Wrench *							Steel	**170037** 7400-000-000-00-40
Mounting set for saw blade (incl. 2 washers, screw, wrench)							HSS	**170020** 7450-038-030-00-00
Centering washer **	mm	25		7.9		13	HSS	**170018** 7450-025-007-00-30
	inch	0.984		0.311		0.512		
Spring washer **	mm	20		0.3		7	HSS	**170019** 7450-020-000-00-30
	inch	0.7874		0.012		0.276		
Screw **							Steel	**170108** 7450-000-000-00-20
Allen wrench (SW 4) **							Steel	**170109** 7450-000-000-00-40
½"-Torque wrench adapter for screw*							Steel	**170134** 7450-000-000-00-52
Reduction for torque wrench adapter from ½" to ⅜"*							Steel	**170136** 7450-000-000-00-54

* Single components for the shank sets
** Single components for the mounting set for the saw blade
All CORECUT 38.1-shanks may also be used with the CORECUT 45-system (short version).

SC=Solid Carbide, PM=Powdered Metal



Corecut 45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7450-024-000-00-31
7150-045-030-00-00
7450-030-007-00-30

Front-End Tools		Cutting Dia		Overall Width		Arbor Dia		Mat.	EDP# / Item #
HSS Cobalt wavy cutter, uncoated, T=20	mm	45	±0.1	9		13	H7	PM	**170023** 7110-045-009-00-00
	inch	1.77	±0.004	0.354		0.5118	+0.0008		
Solid carbide wavy cutter, polished, AWAC3-coated	mm	45	±0.1	9		13	H7	SC	**170026** 7115-045-009-23-00
	inch	1.77	±0.004	0.354		0.5118	+0.0008		
Solid carbide knife, polished, uncoated	mm	45	±0.1	9		13	H7	SC	**170024** 7105-045-009-00-00
	inch	1.77	±0.004	0.354		0.5118	+0.0008		
Solid carbide knife, polished, AWAC3-coated	mm	45	±0.1	9		13	H7	SC	**170025** 7105-045-009-23-00
	inch	1.77	±0.004	0.354		0.5118	+0.0008		
Saw blade, helical teeth T=85 *	mm	45	±0,1	0.3	±0.02	22	H7	HSSCo	**170027** 7150-045-030-00-00
	inch	1.77	±0,004	0.0118	±0.0008	0.8661	+0.0008		

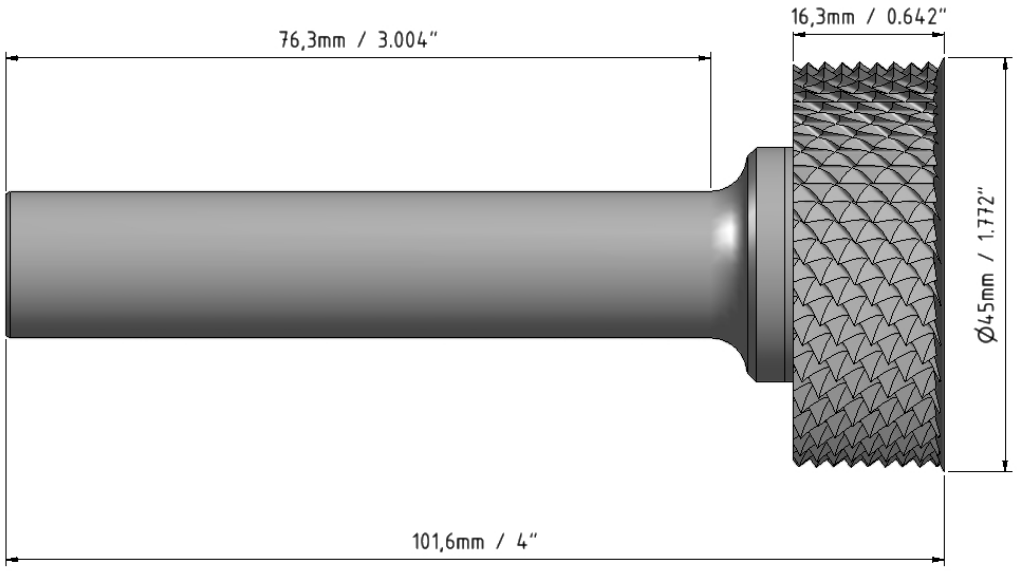
* requires a mounting set (see accessories)

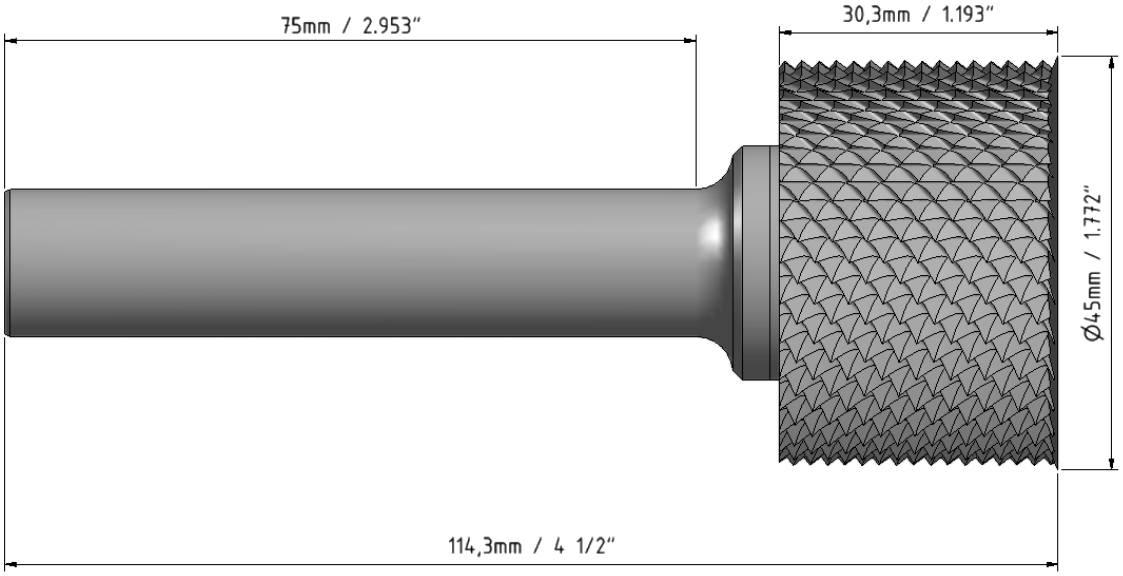
Shredders		Cutting Dia		Cutting Length		Arbor Hole Dia		Mat.	EDP# / Item #
Shredder, short version, with teeth for Nomex, AWC2-coated	mm	44	±0.2	16		13	H6	PM	**170031** 7300-044-016-05-00
	inch	1.732	±0.008	0.63		0.5118	+0.0005		
Shredder, short version, diamond-shaped teeth, AWAC3-coated	mm	44	±0.2	16		13	H6	PM	**170032** 7300-044-016-23-10
	inch	1.732	±0.008	0.63		0.5118	+0.0005		
Shredder, long version, with teeth for Nomex, AWC2-coated	mm	44	±0.2	30		13	H6	PM	**170033** 7300-044-030-05-00
	inch	1.732	±0.008	1.181		0.5118	+0.0005		
Shredder, long version, diamond-shaped teeth, AWAC3-coated	mm	44	±0.2	30		13	H6	PM	**170034** 7300-044-030-23-10
	inch	1.732	±0.008	1.181		0.5118	+0.0005		

Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	EDP# / Item #
Shank set, ø 1/2", short version*** (incl. screw and wrench)	mm	12.7	h6	13	-0.011	96.2	HSS	**170047** 7400-012-011-00-00
	inch	1/2	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 5/8", short version*** (incl. screw and wrench)	mm	15.875	h6	13	-0.011	96.2	HSS	**170049** 7400-015-011-00-00
	inch	5/8	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 16mm, short version*** (incl. screw and wrench)	mm	16	h6	13	-0.011	96.2	HSS	**170051** 7400-016-011-00-00
	inch	0.63	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 20mm, short version*** (incl. screw and wrench)	mm	20	h6	13	-0.011	96.2	HSS	**170053** 7400-020-011-00-00
	inch	0.7874	-0.0005	0.5118	-0.0005	3.787		
Shank *, ø 1/2", short version***	mm	12.7	h6	13	-0.011	96.2	HSS	**170046** 7400-012-011-00-10
	inch	1/2	-0.0005	0.5118	-0.0005	3.787		
Shank *, ø 5/8", short version***	mm	15.875	h6	13	-0.011	96.2	HSS	**170048** 7400-015-011-00-10
	inch	5/8	-0.0005	0.5118	-0.0005	3.787		
Shank *, ø 16mm, short version***	mm	16	h6	13	-0.011	96.2	HSS	**170050** 7400-016-011-00-10
	inch	0.63	-0.0005	0.5118	-0.0005	3.787		
Shank *, ø 20mm, short version***	mm	20	h6	13	-0.011	96.2	HSS	**170052** 7400-020-011-00-10
	inch	0.7874	-0.0005	0.5118	-0.0005	3.787		
Shank set, ø 1/2", long version**** (incl. screw and wrench)	mm	12.7	h6	13	-0.011	108.4	HSS	**170039** 7400-012-025-00-00
	inch	1/2	-0.0005	0.5118	-0.0005	4.268		
Shank set, ø 5/8", long version**** (incl. screw and wrench)	mm	15.875	h6	13	-0.011	108.4	HSS	**170041** 7400-015-025-00-00
	inch	5/8	-0.0005	0.5118	-0.0005	4.268		
Shank set, ø 16mm, long version**** (incl. screw and wrench)	mm	16	h6	13	-0.011	108.4	HSS	**170043** 7400-016-025-00-00
	inch	0.63	-0.0005	0.5118	-0.0005	4.268		
Shank set, ø 20mm, long version**** (incl. screw and wrench)	mm	20	h6	13	-0.011	108.4	HSS	**170045** 7400-020-025-00-00
	inch	0.7874	-0.0005	0.5118	-0.0005	4.268		
Shank *, ø 1/2", long version****	mm	12.7	h6	13	-0.011	108.4	HSS	**170038** 7400-012-025-00-10
	inch	1/2	-0.0005	0.5118	-0.0005	4.268		
Shank *, ø 5/8", long version****	mm	15.875	h6	13	-0.011	108.4	HSS	**170040** 7400-015-025-00-10
	inch	5/8	-0.0005	0.5118	-0.0005	4.268		
Shank *, ø 16mm, long version****	mm	16	h6	13	-0.011	108.4	HSS	**170042** 7400-016-025-00-10
	inch	0.63	-0.0005	0.5118	-0.0005	4.268		
Shank *, ø 20mm, long version****	mm	20	h6	13	-0.011	108.4	HSS	**170044** 7400-020-025-00-10
	inch	0.7874	-0.0005	0.5118	-0.0005	4.268		
Screw *							Steel	**170035** 7400-000-000-00-20
Wrench *							Steel	**170037** 7400-000-000-00-40
Mounting set for saw blade (incl. 2 washers, screw, wrench)							HSS	**170030** 7450-045-030-00-00
Centering washer **	mm	30		7.6		13	HSS	**170028** 7450-030-007-00-30
	inch	1.181		0.2992		0.5118		
Spring washer **	mm	24		0.3		7	HSS	**170029**7450-024-000-00-31
	inch	0.945		0.0118		0.2756		
Screw **							Steel	**170108** 7450-000-000-00-20
Allen wrench (SW 4) **							Steel	**170109** 7450-000-000-00-40
½"-Torque wrench adapter for screw*							Steel	**170134** 7450-000-000-00-52
Reduction for torque wrench adapter from ½" to ⅜"*							Steel	**170136** 7450-000-000-00-54

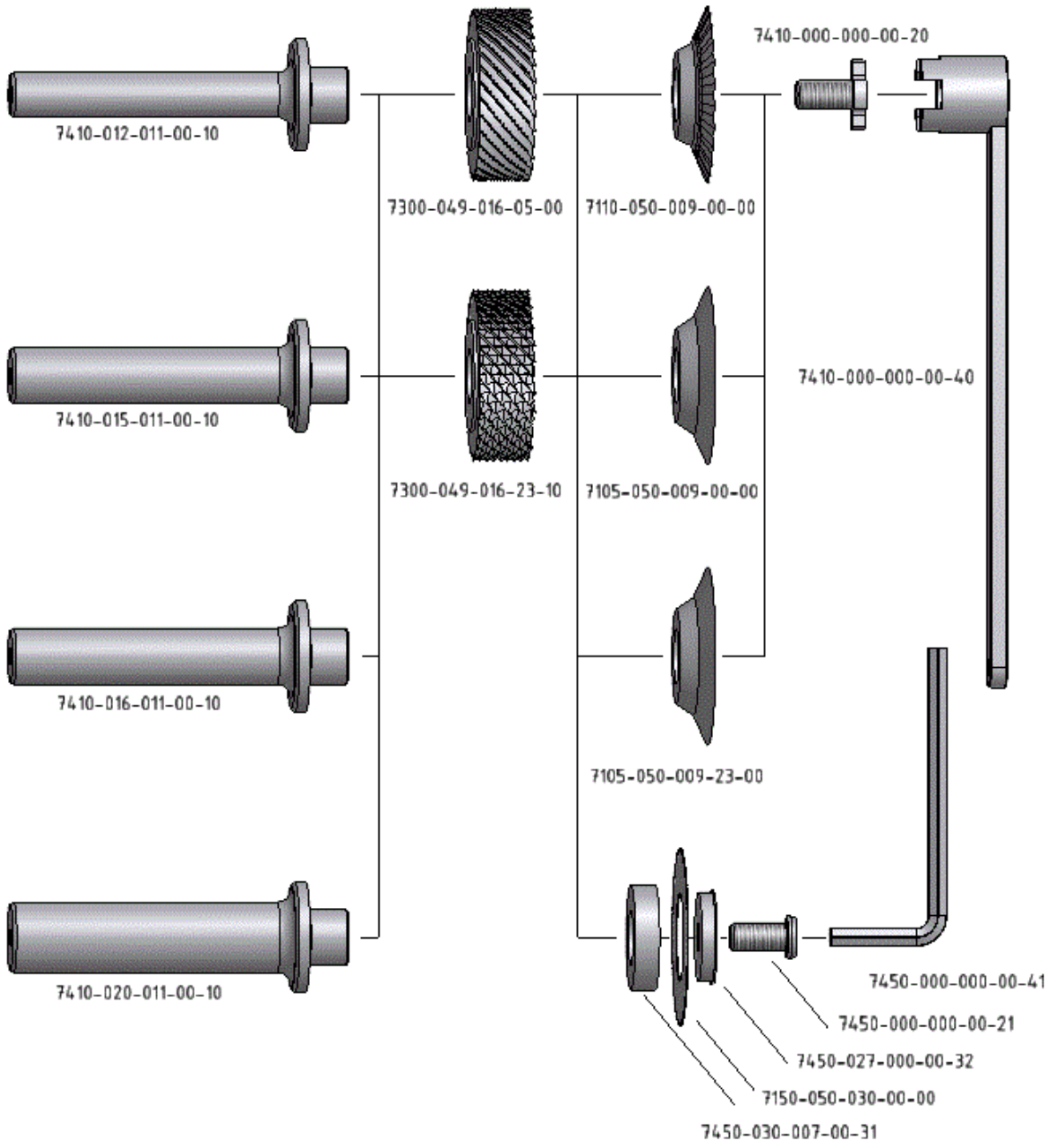
* Single components for the shank sets
** Single components for the mounting set for the saw blade
*** suitable for short version shredder tools; may also be used with Corecut 38.1 (1½")
**** suitable for long version shredder tools

