

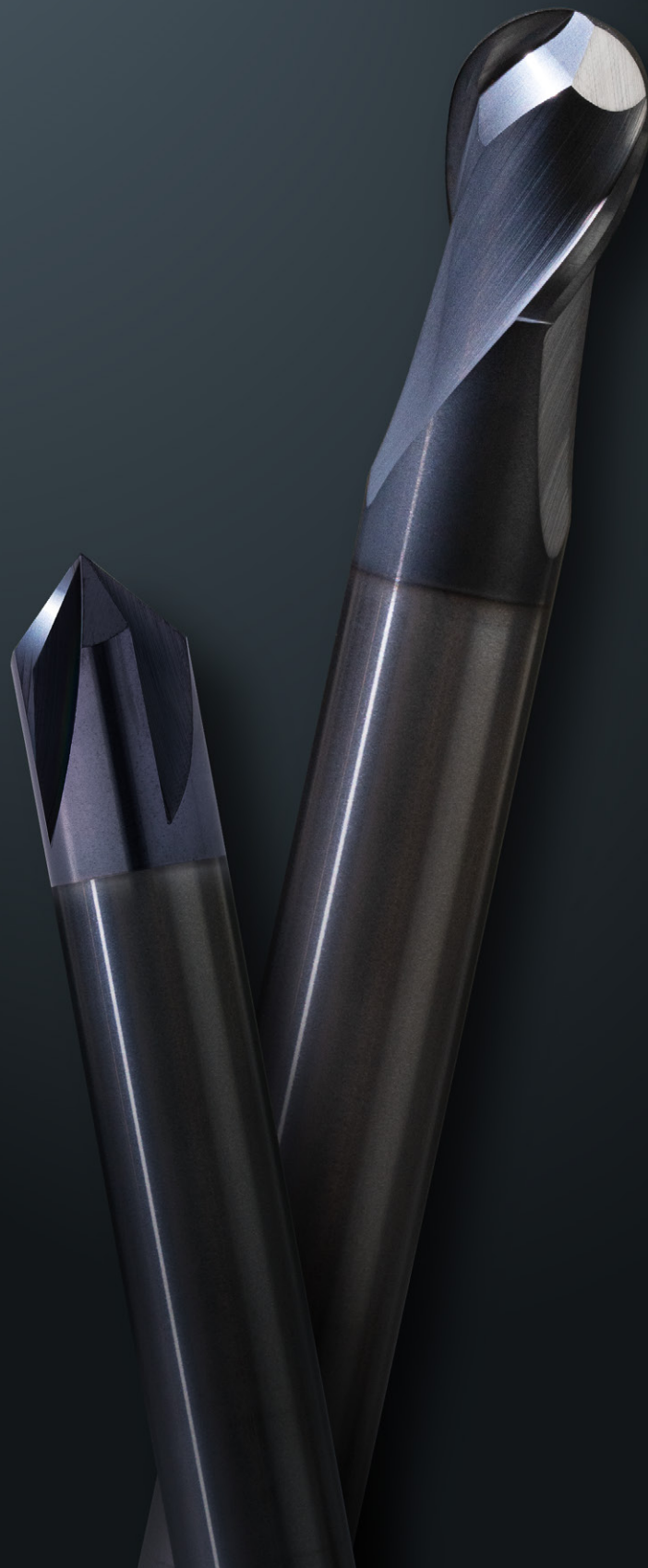
HOFMANN & VRATNY — BCU1 SERIES — UNIVERSAL MACHINING EN

BCU1 SERIES



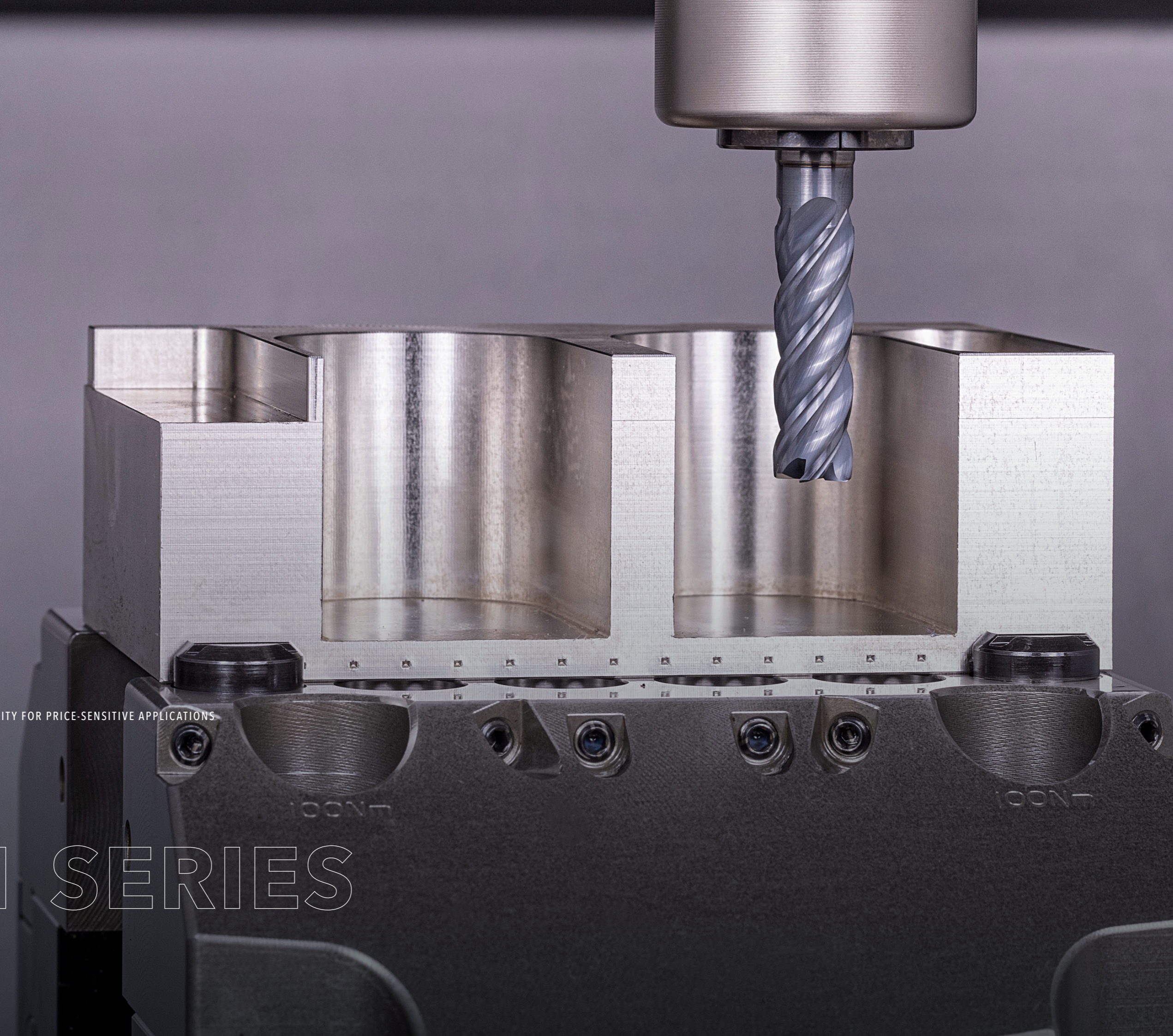
Basic

2024



HOFMANN & VRATNY — SOLID QUALITY FOR PRICE-SENSITIVE APPLICATIONS

OUR BCU1 SERIES



THE RIGHT MILLING CUTTER. AT ALL TIMES.

Welcome to Hofmann & Vratny. As the leading manufacturer of solid carbide milling cutters, we enable companies throughout the world to manufacture their products.

Every day, our strong team works on our collective goal of producing the best milling cutters in the world. Companies from the medical industry, semi-conductor industry, machine and plant construction, aviation, aerospace engineering and, not least, the automotive industry have been using our milling cutters for decades now. Quality - Made in Bavaria.

The success of our company is built on innovation, a culture of cooperation, open interaction with high respect and many years of successful and trustful collaboration with our business partners. You can always count on us, our milling cutters and our irrepressible drive to shape the future of the industry together. To us, that means shaping tomorrow.