SC=Solid Carbide, PM=Powdered Metal


16,3mm / 0.642"
76,3mm / 3.004"
Ø45mm / 1.772"
101,6mm / 4"


30,3mm / 1.193"
75mm / 2.953"
Ø45mm / 1.772"
114,3mm / 4 1/2"

Corecut 50.8 (2")



Front-End Tools		Cutting Dia		Overall Width		Arbor Dia		Mat.	**EDP#** / Item #
HSS Cobalt wavy cutter, uncoated, T=24	mm	50.8	±0.1	9		16	H7	PM	**170054** 7110-050-009-00-00
	inch	2	±0.004	0.354		0.63	+0.0008		
Solid carbide knife, polished, uncoated	mm	50.8	±0.1	9		16	H7	SC	**170055** 7105-050-009-00-00
	inch	2	±0.004	0.354		0.63	+0.0008		
Solid carbide knife, polished, AWAC3-coated	mm	50.8	±0.1	9		16	H7	SC	**170056** 7105-050-009-23-00
	inch	2	±0.004	0.354		0.63	+0.0008		
Saw blade, helical toothing T=90 *	mm	50.8	±0.1	0.3	±0.02	25.4	H7	HSSCo	**170057** 7150-050-030-00-00
	inch	2	±0.004	0.0118	±0.0008	1	+0.0008		

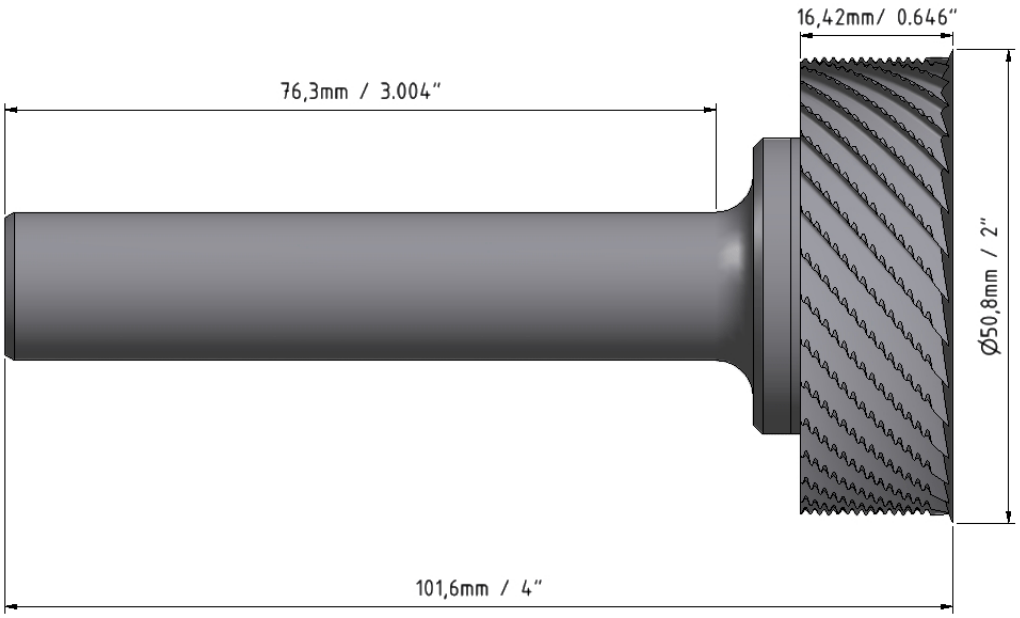
* requires a mounting set (see accessories)

Shredders		Cutting Dia		Cutting Length		Arbor Hole Dia		Mat.	EDP# / Item #
Shredder with teeth for Nomex, AWC2-coated	mm	49	±0.2	16		16	H6	PM	**170062** 7300-049-016-05-00
	inch	1.929	±0.008	0.63		0.63	+0.0005		
Shredder with diamond-shaped teeth, AWAC3-coated	mm	49	±0.2	16		16	H6	PM	**170063** 7300-049-016-23-10
	inch	1.929	±0.008	0.63		0.63	+0.0005		

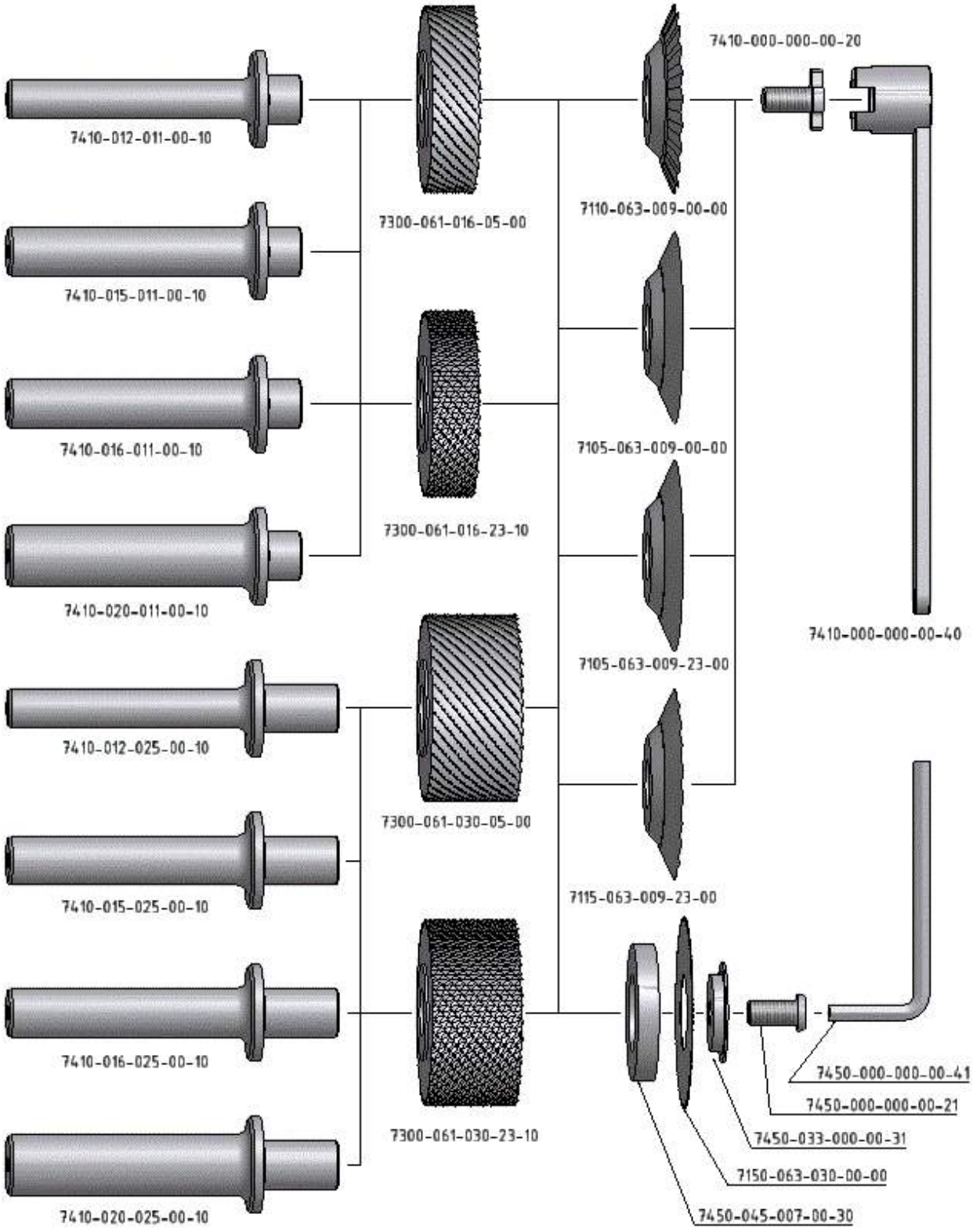
Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	EDP# / Item #
Shank set, ø 1/2" (incl. screw and wrench)	mm	12.7	h6	16	-0.011	96.2	HSS	**170088** 7410-012-011-00-00
	inch	1/2	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 5/8" (incl. screw and wrench)	mm	15.875	h6	16	-0.011	96.2	HSS	**170090** 7410-015-011-00-00
	inch	5/8	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 16mm (incl. screw and wrench)	mm	16	h6	16	-0.011	96.2	HSS	**170092** 7410-016-011-00-00
	inch	0.63	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 20mm (incl. screw and wrench)	mm	20	h6	16	-0.011	96.2	HSS	**170094** 7410-020-011-00-00
	inch	0.7874	-0.0005	0.63	-0.0005	3.787		
Shank ø 1/2" *	mm	12.7	h6	16	-0.011	96.2	HSS	**170087** 7410-012-011-00-10
	inch	1/2	-0.0005	0.63	-0.0005	3.787		
Shank, ø 5/8" *	mm	15.875	h6	16	-0.011	96.2	HSS	**170089** 7410-015-011-00-10
	inch	5/8	-0.0005	0.63	-0.0005	3.787		
Shank, ø 16mm *	mm	16	h6	16	-0.011	96.2	HSS	**170091** 7410-016-011-00-10
	inch	0.63	-0.0005	0.63	-0.0005	3.787		
Shank, ø 20mm *	mm	20	h6	16	-0.011	96.2	HSS	**170093** 7410-020-011-00-10
	inch	0.7874	-0.0005	0.63	-0.0005	3.787		
Screw *							Steel	**170076** 7410-000-000-00-20
Wrench *							Steel	**170078** 7410-000-000-00-40
Mounting set for saw blade (incl. 2 washers, screw, wrench)							HSS	**170061** 7450-050-030-00-00
Centering washer **	mm	30		7		16	HSS	**170058** 7450-030-007-00-31
	inch	1.181		0.2756		0.63		
Spring washer **	mm	24		0.5		8.5	HSS	**170059** 7450-027-000-00-32
	inch	0.945		0.0197		0.3346		
Screw **							Steel	**170060** 7450-000-000-00-21
Allen wrench (SW 5) **							Steel	**170111** 7450-000-000-00-41
½"-Torque wrench adapter for screw*							Steel	**170135** 7450-000-000-00-52
Reduction for torque wrench adapter from ½" to ⅜"*							Steel	**170136** 7450-000-000-00-54

* Single components for the shank sets
** Single components for the mounting set for the saw blade
All CORECUT 50.8-shanks may also be used with the CORECUT 63-system (short version).

SC=Solid Carbide, PM=Powdered Metal


16,42mm/ 0.646"
76,3mm / 3.004"
Ø50,8mm / 2"
101,6mm / 4"

Corecut 63


7410-012-011-00-10
7410-015-011-00-10
7410-016-011-00-10
7410-020-011-00-10
7410-012-025-00-10
7410-015-025-00-10
7410-016-025-00-10
7410-020-025-00-10
7300-061-016-05-00
7300-061-016-23-10
7300-061-030-05-00
7300-061-030-23-10
7410-000-000-00-20
7110-063-009-00-00
7105-063-009-00-00
7105-063-009-23-00
7115-063-009-23-00
7410-000-000-00-40
7450-000-000-00-41
7450-000-000-00-21
7450-033-000-00-31
7150-063-030-00-00
7450-045-007-00-30

Front-End Tools		Cutting Dia		Overall Width		Arbor Dia		Mat.	EDP# / Item #
HSS Cobalt wavy cutter, uncoated, T=22	mm	63	±0.1	9		16	H7	PM	**170064** 7110-063-009-00-00
	inch	2.48	±0.004	0.354		0.63	+0.0008		
Solid carbide wavy cutter, polished, AWAC3-coated	mm	63	±0.1	9		16	H7	SC	**170067** 7115-063-009-23-00
	inch	2.48	±0.004	0.354		0.63	+0.0008		
Solid carbide knife, polished, uncoated	mm	63	±0.1	9		16	H7	SC	**170065** 7105-063-009-00-00
	inch	2.48	±0.004	0.354		0.63	+0.0008		
Solid carbide knife, polished, AWAC3-coated	mm	63	±0.1	9		16	H7	SC	**170066** 7105-063-009-23-00
	inch	2.48	±0.004	0.354		0.63	+0.0008		
Saw blade, helical teeth T=100 *	mm	63	±0.1	0.3	±0.02	25.4	H7	HSSCo	**170068** 7150-063-030-00-00
	inch	2.48	±0.004	0.0118	±0.0008	1	+0.0008		

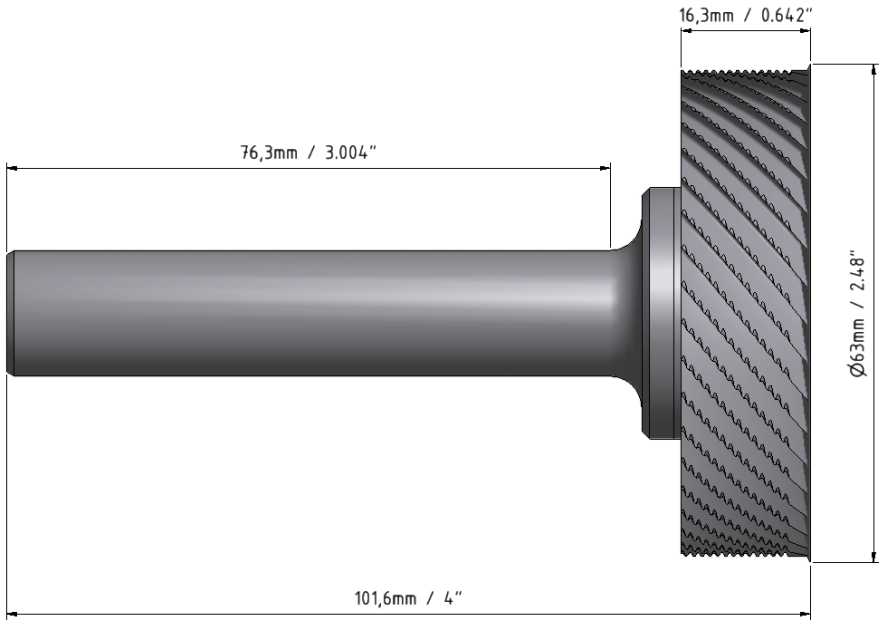
* requires a mounting set (see accessories)

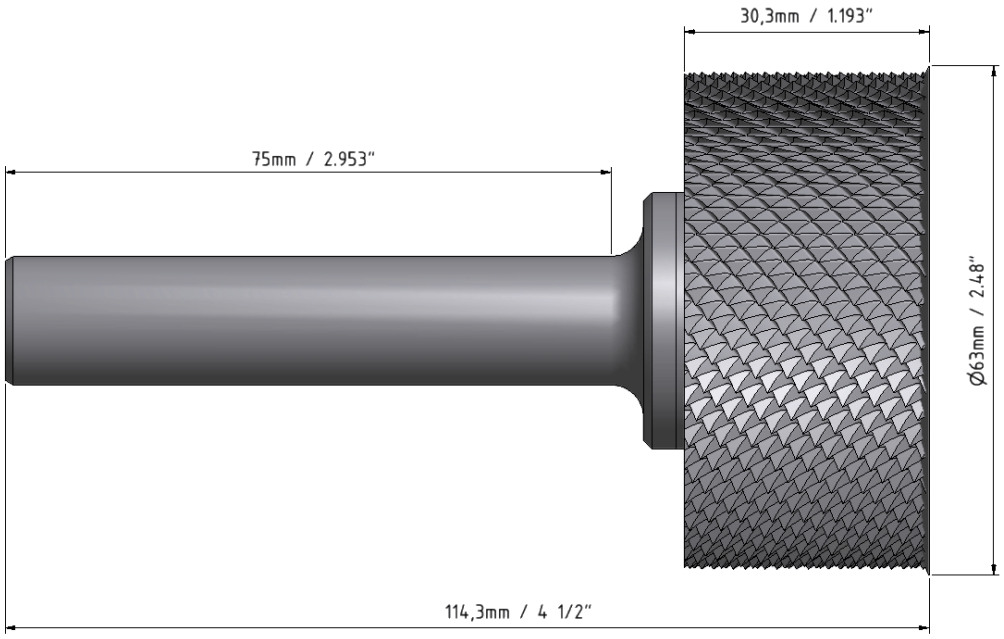
Shredders		Cutting Dia		Cutting Length		Arbor Hole Dia		Mat.	EDP# / Item #
Shredder, short version, with teeth for Nomex, AWC2-coated	mm	61.5	±0.2	16		16	H6	PM	**170072** 7300-061-016-05-00
	inch	2.421	±0.008	0.63		0.63	+0.0005		
Shredder, short version, diamond-shaped teeth, AWAC3-coated	mm	61.5	±0.2	16		16	H6	PM	**170073** 7300-061-016-23-10
	inch	2.421	±0.008	0.63		0.63	+0.0005		
Shredder, long version, with teeth for Nomex, AWC2-coated	mm	61.5	±0.2	30		16	H6	PM	**170074** 7300-061-030-05-00
	inch	2.421	±0.008	1.181		0.63	+0.0005		
Shredder, long version, diamond-shaped teeth, AWAC3-coated	mm	61.5	±0.2	30		16	H6	PM	**170075** 7300-061-030-23-10
	inch	2.421	±0.008	1.181		0.63	+0.0005		

Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	EDP# / Item #
Shank set, ø 1/2", short version*** (incl. screw and wrench)	mm	12.7	h6	16	-0.011	96.2	HSS	**170088** 7410-012-011-00-00
	inch	1/2	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 5/8", short version*** (incl. screw and wrench)	mm	15.875	h6	16	-0.011	96.2	HSS	**170090** 7410-015-011-00-00
	inch	5/8	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 16mm, short version*** (incl. screw and wrench)	mm	16	h6	16	-0.011	96.2	HSS	**170092** 7410-016-011-00-00
	inch	0.63	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 20mm, short version*** (incl. screw and wrench)	mm	20	h6	16	-0.011	96.2	HSS	**170094** 7410-020-011-00-00
	inch	0.7874	-0.0005	0.63	-0.0005	3.787		
Shank *, ø 1/2", short version***	mm	12.7	h6	16	-0.011	96.2	HSS	**170087** 7410-012-011-00-10
	inch	1/2	-0.0005	0.63	-0.0005	3.787		
Shank *, ø 5/8", short version***	mm	15.875	h6	16	-0.011	96.2	HSS	**170089** 7410-015-011-00-10
	inch	5/8	-0.0005	0.63	-0.0005	3.787		
Shank *, ø 16mm, short version***	mm	16	h6	16	-0.011	96.2	HSS	**170091** 7410-016-011-00-10
	inch	0.63	-0.0005	0.63	-0.0005	3.787		
Shank *, ø 20mm, short version***	mm	20	h6	16	-0.011	96.2	HSS	**170093** 7410-020-011-00-10
	inch	0.7874	-0.0005	0.63	-0.0005	3.787		
Shank set, ø 1/2", long version**** (incl. screw and wrench)	mm	12.7	h6	16	-0.011	108.4	HSS	**170080** 7410-012-025-00-00
	inch	1/2	-0.0005	0.63	-0.0005	4.268		
Shank set, ø 5/8", long version**** (incl. screw and wrench)	mm	15.875	h6	16	-0.011	108.4	HSS	**170082** 7410-015-025-00-00
	inch	5/8	-0.0005	0.63	-0.0005	4.268		
Shank set, ø 16mm, long version**** (incl. screw and wrench)	mm	16	h6	16	-0.011	108.4	HSS	**170084** 7410-016-025-00-00
	inch	0.63	-0.0005	0.63	-0.0005	4.268		
Shank set, ø 20mm, long version**** (incl. screw and wrench)	mm	20	h6	16	-0.011	108.4	HSS	**170086** 7410-020-025-00-00
	inch	0.7874	-0.0005	0.63	-0.0005	4.268		
Shank *, ø 1/2", long version****	mm	12.7	h6	16	-0.011	108.4	HSS	**170079** 7410-012-025-00-10
	inch	1/2	-0.0005	0.63	-0.0005	4.268		
Shank *, ø 5/8", long version****	mm	15.875	h6	16	-0.011	108.4	HSS	**170081** 7410-015-025-00-10
	inch	5/8	-0.0005	0.63	-0.0005	4.268		
Shank *, ø 16mm, long version****	mm	16	h6	16	-0.011	108.4	HSS	**170083** 7410-016-025-00-10
	inch	0.63	-0.0005	0.63	-0.0005	4.268		
Shank *, ø 20mm, long version****	mm	20	h6	16	-0.011	108.4	HSS	**170085** 7410-020-025-00-10
	inch	0.7874	-0.0005	0.63	-0.0005	4.268		
Screw *							Steel	**170076** 7410-000-000-00-20
Wrench *							Steel	**170078** 7410-000-000-00-40
Mounting set for saw blade (incl. 2 washers, screw, wrench)							HSS	**170071** 7450-063-030-00-00
Centering washer **							HSS	**170069** 7450-045-007-00-30
Spring washer **							HSS	**170070** 7450-033-000-00-31
Screw **							Steel	**170060** 7450-000-000-00-21
Allen wrench (SW 5) **							Steel	**170111** 7450-000-000-00-41
½"-Torque wrench adapter for screw*							Steel	**170135** 7450-000-000-00-52
Reduction for torque wrench adapter from ½" to ⅜"*							Steel	**170136** 7450-000-000-00-54

* Single components for the shank sets
** Single components for the mounting set for the saw blade
*** suitable for short version shredder tools; may also be used with Corecut 50.8 (2")
**** suitable for long version shredder tools

SC=Solid Carbide, PM=Powdered Metal


16,3mm / 0.642"
76,3mm / 3.004"
Ø63mm / 2.48"
101,6mm / 4"


30,3mm / 1.193"
75mm / 2.953"
Ø63mm / 2.48"
114,3mm / 4 1/2"

2 POCKET CUT

Shank tools with axial and radial teeth. Ideal for the machining of pockets and slots in honeycomb materials. Available with three different tooth geometries to suit your applications.

POCKET CUT

TOOLING SYSTEM for Honeycomb Applications

Introduction

The POCKET CUT tools are designed for machining pockets, slots, and plunge applications in honeycomb. With the combination of axial and radial teeth, it is the perfect tool for 3-axis machines, where the spindle can not be tilted. Its unique front teeth design allows for crisp cell cuts in pockets on 3-axis machines. They can also be used on 5-axis machines. The cutters different mantle designs offer an optimized cell-waste crushing process.

All shredder end mills are made out of HSS Cobalt Powdered Metal (PM). Additionally, performance and tool life is increased using an appropriate coating: The PVD coating (Physical Vapor Deposition) for wear protection or the multi-layer PVD coating to prevent sticking as well.

Three different tooth types are available to satisfy your requirements and provide a perfect solution for any honeycomb material.

Components and Applications

Teeth for "Nomex"

7350-015-031-05-00

The teeth of this POCKET CUT tool are designed especially for meta-aramid fiber honeycombs (like NOMEX). Its PVD coating reduces wear and increases tool life.

Fine diamond-shaped teeth

7350-015-031-23-20

The fine diamond shaped teeth of this tool are designed for all advanced KEVLAR, Aluminum, Carbon Fiber and NOMEX honeycomb applications. The patented tooth geometry is optimized for machining any meta- or para-aramid fiber honeycomb material. The high tooth density produces the best surface finishes also on very dense honeycombs.

The tool is coated with a multi-layer PVD coating. With its wear resistance it increases the tool life significantly. The multi-layer coating prevents sticking of resin, adhesive and aluminum material.

Coarse diamond-shaped teeth

7350-015-031-23-10

Like the POCKET CUT tool mentioned above, this one also has diamond shaped teeth, but the patented tooth geometry is coarse and designed for roughing. It reduces machining times and still allows an acceptable surface finish in peripheral cuts in the majority of materials.

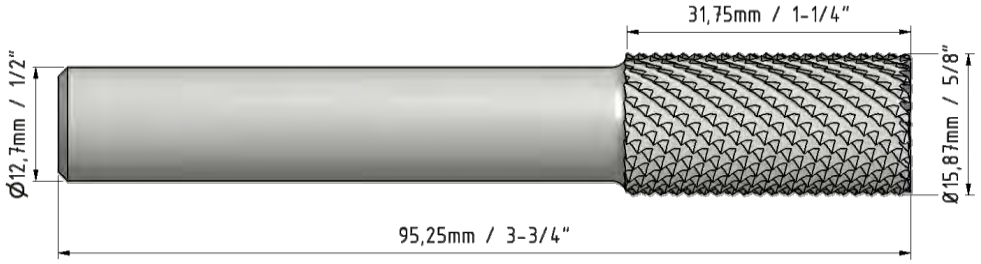
The tool has a PVD multi-layer coating for maximum performance and tool life.

Technical Specifications

Pocket Cut

Pocket Cut		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	EDP# / Item #
Pocket Cut with teeth for Nomex, AWC2-coated	mm	15.875	±0.1	31.75	95.25	12.7	h6	PM	**170104** 7350-015-031-05-00
	inch	5/8	±0.005	1 1/4	3 3/4	1/2	-0.0005		
Pocket Cut, fine diamond-shaped teeth, AWAC3-coated	mm	15.875	±0.1	31.75	95.25	12.7	h6	PM	**170105** 7350-015-031-23-20
	inch	5/8	±0.005	1 1/4	3 3/4	1/2	-0.0005		
Pocket Cut, coarse diamond-shaped teeth, AWAC3-coated	mm	15.875	±0.1	31.75	95.25	12.7	h6	PM	**170106** 7350-015-031-23-10
	inch	5/8	±0.005	1 1/4	3 3/4	1/2	-0.0005		

PM=Powdered Metal



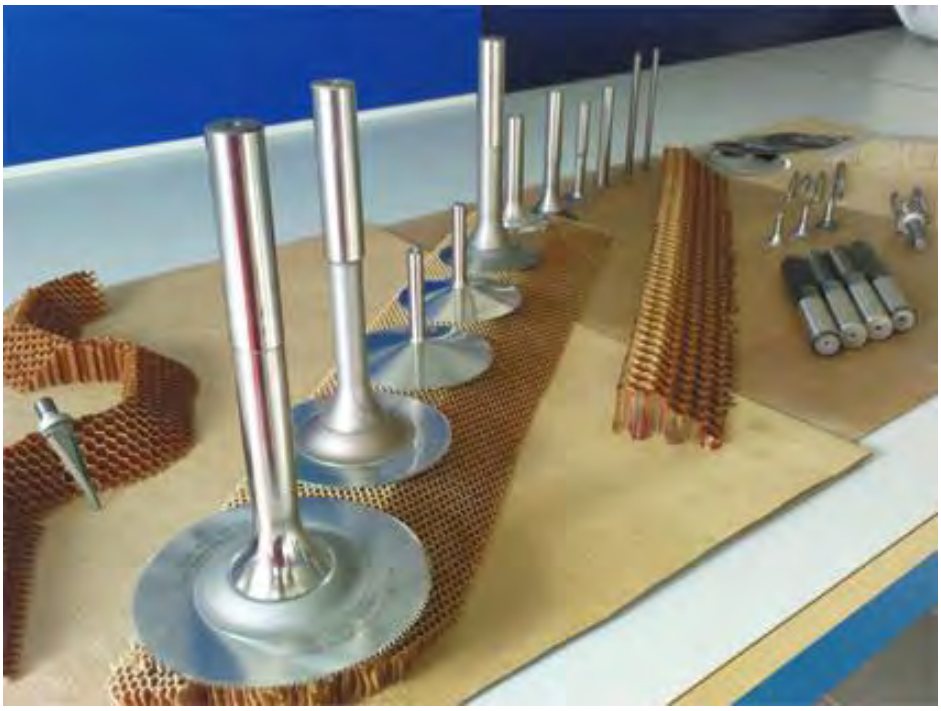
3 VALVE TYPE CUTTER

Tool combination of circular knife or saw blade and a valve-shaped shank. Ideal for cut-off operations and chamfering in any kind of honeycomb material.

VALVE TYPE CUTTER

Tooling System for Honeycomb Applications

Introduction



The VALVE TYPE CUTTERS are designed for cut-off and chamfering operations in all types of honeycomb materials. Smooth chamfers can be machined on thick honeycomb sheets in one operation. All VALVE TYPE tools are designed for applications where a shredder is not absolutely necessary (see also CORECUT system).

The VALVE TYPE CUTTERS combine a front-end tool and a shank. The shanks were especially developed for these tools and make this system very flexible. The shape of the shanks assures a good evacuation of the cut-off material. And the front-end tools can easily be replaced.

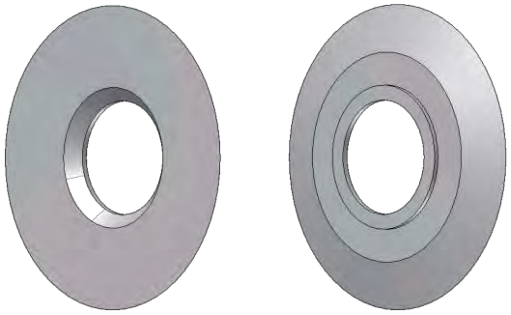
VALVE TYPE CUTTERS with an outer diameter of 50.8 mm (2 inch) and 100 mm (approx. 4 inch) are available. The most important dimension of composite cutters is the outer diameter of the front-end tool. Therefore, we have named the VALVE TYPE Tool Systems in correspondence with this dimension as stated in millimeters.

In the following section the individual components are described in detail. The table gives an overview for which tool systems the component is available.