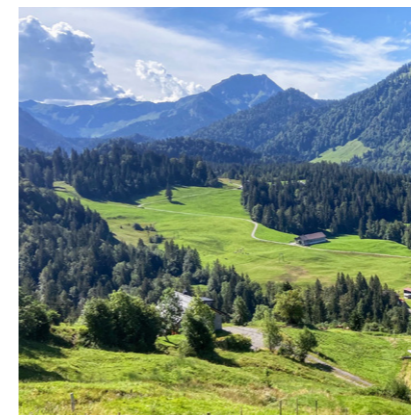
Andreas Vratny

Zdenek Vratny

Marius Heinemann-Grüder



OUR
BCU1 SERIES



48
YEARS OF
EXPERIENCE

2 Mio.
MILLING
CUTTERS
PRODUCED
EVERY YEAR

MADE IN BAVARIA

Our milling cutters are used by companies all over the world. Still they all have the same origin: Our production sites in Bavaria, Germany.

As a traditional company, we are proud of our strong connection to the region. Ever since we were founded, we have been firmly tied to our homeland, and our team works on producing the best milling cutters in the world in a familial environment. Genuine quality work, the highest-quality craftsmanship and a strong promotion and retention of our talent: This is what Made in Bavaria means to us.


**MADE IN
BAVARIA**

PROVEN QUALITY





OUR BCU1 SERIES

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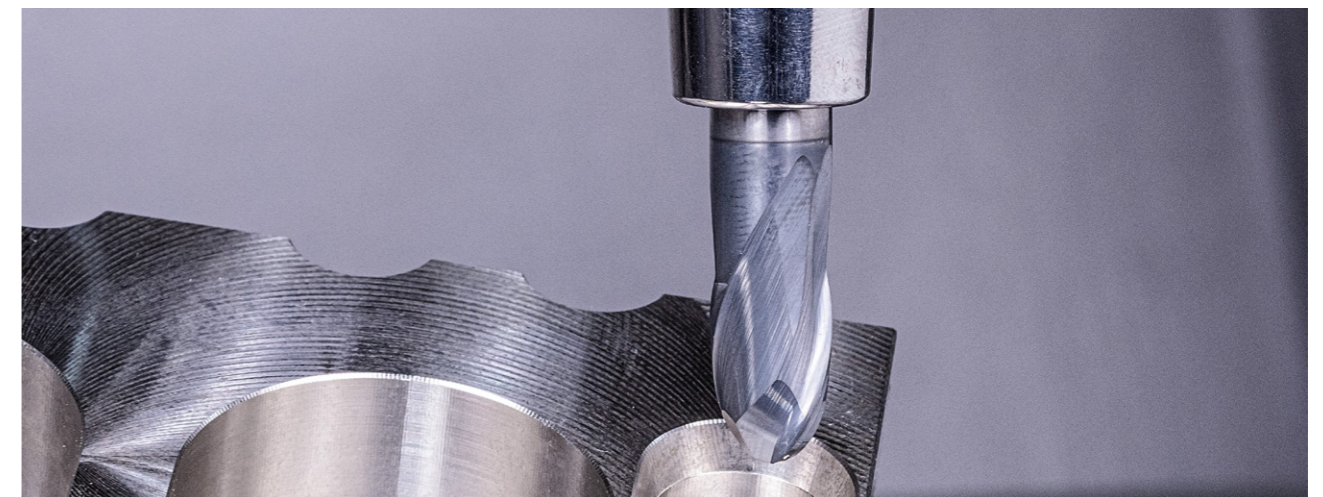
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OUR BCU1 SERIES

Solid quality for price-sensitive applications



OUR BCU1 SERIES PERFORMS WELL IN ALL AREAS OF APPLICATION.

Our H&V BCU1 Series is a very attractively priced supplement to our Expert product line, specially designed for universal machining.

The geometry, material and coating are optimised to ensure an attractive price/performance ratio. Therefore, our milling cutters are ideal for price-conscious users in almost all areas of application.