Components and Applications

Front-End Tools

Solid carbide knife

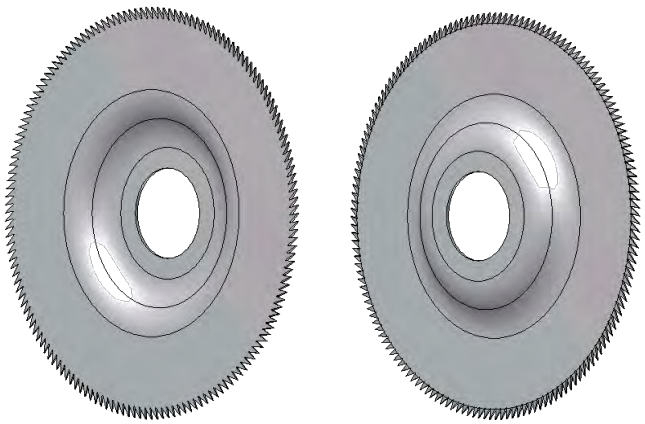


These solid carbide knives have a polished plain cutting edge. The high quality solid carbide assures a long tool life. The knife is available in an uncoated version and with a combined PVD-multi-layer coating, which reduces wear and prevents the sticking of resin, adhesive and aluminum material.

These knives can be used for a lot of applications in all kinds of aramid and metallic honeycombs.

Availability	Valve Type 50.8	Valve Type 100
Solid carbide knife uncoated	●	
Solid carbide knife coated	●	

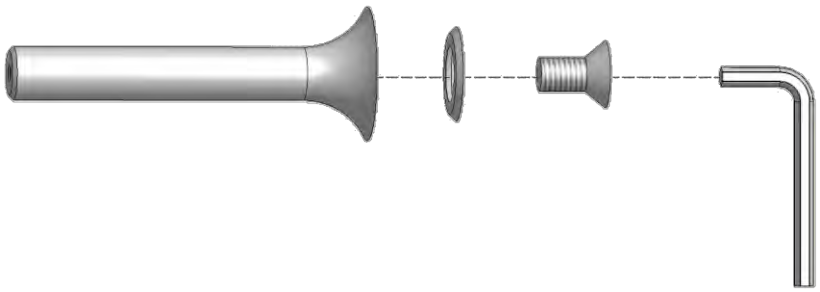
Saw blade



The saw blade made of HSS has patented helical GN-Teeth. They reduce cutting forces and assure the best surface finish even when processing most fragile honeycomb structures. It can be used for a lot of applications in all kinds of aramid and metallic honeycombs. Also for creating core layers with extreme smooth and low angles combined with large cell sizes it is the ideal choice. Its hollow shape prevents noise during the machining process.

Availability	Valve Type 50.8	Valve Type 100
HSS saw blade		●

Accessories

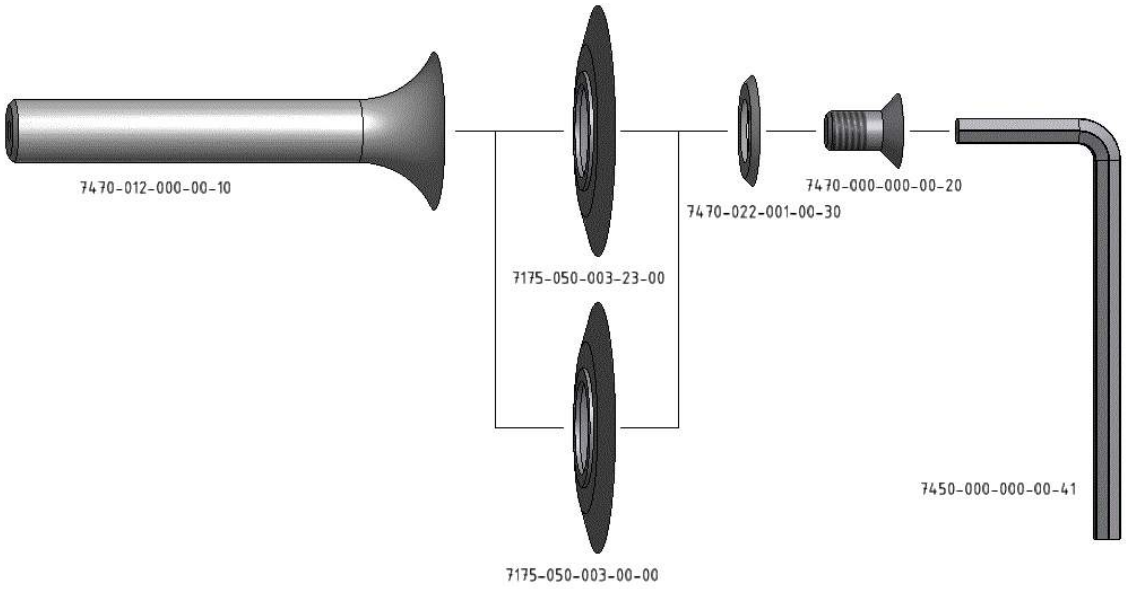


The above mentioned knives and saw blades are mounted on a hardened shank made of HSS. All shanks are ground to h6 tolerance to fit shrinking chucks. They are available as sets, each containing a shank, a required fitting ring or washers, a suitable mounting screw and wrench. All parts are deliverable as single parts as well.

Availability	Valve Type 50.8	Valve Type 100
Shank ø 1/2"	●	●
Shank ø 5/8"		●
Shank ø 16 mm		●

Technical Specifications

Valve Type Cutter 50.8

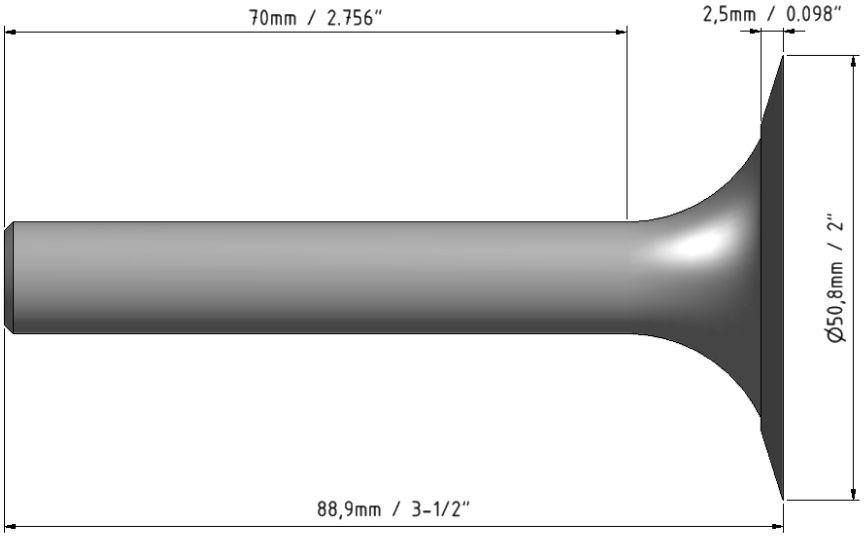


Front-End Tools		Cutting Dia		Overall Width	Arbor Dia		Mat.	**EDP#** / Item #
Solid carbide knife, uncoated	mm	50.8	±0.2	3,3	19.05	H7	SC	**170095** 7175-050-003-00-00
	inch	2	±0.008	0.1299	3/4	+0.0008		
Solid carbide knife, AWAC3-coated	mm	50.8	±0.2	3,3	19.05	H7	SC	**170096** 7175-050-003-23-00
	inch	2	±0.008	0.1299	3/4	+0.0008		

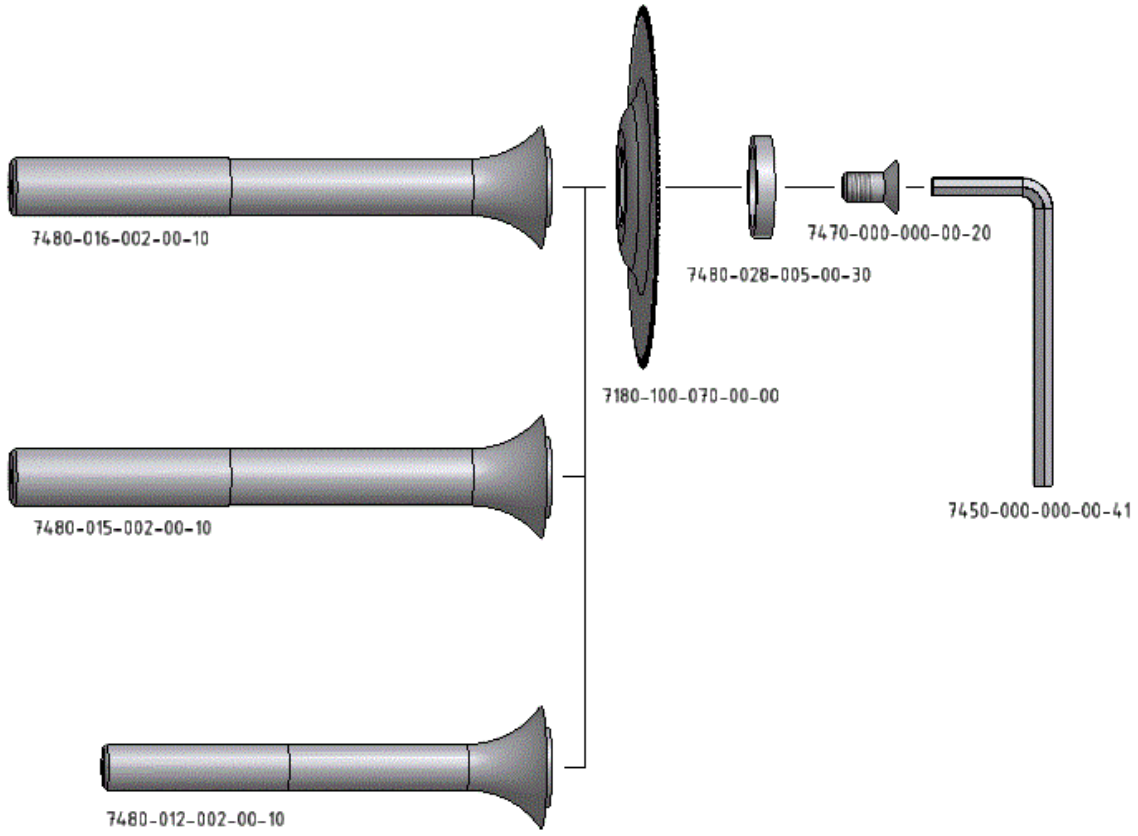
Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	**EDP#** / Item #
Shank-Set ø 1/2" (incl. fitting ring, mounting screw, wrench)	mm	12.7	h6	32	-0.5+0.1	86.4	HSS	**170099** 7470-012-000-00-00
	inch	1/2	-0.0005	1.2598	-0.02+0.004	3.4016		
Shank ø 1/2" *	mm	12.7	h6	32	-0.5+0.1	86.4	HSS	**170097** 7470-012-000-00-10
	inch	1/2	-0.0005	1.2598	-0.02+0.004	3.4016		
Fitting ring *							HSS	**170098** 7470-022-001-00-30
Mounting screw *							Steel	**170115** 7470-000-000-00-20
Allen wrench (SW 5) *							Steel	**170111** 7450-000-000-00-41

* Single components for the shank sets

SC=Solid Carbide, HSS=High Speed Steel


70mm / 2.756"
2,5mm / 0.098"
Ø50,8mm / 2"
88,9mm / 3-1/2"

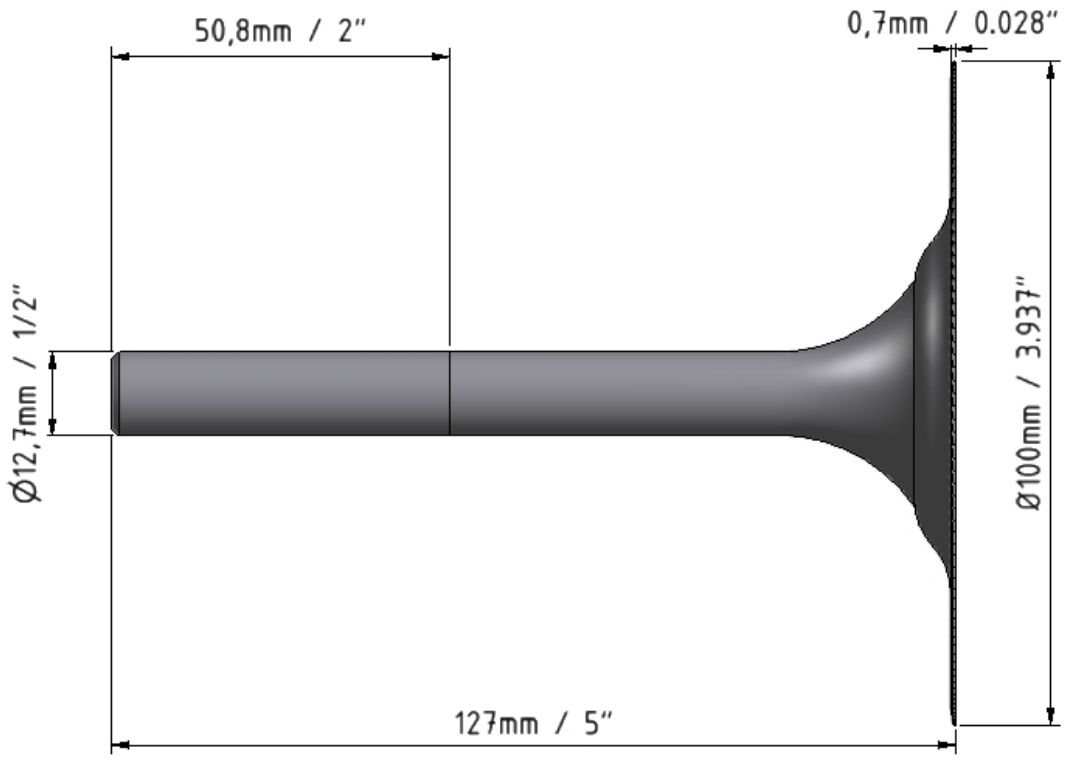
Valve Type Cutter 100

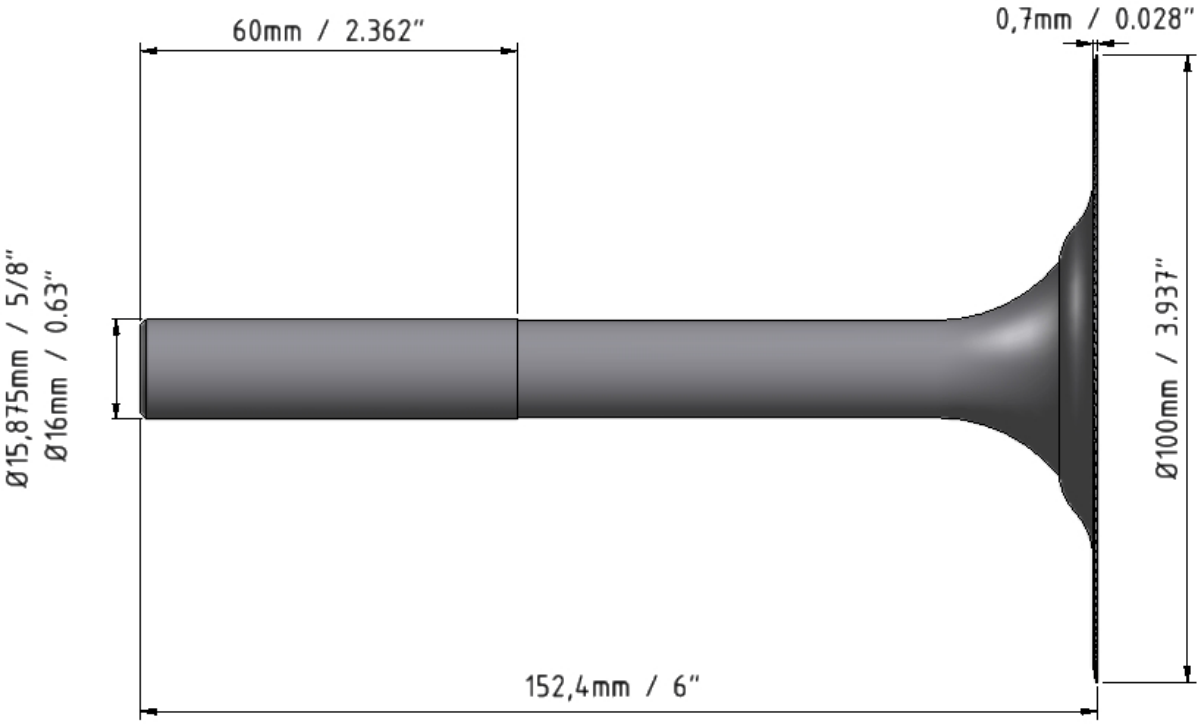


Front-End Tools		Cutting Dia		Overall Width	Arbor Dia		Mat.	**EDP#** / Item #
Saw blade, T=160	mm	100	±0.6	0.7	22	H7	HSS	**170100** 7180-100-070-00-00
	inch	3.937	±0.025	0.0276	0.8661	+0.0008		

Accessories		Shank Dia		Arbor Dia		Overall Length	Mat.	**EDP#** / Item #
Shank-Set ø 1/2" (incl. mounting washer, screw, wrench)	mm	12.7	h6	22	h6	122.8	HSS	**170110** 7480-012-002-00-00
	inch	1/2	-0.0005	0.8661	-0.0006	4.835		
Shank ø 1/2" *	mm	12.7	h6	22	h6	122.8	HSS	**170118** 7480-012-002-00-10
	inch	1/2	-0.0005	0.8661	-0.0006	4.835		
Shank-Set ø 5/8" (incl. mounting washer, screw, wrench)	mm	15.875	h6	22	h6	148.2	HSS	**170107** 7480-015-002-00-00
	inch	5/8	-0.0005	0.8661	-0.0006	5.8346		
Shank ø 5/8" *	mm	15.875	h6	22	h6	148.2	HSS	**170117** 7480-015-002-00-10
	inch	5/8	-0.0005	0.8661	-0.0006	5.8346		
Shank-Set ø 16mm (incl. mounting washer, screw, wrench)	mm	16	h6	22	h6	148.2	HSS	**170103** 7480-016-002-00-00
	inch	0.63	-0.0005	0.8661	-0.0006	5.8346		
Shank ø 16mm *	mm	16	h6	22	h6	148.2	HSS	**170101** 7480-016-002-00-10
	inch	0.63	-0.0005	0.8661	-0.0006	5.8346		
Mounting washer *							HSS	**170102** 7480-028-005-00-30
Screw *							Steel	**170115** 7470-000-000-00-20
Allen wrench (SW 5) *							Steel	**170111** 7450-000-000-00-41

* Single components for the shank sets


50,8mm / 2"
0,7mm / 0.028"
Ø12,7mm / 1/2"
Ø100mm / 3.937"
127mm / 5"


60mm / 2.362"
0,7mm / 0.028"
Ø15,875mm / 5/8"
Ø16mm / 0.63"
Ø100mm / 3.937"
152,4mm / 6"

4 PROFILE CUT

Shank tools designed for profiling complicated honeycomb parts and structures.

The tools are available in center cutting and ball nose end teeth. Plunge cuts into the honeycomb material are possible.

PROFILE CUT

Tool for Honeycomb Applications

Introduction

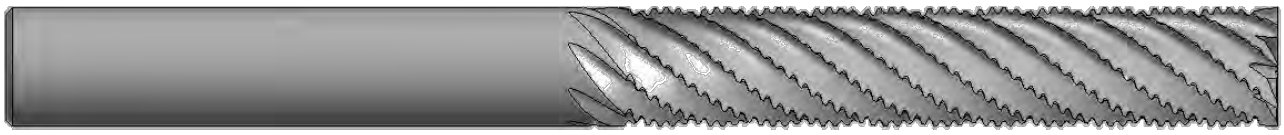
The PROFILE CUT tools are specially designed for the profiling of complicated honeycomb parts and structures whereby plunging operations are possible because of the center cutting end teeth. These tools are also available with ball nose to facilitate a smooth radius. With their combination of radial and axial teeth the PROFILE CUTs are optimized for the application on 3-axis machines which only allow a tilted spindle head in one direction or not at all. Of course they can also be used on five-axis milling machines.

All PROFILE CUT tools are made out of high quality solid carbide. They are coated with our patented PVD multi-layer coating.

The customer can choose between two end teeth geometries to meet his special requests. We present the best solution for every application. On request we also design variations to the catalog concepts, for example with left hand helical teeth or left hand cutting teeth.

Components and Applications

Profile Cut with center cutting end teeth



The tooth geometry of this PROFILE CUT tool was specially designed to machine meta-aramid-fiber honeycombs (like Nomex). Center cutting axial teeth allow for a plunge cut into a honeycomb part.

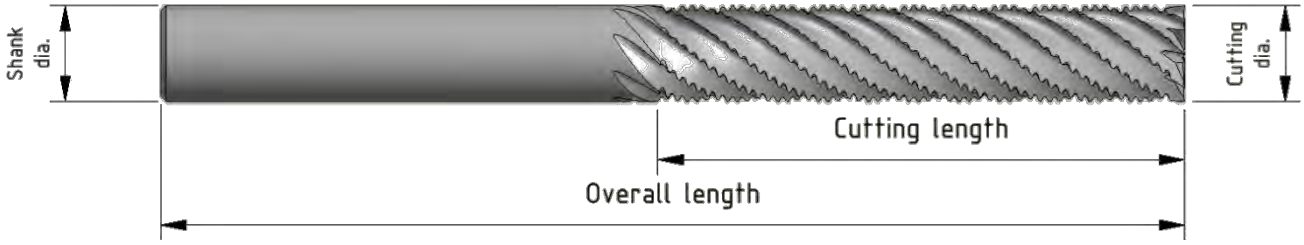
Profile Cut with ball nose

This PROFILE CUT has the same radial type of toothing as the above-mentioned cutter. The radial “ball nose” allows a smooth radius in the bottom of your honeycomb parts.

Technical Specifications

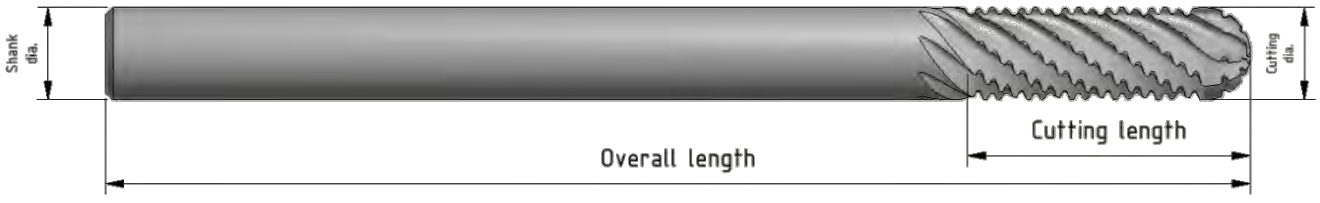
Profile Cut

Profile Cut		Cutting dia.		Cutting length	Overall Length	Shank dia.		Mat.	EDP# / Item #
Profile Cut, CC, AWAC3-coated	mm	3.175	±0.1	25.4	76.2	3,175	h6	SC	**170231** 7365-003-025-23-30
	inch	1/8	±0.005	1	3	1/8	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	3.175	±0.1	53.975	76.2	3,175	h6	SC	**170232** 7365-003-053-23-30
	inch	1/8	±0.005	2-1/8	3	1/8	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	4.7625	±0.1	25.4	76.2	4,7625	h6	SC	**170233** 7365-004-025-23-30
	inch	3/16	±0.005	1	3	3/16	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	6.35	±0.1	19.05	76.2	6,35	h6	SC	**170234** 7365-006-019-23-30
	inch	1/4	±0.005	3/4	3	1/4	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	6.35	±0.1	25.4	76.2	6,35	h6	SC	**170235** 7365-006-025-23-30
	inch	1/4	±0.005	1	3	1/4	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	9.525	±0.1	25.4	76.2	9,525	h6	SC	**170237** 7365-009-025-23-30
	inch	3/8	±0.005	1	3	3/8	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	9.525	±0.1	50.8	101.6	9,525	h6	SC	**170238** 7365-009-050-23-30
	inch	3/8	±0.005	2	4	3/8	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	12.7	±0.1	50.8	101.6	12,7	h6	SC	**170305** 7365-012-050-23-30
	inch	1/2	±0.005	2	4	1/2	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	12.7	±0.1	76.2	152.4	12,7	h6	SC	**170239** 7365-012-076-23-30
	inch	1/2	±0.005	3	6	1/2	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	19.05	±0.1	76.2	152.4	19,05	h6	SC	**170241** 7365-019-076-23-30
	inch	3/4	±0.005	3	6	3/4	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	25.4	±0.1	50.8	101.6	25,4	h6	SC	**170242** 7365-025-050-23-30
	inch	1	±0.005	2	4	1	-0.0005		
Profile Cut, CC, AWAC3-coated	mm	25.4	±0.1	76.2	152.4	25,4	h6	SC	**170243** 7365-025-076-23-30
	inch	1	±0.005	3	6	1	-0.0005		



Profile Cut		Cutting dia.		Cutting length	Overall Length	Shank dia.		Mat.	EDP# / Item #
Profile Cut, BN, AWAC3-coated	mm	6.35	±0.1	50.8	152.4	6.35	h6	SC	**170236** 7365-006-050-23-31
	inch	1/4	±0.005	2	6	1/4	-0.0005		
Profile Cut, BN, AWAC3-coated	mm	12.7	±0.1	76.2	152.4	12.7	h6	SC	**170240** 7365-012-076-23-31
	inch	1/2	±0.005	3	6	1/2	-0.0005		

SC=Solid Carbide



5 FOAM CUT

End Mills especially designed for the machining of technical foams.
These cutters have axial and radial teeth. To create smooth radiuses as well as sharp edges on the parts the FOAM CUT tools are in both ball nose and square end available.

FOAM CUT

TOOL for Foam Applications

Introduction

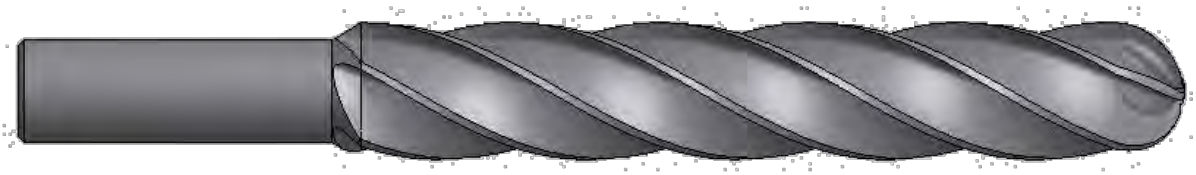
The FOAM CUT tools are designed to machine solid foams and foam potted honeycombs. One version with ball nose geometry is predestined for the machining of filigreed parts on five-axis machines. To realize sharp edges, the FOAM CUT is also available with square end. These high performance cutters have aggressive tooth geometry with high rake angles and wide flutes to allow easy chip evacuation and unparalleled feed rates.

The unequal tooth pitch prevents vibrations and enables an excellent surface finish.

All FOAM CUT tools are made out of HSS Cobalt Powdered Metal (PM). Additionally, performance and tool life is increased using an appropriate coating: A patented multi-layer PVD coating for wear protection and to prevent sticking as well.

Components and Applications

Foam Cut with ball nose



Foam Cut with square end

The FOAM CUT teeth are designed for the machining of pure foam and for the machining of foam potted honeycombs. Big flute spacing facilitates the chip flow and meets all requirements of feed.

The hemisphere formed ball nose enables a filigreed machining on 3- or 5-axis-machines with every continual junction. Center cutting end teeth allow plunging into solid material with no problem.

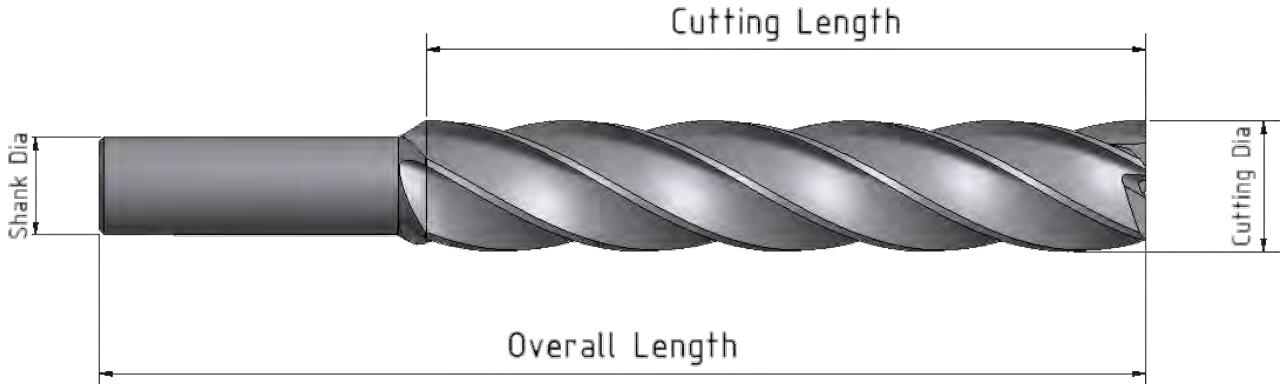
The patented multi-layer PVD coating prevents sticking and reduces wear of the cutting edges and guarantees maximum performance and a significantly increased tool life.

600 IPM at a cutting speed of about 590000 IPM are possible without problems.

Technical Specification

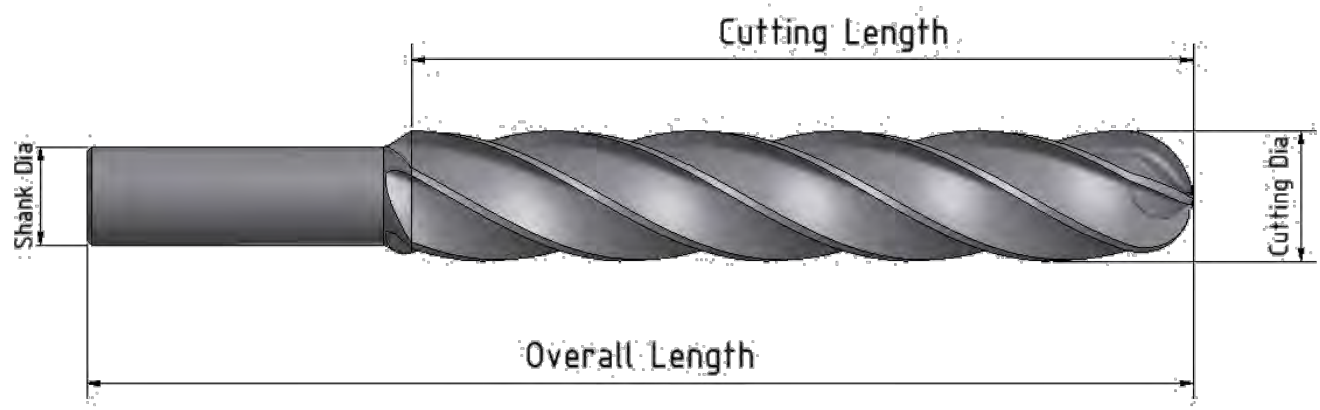
Foam Cut

Foam Cut		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	EDP# / Item #
Foam Cut CC, AWAC3-coated	mm	6.35	±0.1	38.1	101.6	6.35	h6	PM	**170307** 7360-006-038-23-31
	inch	1/4	±0.005	1 1/2	4	1/4	-0.0005		
Foam Cut CC, AWAC3-coated	mm	12.7	±0.1	76.2	127	12.7	h6	PM	**170308** 7360-012-076-23-31
	inch	1/2	±0.005	3	5	1/2	-0.0005		
Foam Cut CC, AWAC3-coated	mm	19.05	±0.1	101.6	158.75	19.05	h6	PM	**170309** 7360-019-101-23-31
	inch	3/4	±0.005	4	6 1/4	3/4	-0.0005		
Foam Cut CC, AWAC3-coated	mm	25.4	±0.1	152.4	215.9	19.05	h6	PM	**170310** 7360-025-152-23-31
	inch	1	±0.005	6	8 1/2	3/4	-0.0005		



Foam Cut		Cutting Dia		Cutting Length	Overall Length	Shank Dia		Mat.	EDP# / Item #
Foam Cut BN, AWAC3-coated	mm	6.35	±0.1	38.1	101.6	6.35	h6	PM	**170306** 7360-006-038-23-30
	inch	1/4	±0.005	1 1/2	4	1/4	-0.0005		
Foam Cut BN, AWAC3-coated	mm	12.7	±0.1	76.2	127	12.7	h6	PM	**170300** 7360-012-076-23-30
	inch	1/2	±0.005	3	5	1/2	-0.0005		
Foam Cut BN, AWAC3-coated	mm	19.05	±0.1	101.6	158.75	19.05	h6	PM	**170301** 7360-019-101-23-30
	inch	3/4	±0.005	4	6 1/4	3/4	-0.0005		
Foam Cut BN, AWAC3-coated	mm	25.4	±0.1	152.4	215.9	19.05	h6	PM	**170302** 7360-025-152-23-30
	inch	1	±0.005	6	8 1/2	3/4	-0.0005		

PM=Powdered Metal



6 PANEL CUT

Shank tools with end teeth designed for profiling and drilling operations in sandwich panels. Enables extremely high feed rates due to the special tooth configurations.

PANEL CUT

Tool for Panel Applications

Introduction

The PANEL CUT tools are specially designed for the machining of composite lightweight panels. With the PANEL CUT it is possible to drill perfectly clean holes through sandwich panels without any delamination on the glass or carbon fiber skins or flagging of the honeycomb in between. It is also the ideal tool for profiling operations where the PANEL CUT achieves outstanding results. The honeycomb structure between the skins gets removed cleanly without any flagging.

The outstanding advantage of the PANEL CUT is the possibility of extremely high feed rates while still establishing a clean surface finish. With feed rates of up to 400 IPM you are able to maximize your productivity.

Components and Applications

Panel Cut with center cutting end teeth

7345-006-015-00-01

7345-006-031-00-01

7345-012-031-00-01

The special tooth design of the PANEL CUT increases tool life due to stabilized tips. It also enables extremely high feed rates and reduces machining times of sandwich panels remarkably. The sophisticated tool geometry of the PANEL CUT allows a precise machining of composite panels and a high quality surface finish of the skins.

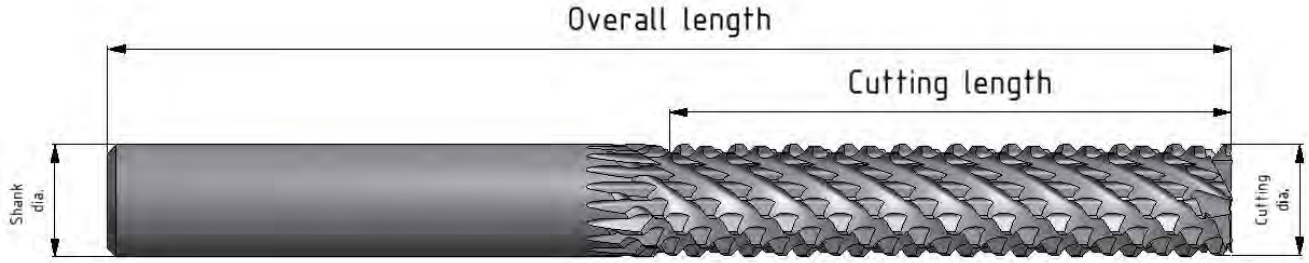
Please refer to PROFILE CUT section 4.1-4.4 for Aluminum Panel Machining Tooling.

Technical Specifications

Panel Cut

Panel Cut		Cutting dia.		Cutting length	Overall length	Shank dia.		Mat.	**EDP#** / Item #
Panel Cut, CC	mm	6.35	±0.1	15.875	63.5	6.35	h6	SC	**170126** 7345-006-015-00-01
	inch	1/4	±0.005	5/8	2-1/2	1/4	-0.0005		
Panel Cut, CC	mm	6.35	±0.1	31.75	63.5	6.35	h6	SC	**170127** 7345-006-031-00-01
	inch	1/4	±0.005	1-1/4	2-1/2	1/4	-0.0005		
Panel Cut, CC	mm	12.7	±0.1	31.75	76.2	12.7	h6	SC	**170128** 7345-012-031-00-01
	inch	1/2	±0.005	1-1/4	3	1/2	-0.0005		

SC=Solid Carbide



7 DECORING CUT

Shank tools to undercut composite sandwich panels. Specially designed to drill perfectly clean holes and to undercut the panel skins in one step.

DECORING CUT

Tool for Panel Applications

Introduction

The DECORING CUT is specially engineered for the machining of composite lightweight panels.

It is the ideal solution to drill holes into the panel and to undercut the skins. This is often necessary to achieve a better bonding between insert, potting and panel. Undercutting of the outside profile contour is often done to be able to epoxy the out edge of the part to achieve a better stability and surface finish. With its end teeth the DECORING CUT enables to first drill the hole and then undercut the panel without a tool change. Thereby it removes and pulverizes the material instead of just compressing it and eliminates the core “spring back”.

The DECORING CUT is made out of Solid Carbide or HSS Cobalt Powdered Metal (PM) and coated with our patented PVD multi-layer coating. It is available in different dimensions depending on the panel width and necessary undercut depth.

Please contact us on any special sizes needed we understand that there are many insert sizes needed.

Components and Applications

Decoring Cut to undercut sandwich panels

The DECORING CUT with its sophisticated tooth geometry is suitable for plunging and undercutting of the skins in composite sandwich panels like no other tool. We recommend the Solid Carbide version if plunging is a main part of the work due to a longer tool life. For mainly undercutting operations, the HSS Cobalt Powdered Metal PANEL CUT is suitable. The DECORING CUT has a PVD multi-layer coating for maximum performance and tool life.

The tools are available from stock in different dimensions. Please choose the cutting length depending on the panel width. Please take the details from the chart in the following technical specifications.

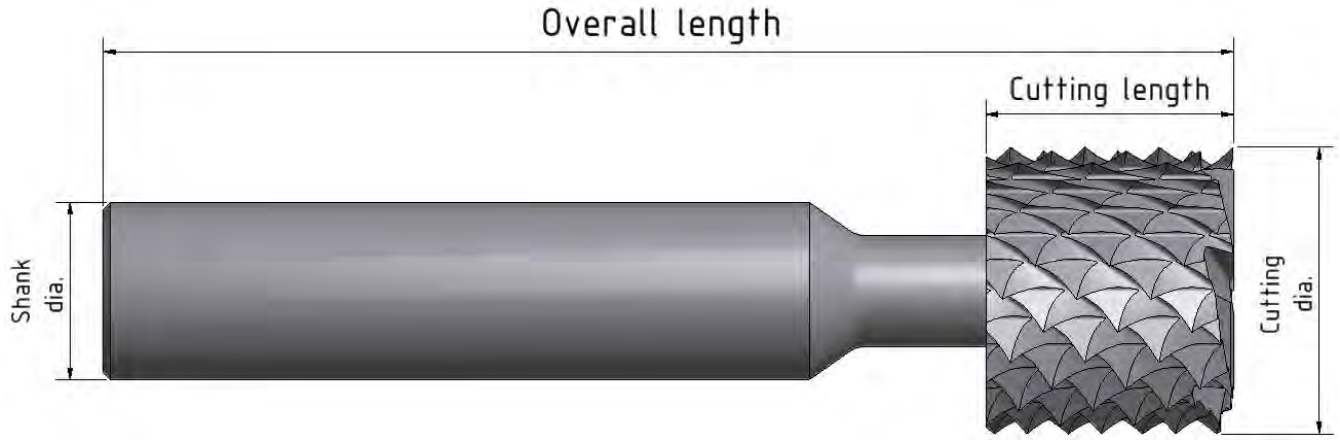
Technical Specifications

Decoring Cut

Decoring Cut		Cutting dia.		Cutting length	Overall length	Shank dia.		Neck dia.	Panel width	Mat.	EDP# / Item #
Decoring Cut, AWAC3-coated	mm	11,113	±0,2	5,08	68,5	12,7	h6	3,556	6,35	SC	**170137** 7335-011-005-23-01
	inch	7/16	±0,005	0.2	2.7	1/2	-0,0005	0.14	1/4		
Decoring Cut, AWAC3-coated	mm	11,113	±0,2	11,43	74,5	12,7	h6	3,556	12,7	SC	**170138** 7335-011-011-23-01
	inch	7/16	±0,005	0.45	2.93	1/2	-0,0005	0.14	1/2		
Decoring Cut, AWAC3-coated	mm	11,51	±0,2	5,08	68,5	12,7	h6	3,556	6,35	SC	**170139** 7335-011-005-23-02
	inch	0.453	±0,005	0.2	2.7	1/2	-0,0005	0.14	1/4		
Decoring Cut, AWAC3-coated	mm	11,51	±0,2	11,43	74,5	12,7	h6	3,556	12,7	SC	**170140** 7335-011-011-23-02
	inch	0.453	±0,005	0.45	2.93	1/2	-0,0005	0.14	1/2		
Decoring Cut, AWAC3-coated	mm	12,7	±0,2	5,08	68,5	12,7	h6	3,556	6,35	SC	**170141** 7335-012-005-23-01
	inch	1/2	±0,005	0.2	2.7	1/2	-0,0005	0.14	1/4		
Decoring Cut, AWAC3-coated	mm	12,7	±0,2	11,43	74,5	12,7	h6	3,556	12,7	SC	**170142** 7335-012-011-23-01
	inch	1/2	±0,005	0.45	2.93	1/2	-0,0005	0.14	1/2		
Decoring Cut, AWAC3-coated	mm	14,224	±0,2	5,08	68,5	12,7	h6	4,572	6,35	SC	**170143** 7335-014-005-23-01
	inch	0.56	±0,005	0.2	2.7	1/2	-0,0005	0.18	1/4		
Decoring Cut, AWAC3-coated	mm	14,224	±0,2	11,43	74,5	12,7	h6	4,572	12,7	SC	**170144** 7335-014-011-23-01
	inch	0.56	±0,005	0.45	2.93	1/2	-0,0005	0.18	1/2		
Decoring Cut, AWAC3-coated	mm	14,99	±0,2	5,08	68,5	12,7	h6	4,572	6,35	SC	**170145** 7335-014-005-23-02
	inch	0.59	±0,005	0.2	2.7	1/2	-0,0005	0.18	1/4		
Decoring Cut, AWAC3-coated	mm	14,99	±0,2	11,43	74,5	12,7	h6	4,572	12,7	SC	**170146** 7335-014-011-23-02
	inch	0.59	±0,005	0.45	2.93	1/2	-0,0005	0.18	1/2		

Decoring Cut		Cutting dia.		Cutting length	Overall length	Shank dia.		Neck dia.	Panel width	Mat.	EDP# / Item #
Decoring Cut, AWAC3-beschichtet	mm	20.638	±0.2	5.08	68.5	12.7	h6	7.938	6.35	PM	**170129** 7330-020-005-23-01
	inch	13/16	±0.005	0.2	2.7	1/2	-0.0005	5/16	1/4		
Decoring Cut, AWAC3-beschichtet	mm	20.638	±0.2	11.43	74.5	12.7	h6	7.938	12.7	PM	**170130** 7330-020-011-23-01
	inch	13/16	±0.005	0.45	2.93	1/2	-0.0005	5/16	1/2		
Decoring Cut, AWAC3-beschichtet	mm	20.638	±0.2	17.78	81	12.7	h6	7.938	19.05	PM	**170131** 7330-020-017-23-01
	inch	13/16	±0.005	0.7	3.19	1/2	-0.0005	5/16	3/4		

SC=Solid Carbide; PM=Powdered Metal



8 FIBER CUT

Solid Carbide routers for the machining of uni- and multi-directional layers as well as woven fabrics made out of CFRP (carbon-fiber-reinforced plastic) or GFRP (glass-fiber-reinforced plastic).

FIBER CUT

Tool for CFRP/GFRP Applications

Introduction

The FIBER CUT is specially designed for the machining of uni- and multi-directional layers as well as woven fabrics made out of CFRP (carbon-fiber-reinforced plastic) or GFRP (glass-fiber-reinforced plastic).

It is the perfect solution for various milling operations in highly abrasive carbon- and glass fiber materials. The FIBER CUT is available with and without center cutting end teeth. End cutting must be selected when plunging operations are required. The sophisticated tool geometry enables a clean cut and avoids fraying issues and delamination. The best surface finish usually gets accomplished by machining in a conventional milling direction. Due to the aggressive cutting edge geometry the FIBER CUT is able to work under very high feed rates.

The FIBER CUT tools are made out of high-quality Solid Carbide (SC) and are available in many different dimensions as well as with or without end teeth. Special dimensions available per customers request.

Components and Applications

Fiber Cut with center cutting end teeth

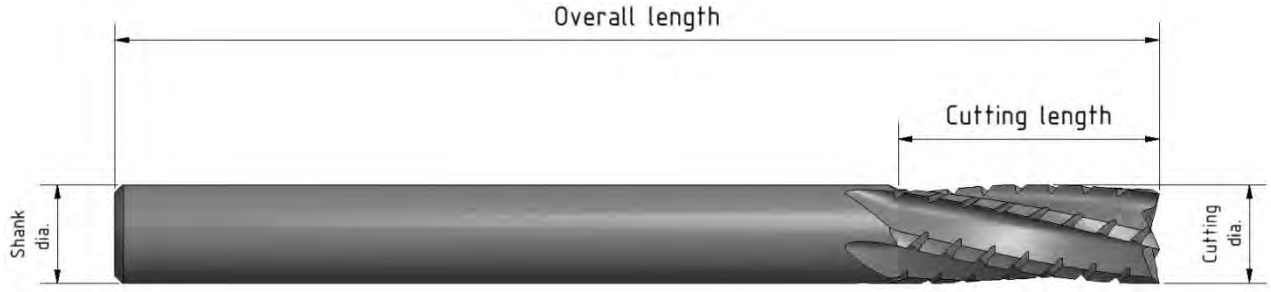
Fiber Cut without center cutting end teeth

The aggressive geometry of the FIBER CUT generates a minimal amount of cutting forces. Thereby the condition of the special ground surface reduces adhesion and leads to an increased tool life. The combination of all of these features in the FIBER CUT tool enables high feed rates and significant boost in productivity.

Technical Specifications

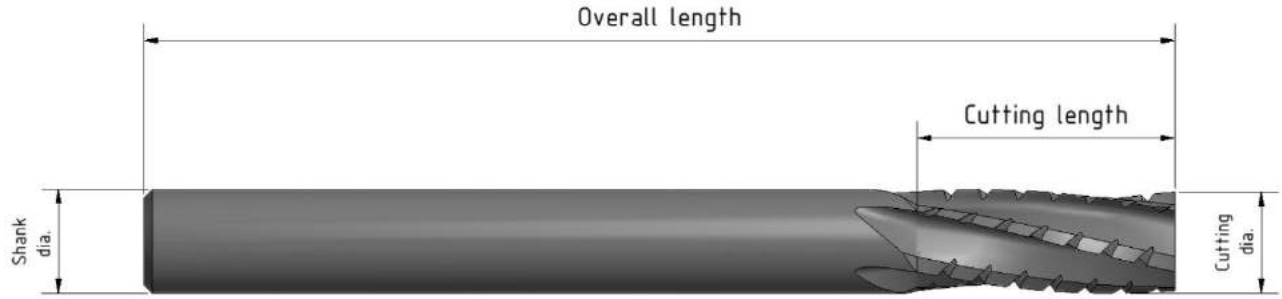
Fiber Cut

Fiber Cut		Cutting dia.		Cutting length	Overall length	Shank dia.		Mat.	EDP # / Item #
Fiber Cut with end teeth	mm	6,35	-0,1	15,875	63,5	6,35	h6	SC	**170311** 7375-006-015-00-01
	inch	1/4	-0,004	5/8	2-1/2	1/4	-0,0005		
Fiber Cut with end teeth	mm	6,35	-0,1	31,75	63,5	6,35	h6	SC	**170313** 7375-006-031-00-01
	inch	1/4	-0,004	1-1/4	2-1/2	1/4	-0,0005		
Fiber Cut with end teeth	mm	6	-0,1	20	58	6	h6	SC	**170315** 7375-006-020-00-01
	inch	0.236	-0,004	0.787	2.283	0.236	-0,0005		
Fiber Cut with end teeth	mm	9,525	-0,1	31,75	76,2	9,525	h6	SC	**170319** 7375-009-031-00-01
	inch	3/8	-0,004	1-1/4	3	3/8	-0,0005		
Fiber Cut with end teeth	mm	10	-0,1	30	72	10	h6	SC	**170317** 7375-010-030-00-01
	inch	0.394	-0,004	1.181	2.874	0.394	-0,0005		
Fiber Cut with end teeth	mm	12	-0,1	30	84	12	h6	SC	**170320** 7375-012-030-00-01
	inch	0.472	-0,004	1.181	3.307	0.472	-0,0005		
Fiber Cut with end teeth	mm	12,7	-0,1	31,75	76,2	12,7	h6	SC	**170318** 7375-012-031-00-01
	inch	1/2	-0,004	1-1/4	3	1/2	-0,0005		



Fiber Cut		Cutting dia.		Cutting length	Overall length	Shank dia.		Mat.	EDP # / Item #
Fiber Cut without end teeth	mm	6,35	-0,1	15,875	63,5	6,35	h6	SC	**170312** 7375-006-015-00-02
	inch	1/4	-0,004	5/8	2-1/2	1/4	-0,0005		
Fiber Cut without end teeth	mm	6,35	-0,1	31,75	63,5	6,35	h6	SC	**170314** 7375-006-031-00-02
	inch	1/4	-0,004	1-1/4	2-1/2	1/4	-0,0005		
Fiber Cut without end teeth	mm	6	-0,1	20	58	6	h6	SC	**170316** 7375-006-020-00-02
	inch	0.236	-0,004	0.787	2.283	0.236	-0,0005		

SC=Solid Carbide



Available with coatings if applicable.

9 SPECIALS

Besides the standard tools for honeycomb applications introduced in the previous chapters there is a wide range of special tools engineered for specific applications. Those tools are available on demand and get produced according to your particular needs.

SPECIALS

Tools for Honeycomb Applications

Introduction

Besides the standard tools for honeycomb applications introduced in the previous chapters, which are available from stock, there is a wide range of special tools engineered for specific applications. Those tools are available on demand and get produced according to your particular needs.

Let us know about your machining needs, we look forward to designing the appropriate tools for your application and material.

Examples

9.1 Hollow drills to machine honeycomb structures

An example for a composite tooling special is a hollow drill. These tools are used to drill or punch through honeycomb structures. The advantages in comparison to a cutting tool are the clean cut of the cell wall and the avoidance of dust. Hollow drills can be used to create perfect holes and pockets in honeycomb. They are also suitable for contour operations when you need a perfect finish without any flagging.

This tool is also produced in a modified version with teeth to remove resin overlaps in carbon elements.

Do not hesitate contacting us to talk about your concrete application and our solution with a special hollow drill engineered to your needs and requirements.

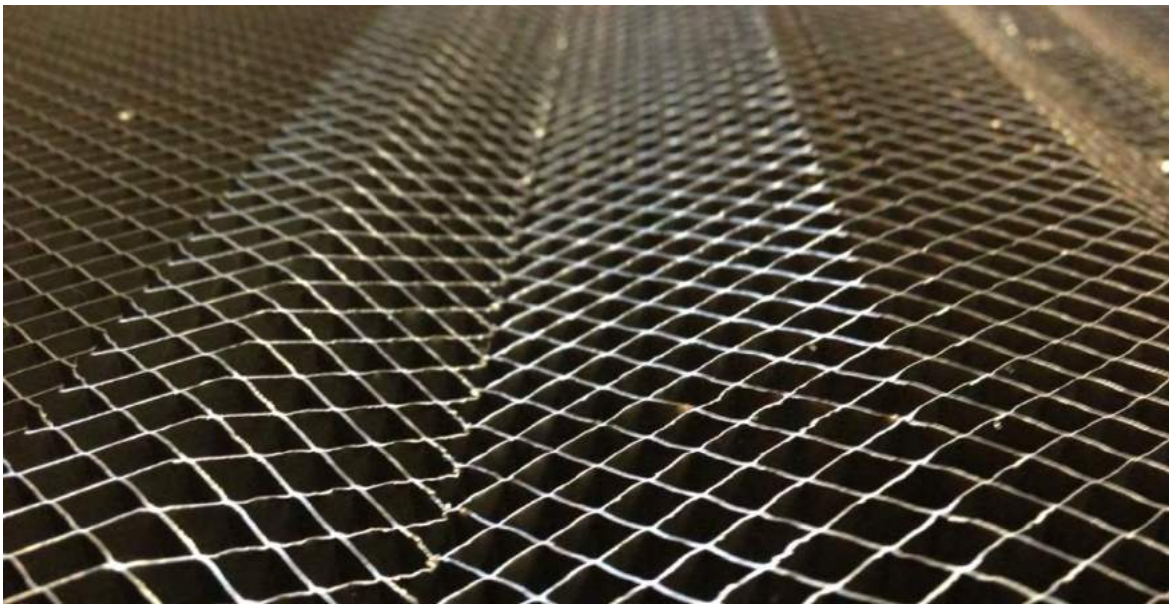
9.2 Tools for the machining of titanium and stainless steel honeycomb core structures

The CORECUT tooling system in chapter 1 is ideal for machining Nomex, Kevlar and Aluminum honeycomb. With the addition of a new shredder and knife combination, this system can also be used to machine titanium and stainless steel honeycomb core structures.

The welded titanium honeycomb and the stainless steel honeycomb are extremely strong and machining with the usual tools is not possible. Especially for the titanium honeycomb, the reduction of friction to avoid heat is an essential subject. If extreme heat is produced, the material may burn.

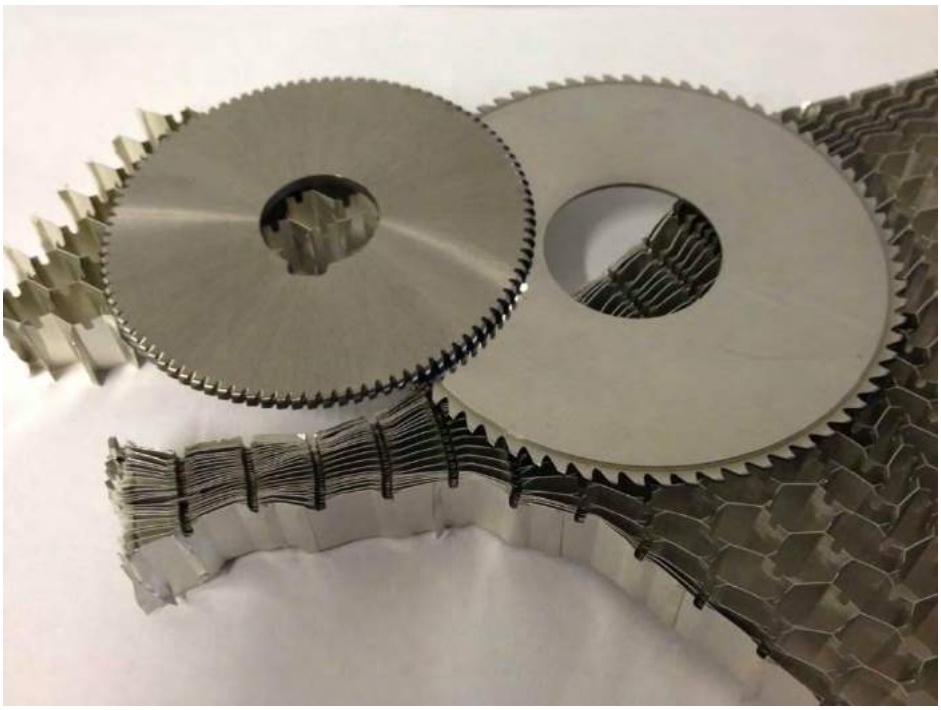
We have developed the first engineered special tooling combination for this purpose enabling the machining on 5-axis machines. The tool geometry as well as the parameters are completely different from the usual standards in the machining of composites.

Please contact for further details.



Titanium Honeycomb machined with tools from Neuhäuser

9.3 Slitting Saws and Form Cutters for the grooving of honeycomb structure parts (drainage slots)



Form cutter sets for the grooving operations of honeycomb structure parts before expansion are another example of special tooling. Drainage slots are necessary in cases that condensation needs to be drained.

9.4 Ultrasonic Tools for the machining of honeycomb structures

We also produce high quality circular and V knives for the use on ultrasonic machines as specials in dimensions according to customer demands.

Feel free to contact us about the benefits and the expertise that we provide in the production of ultrasonic tools.

Speed & Feeds – Data Sheet for the Machining

Cell Width and Density	Fiber Material	Cutting Speed RPM*	Feed Rate (Finishing) IPM	Feed Rate (Roughing) IPM	HSSCo Wavy Cutter	SC Wavy Cutter
1/8”-48	Nomex	10,000-18,000	50-400	up to 1,000		
1/8”-64	Nomex	10,000-18,000	50-400	up to 1,000	x	
0.165”-24	Nomex	10,000-18,000	50-400	up to 1,000		
0.165”-48	Nomex	10,000-18,000	50-400	up to 1,000		
0.19”-32	Nomex	10,000-18,000	50-400	up to 1,000		
0.19”-48 OX	Nomex	10,000-18,000	50-400	up to 1,000		
0.19”-64	Nomex	10,000-18,000	50-400	up to 1,000	x	x
0.19”-96	Nomex	10,000-18,000	50-400	up to 1,000	x	x
0.19”-132	Nomex	10,000-18,000	50-400	up to 1,000	x	x
0.38”-32	Nomex	10,000-18,000	50-400	up to 1,000	x	x
1/8”-48	Kevlar	14,000-24,000	50-400	up to 1,000		x
0.165”-28	Kevlar	14,000-24,000	50-400	up to 1,000		x
0.19”-48	Kevlar	14,000-24,000	50-400	up to 1,000		x
0.38”-40	Kevlar	14,000-24,000	50-400	up to 1,000		x
0.165”	Glass	10,000-18,000	50-400	up to 1,000		x
1/4”	Glass	10,000-18,000	50-400	up to 1,000		x
0.38”	Glass	10,000-18,000	50-400	up to 1,000		x
1/8”	Aluminum	10,000-24,000	10–300	up to 1,000		x
0.16”	Aluminum	10,000-24,000	10–300	up to 1,000		x
0.19”	Aluminum	10,000-24,000	10–300	up to 1,000		x
1/4”	Aluminum	10,000-24,000	10–300	up to 1,000		x
0.37”	Aluminum	10,000-24,000	10–300	up to 1,000	x	x
1/2”	Aluminum	10,000-24,000	10–300	up to 1,000	x	x
	Titanium*	1,000-3,000	5-50	55		
	Inconel**	1,500-3,500	5-40	45		

* The cutting speed is given in RPM, but depends on the tool diameter. For safety reasons, please ask our application engineers for more information.

** Tooling for the machining of Titanium- and Inconel- Honeycombs is available, but not part of the catalog at this moment.

# of Composite Core Parts

SC Knife, uncoated	SC Knife, coated	HSSCo Knife, coated	SC Knife with teeth	HSSCo Saw	Shredder Nomex	Shreddder Nomex, helix 5°	Shredder diamond-shaped teeth
x	x	x		x	x	x	x
x	x			X	x	x	
x	x	x		x	x	x	x
x	x	x		x	x	x	x
x	x	x		x	x		x
x	x			x	x		x
	x		x		x		
	x		x		x		
			x		x		
			x	x	x		x
x	x		x	x			x
x	x	x	x	x			x
x	x		x	x			x
x	x	x	x	x			x
	x		x		x		x
	x		x		x		x
	x		x		x		x
x	x	x	x		x		x
x	x	x	x		x		x
x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x
	x		x	x		x	x
	x		x	x		x	x

LIMITED WARRANTY

Controx-Neuhäuser warrants to original equipment manufacturers, distributors and industrial and commercial users of its products that each new product manufactured or supplied by Controx-Neuhäuser shall be free from defects in material and workmanship. Controx-Neuhäuser's obligation under this warranty is limited to furnishing without additional charge a replacement or, at its option, repairing or issuing credit for any product which shall within one year from the date of sale be returned freight prepaid to the plant designated by a Controx-Neuhäuser representative and which upon inspection is determined by Controx-Neuhäuser to be defective in materials or workmanship. Complete information as to operating conditions, machine setup and application of cutting fluid should accompany any product returned for inspection. The provisions of this warranty shall not apply to any Controx-Neuhäuser product which has been subjected to misuse, improper operating conditions, machine setup or application of cutting fluid or which has been repaired or altered if such repair or alteration in the judgment of Controx-Neuhäuser would adversely affect performance of the product. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Controx-Neuhäuser shall have no liability or responsibility on any claim of any kind, whether in contract, tort or otherwise, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery or use of any product sold hereunder, in excess of the cost of replacement or repair as provided herein. IN NO EVENT SHALL CONTROX-NEUHÄUSER BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAGAMGES. Controx-Neuhäuser makes no other warranty, express or implied, except as set forth above; and Controx-Neuhäuser neither assumes nor authorizes any other person or entity to assume for it any other obligation or liability in connection with any of its products.

NOTICE: Because we are constantly engaged in a program of product improvement, tool specifications are subject to change at any time.

⚠ WARNING

Any cutting tool may break or shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment at all times in the vicinity of use. Do not touch cutting edges or chips with bare hands. Stop cutting when the tool becomes dull. Stop cutting operation immediately if you hear any strange sounds. Use correct tools for the operation. Check dimensions to ensure proper selection. Do not modify tools. Wet or dry grinding of cutting tools produces potentially hazardous dusts or mists; to avoid adverse health effects, use adequate ventilation and read the Material Safety Data Sheet for further application tool material or grade before grinding.

Terms of Delivery

I. **General Information**

1. Any and all deliveries made and services provided are subject to the Terms of Delivery at hand as well as to separate contractual agreements possibly concluded. Any deviating terms of purchase of the Buyer shall not become a constituent element of the contract even in case of order acceptance.
   A contract shall be established – for lack of specific agreement – with the written order confirmation of the Seller.
2. The Seller reserves property and copyrights for samples, cost estimates, drawings and similar information of physical and non-physical nature – also in electronic form; these may not be disclosed to third parties. The Seller undertakes not to disclose information and documents identified as confidential by the Buyer to third parties without his written consent.
3. Samples shall be supplied only against charges.
4. Verbal supplementary agreements do not exist. Modifications require written form in order to be effective.

II. **Price and Payment**

1. The prices – for lack of specific agreement – shall be ex works and do not include packaging. The quoted price of products does not include duty, tariffs, taxes or similar charges, which shall be borne by the Buyer, unless otherwise agreed upon in writing.
2. For lack of specific agreement, payment shall be effected immediately following delivery to the account of the Seller and without any deduction. The respective quantity delivered shall be charged.
3. The Buyer shall have the right to retain payments or to offset these against counterpayments only to the extent that his counterclaims are undisputed and determined legally binding.

III. **Period of Delivery, Default in Delivery**

1. The Period of Delivery results from the agreements entered into between the contracting parties. The prerequisite for compliance by the Seller is that any and all commercial and technical questions have been clarified between the contracting parties and that the Buyer has complied with any and all obligations under his responsibility, such as e.g. the procurement of the certificates or authorizations required by the authorities or performance of a down payment. Should this not be the case, the Period of Delivery will be extended appropriately. This shall not apply to the extent that the Seller is responsible for the delay.
2. Adherence to the Period of Delivery shall be subject to correct and on-time delivery to us on the part of our suppliers. The Seller shall inform the Buyer about emerging delays as soon as possible.
3. The Period of Delivery shall be deemed to have been complied with if the delivery item has left the factory of the Seller or if readiness for shipment has been announced.
4. In case that the shipment is delayed upon request of the Buyer, the Seller shall be entitled to otherwise dispose of the delivery item after fixing a reasonable deadline and its fruitless expiry and to supply the Buyer subject to a reasonably extended period. In case that the shipment is delayed on account of reasons for which the Buyer is responsible, the costs incurred as a result of such delay shall be charged to the Buyer, beginning one month after announcement of the readiness for shipment of the delivery item.
5. In case that non-compliance with the Period of Delivery is to be attributed to force majeure, labor disputes or other events beyond the sphere of influence of the Seller, the Period of Delivery shall reasonably be extended. The Seller shall inform the Buyer of the beginning and end of such circumstances as soon as possible.
6. In case that delivery is rendered entirely impossible or economically unreasonable for the Seller as a result of force majeure, labor disputes or other events beyond the sphere of influence of the Seller, the Seller shall have the right to either wholly or partially resign from the contract.
   Claims for damages of the Buyer on account of such resignation are excluded. If the Seller intends to make use of his right of resignation, he shall inform the Buyer immediately upon identification of the implications of such event. This shall also apply if an extension of the Period of Delivery has initially been agreed upon with the Buyer.
7. The Buyer may resign from the contract without fixing a time limit if complete performance is ultimately rendered impossible for the Seller prior to the transfer of risk. The Buyer may furthermore resign from the contract if execution of part of the delivery is rendered impossible for an order and if the Buyer has a legitimate interest to reject a part delivery. If this is not the case, the Buyer shall have to pay the contract price for the respective part delivery. The same shall apply in case of an inability of the Seller. In all other cases, Paragraph VII.2. "Liability" shall apply.
   In case that the impossibility or inability occurs during the default in acceptance or if the Buyer is alone or predominantly responsible for the circumstances, he shall be obliged to the performance of quid pro quo.
8. In case that the Buyer fixes a reasonable deadline for performance after the due date – taking into consideration the statutory exceptions – and if this deadline is not complied with, the Buyer shall be entitled to resignation within the scope of statutory provisions.
   Upon request of the Seller he undertakes to declare within a reasonable time whether he intends to make use of his right of resignation.
   Further claims from Default in Delivery are exclusively governed by Paragraph VII.2. hereunder.

IV. **Transfer of Risk, Acceptance**

1. The risk shall be transferred to the Buyer whenever the delivery item has left the factory, namely also if part deliveries are performed or if the Seller has undertaken other services, such as e.g. the forwarding expenses or shipment.
2. In case that delivery is delayed or not undertaken as a result of circumstances not to be attributed to the Seller, the risk shall be transferred to the Buyer at the day the readiness for shipment is announced. The Seller undertakes to effect insurance as requested by the Buyer at the expense of the Buyer.
3. Part deliveries shall be permissible to the extent reasonable for the Buyer.

V. **Reservation of Proprietary Rights**

1. The Seller reserves the proprietary right for the delivery item until any and all claims of the Seller versus the Buyer arising from the business relations have been settled, including future claims, also arising from contracts concluded simultaneously or subsequently. This shall also apply if individual or all claims of the Seller were entered into a current account and the balance has been determined and acknowledged.
   In case of behavior of the Buyer contrary to the terms of contract, particularly in case of default in payment, the Seller shall be entitled to withdrawal of the delivery item after overdue notification and the Buyer shall have the obligation to surrender the delivery item. The Buyer is obliged to immediately notify the Seller in case of seizure or other interventions of third parties.
2. The Buyer is entitled to resell the delivery item in ordinary course of business. He, however, already today cedes to the Seller any and all claims arising from the resale versus purchaser or third parties. The Buyer is entitled to collection of said claims also after cession. The authorization of the Seller for collection of the claims on his own is not affected by this.
   The Seller, however, undertakes not to collect the claims as long as the Buyer properly complies with his payment obligations or the authorization to collect has not been revoked or no application for the opening of insolvency procedures has been filed.
   The Seller may otherwise request for the Buyer to disclose the claims ceded and their debtor, providing all information required for collection, handing over all documents pertaining to this, and informing the debtors of the cession, unless already performed by the Seller.
   In case that the delivery item is resold together with merchandise that is not the property of the Seller, the claim of the Seller versus the purchaser shall be deemed to be ceded in the amount of the contract price agreed between Seller and Buyer.
3. The Buyer shall not be entitled to pledge or transfer as security the delivery item.
4. THE BUYER HEREBY GRANTS TO THE SELLER A SECURITY INTEREST IN THE PRODUCTS SOLD HEREUNDER TO SECURE PAYMENT OF THE PRICE OF SUCH PRODUCTS AND AGREES, AND APPOINTS THE SELLER, ITS AGENT, TO TAKE ALL SUCH ACTION AND TO EXECUTE ALL SUCH DOCUMENTS AND INSTRUMENTS AS MAY BE NECESSARY OR REASONABLY REQUESTED BY THE SELLER TO PERFECT AND CONTINUE PERFECTED THE SELLER'S SECURITY INTEREST HEREUNDER.
5. The Seller shall be entitled to insure the delivery item at the expense of the Buyer against theft, breakage, fire, water, and other damages, unless the Buyer has demonstrably obtained such insurance coverage on his own.
6. If, in connection with the payment of the contract price, a liability of the Seller is established for a bill-of-exchange the reservation of proprietary rights including its special forms agreed upon or other securities agreed upon to secure payment shall not expire before the bill-of-exchange has been honored by the Buyer as debtor.
7. The application for the opening of insolvency procedures shall entitle the Seller to resign from the contract and demand immediate return of the delivery item.

VI. **Claims from Defects**

The Seller shall warrant material defects and deficiencies in title of the delivery under exclusion of further claims – subject to Paragraph VII "Liability" – as follows:

Material Defects

1. All those parts are to be reworked or replaced by parts free of defects – which is at the discretion of the Seller – free of charge, which turn out to be defective on account of circumstances that have occurred prior to the transfer of risk. The Seller is to be informed in writing immediately whenever such defects are determined. Parts replaced shall become the property of the Seller.
2. Upon agreement with the Seller, the Buyer shall grant the Seller the time and opportunity required in order to perform any and all rework and substitute deliveries, which the Seller deems necessary, with the Seller otherwise exempted from liability for the resulting consequences. It is only in urgent cases where the operational safety is jeopardized and/or as defense against disproportionate damages – in which cases immediate notification of the Seller is mandatory – that the Buyer has the right to eliminate the defect himself or have the defect eliminated by third parties and demand compensation for expenditures incurred.
3. Regarding the direct costs resulting from rework and/or substitute delivery, the Seller shall bear the costs for the replacement part including shipment – to the extent that the complaint proves justified.

   In all other cases the Buyer shall bear the costs.
4. Within the scope of statutory provisions, the Buyer has the right to resign from the contract if the Seller – taking into account the statutory exceptions – has allowed a reasonable time fixed for rework or substitute delivery on account of material defect to expire fruitlessly.

   In case of only insubstantial defects, the Buyer only has the right for a reduction of the contract price. The right for a reduction of the contract price is otherwise excluded.

   Further claims are determined by Paragraph VII.2. hereunder.
5. No liability is assumed particularly in the following cases:

   Unsuitable or improper use, incorrect installation and/or commissioning by Buyer or third parties, natural wear, erroneous and negligent handling, improper maintenance, unsuitable operating materials, chemical, electro-chemical or electrical impact – to the extent that they are not the responsibility of the Seller.

   The Seller shall assume liability for defects of the material supplied by the Buyer only if the defects could have been identified, had professional diligence been applied.

   In case of manufacturing based on drawings of the Buyer, the Seller shall assume liability only for execution in accordance with the drawings.

5a. If special tools are ordered, the actual delivery quantity is allowed to either exceed or undershoot the order quantity by approx. 10 % or a minimum of 2 units, as required.

6. In case that the Buyer or third parties perform improper rework, the Seller shall not assume any liability for the consequences that result. The same shall apply for modifications of the delivery item made without prior consent of the Seller.

Deficiencies in Title

7. The Buyer shall assume the sole responsibility for documents such as drawings, gauges, samples or the like to be submitted by the Buyer. It is the Buyer's responsibility to ensure that the workshop drawings submitted by the Buyer do not violate the copyrights of third parties. The Seller has no obligation vis-à-vis the Buyer to investigate if the submission of quotes on the basis of workshop drawings submitted to the Seller constitutes any violation of copyrights of third parties. Should a liability of the Seller nevertheless result from constitutive facts, the Buyer shall indemnify and hold harmless the Seller.

VII. **Seller's Liability, Disclaimer of Liability**

1. In case that the delivery item cannot be used by the Buyer in accordance with its contractual purpose by fault of the Seller as a result of negligent or incorrect execution of proposals submitted and consultations performed prior to or following the conclusion of the contract or by violation of other secondary contractual obligations – particularly instructions for operation and maintenance of the delivery item – the stipulations contained in Paragraphs VI and VII.2. shall apply under the exclusion of further claims of the Buyer.
2. The Seller shall assume liability for damages not established on the delivery item as such – on whatever legal grounds – only

a) in case of intent,
b) in case of gross negligence of the proprietor / institutions or senior executives,
c) in case of intentional or negligent violation of life, body and/or health,
d) in case of maliciously concealed defects,
e) in case of defects of the delivery item, to the extent that liability is assumed for personal injury or damage to property for privately used items in accordance with the German Product Liability Act (Produkthaftungsgesetz). In case of culpable breach of material contractual obligations, the Seller shall also assume liability in case of gross negligence of non-executive employees and minor negligence, in the latter case limited to reasonable, foreseeable typical contract damage.

   Further claims are excluded.

3. THE SELLER SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), OR OTHER THEORIES OF LAW, WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY THE SELLER OR UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO. UNDER NO CIRCUMSTANCES WILL THE SELLER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR ANY OTHER LOSS, DAMAGE OR EXPENSE OF ANY KIND, INCLUDING LOSS OF PROFITS, ARISING IN CONNECTION WITH THE CONTRACT OR WITH THE USE OR LIABILITY TO USE THE SELLER'S PRODUCTS FURNISHED UNDER THIS CONTRACT.

VIII. **Statute of Limitations**

Any and all claims of the Buyer – on whatever legal grounds – come under the statutes of limitation in 12 months. The statutory time limits shall apply for claims for damages in accordance with Paragraph VII.2. a – e.

IX. **Special Conditions for Machining Contracts (completion, reprocessing, modification or restoration of tools)**

The following shall apply for machining contracts as a supplement to/deviating from the Terms of Delivery:

1. The subcontractor shall not assume any liability for the behavior of material submitted. His claim for remuneration remains unaffected.
2. Should the material become unusable during the machining by fault of the subcontractor, his claim for remuneration for the service rendered shall lapse. The claim for damages of the Buyer shall be governed by Paragraph VII.2. hereunder.

X. **Applicable Law, Place of Jurisdiction, Place of Performance**

1. German Substantive Law under the exclusion of UN Purchasing Law shall apply for any and all legal relations between Seller and Buyer.
2. Should disputes arise from or in connection with the contract at hand, the parties shall first attempt to reach an out-of-court settlement. Should this not be possible, disputes shall be ultimately decided by a Court of Arbitration in accordance with the Arbitrary Court Regulation of the German Institution for Arbitration (DIS), excluding the regular legal process. The decision shall be taken by three arbitrators, with each of the two parties appointing one arbitrator and the third arbitrator selected by the two arbitrators appointed. Arbitration procedures shall be in German language and performed at the corporate seat of the exporter.
3. Place of Performance shall be Springfield, OH 45502, USA.

Any and all deliveries performed shall exclusively be based on our Terms of Delivery. We hereby object to any and all contrary terms of purchase.

CONTROX-NEUHÄUSER
Precision Cutting Tools

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