- Versatile application thanks to tried-and-tested geometries
- Stable universal coating for machining, even suitable for the most demanding materials in roughing and finishing
- Special fine grain substrate for reduced cracking and improved resistance to cutting edge breakouts

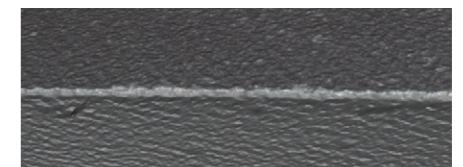
A SPECIAL EDGE PREPARATION PROCESS ENSURES:

- Entirely homogeneous cutting edges
- Even distribution of cutting forces
- Improved surface quality of the component
- Controlled and even wear

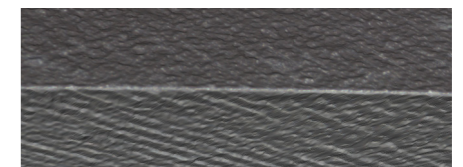


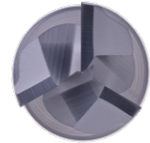
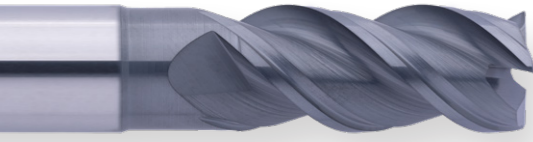
EXPERIENCE OUR BCU1 SERIES IN ACTION

BEFORE EDGE PREPARATION



AFTER EDGE PREPARATION

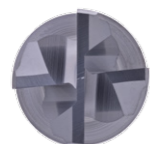
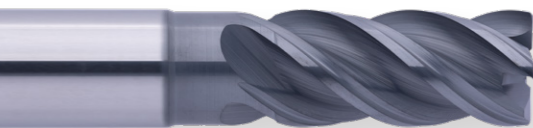




BASIC U1 PERFORMMAKER (M01) Z3



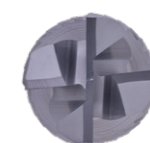
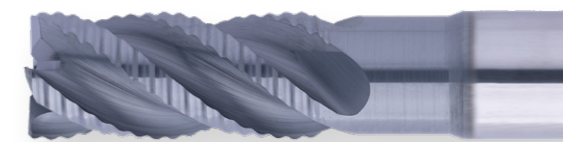
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating



BASIC U1 PERFORMMAKER (M01) Z4



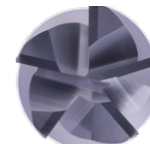
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating



BASIC U1 SLOTMAKER (M02) Z4

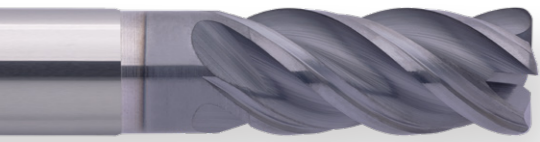


- Optimised chip chambers for a large chip volume,
for example with full slot milling
- Adapted roughing teeth for small chips
- Available in 2xD and 3xD
- Available as HA and HB
- With BUI coating



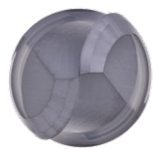
BASIC U1 CHIPMAKER (M03) Z5

- Suitable for roughing and finishing due to adapted chipbreaker
arrangement
- Large chip chambers for good chip disposal
- Unequal tooth pitch for smooth running
- Available in 3.5xD
- Available as HA
- With BUI coating



BASIC U1 FORMMAKER (M06) Z4

- With large corner radii for contour milling
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 2xD
- Available as HA and HB
- With BUI coating

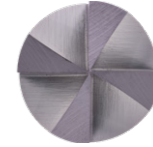
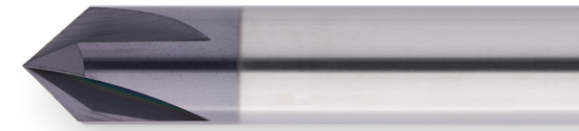


BASIC U1 ROWMAKER (M08) Z2

- Geometry of the face cutting edge designed for a smooth and even cut
- Adapted chip chambers for roughing and finishing
- Suitable for wet and dry processing
- Available in 1.5xD in short, long and overlong versions
- Available as HA
- With BUI coating

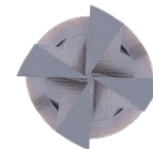
BASIC U1 CHAMFMAKER (M09) Z3-4

- For universal chamfering of components
- Designed for contouring
- Available in 60° and 90°
- Available as HA and HB
- With BUI coating



BASIC U1 FB CHAMFMAKER (M10) Z4

- For universal chamfering of components
- Designed for contouring
- Forward and backward cutting
- grounded from mold blank and round bar available
- Available as HA
- With BUI coating





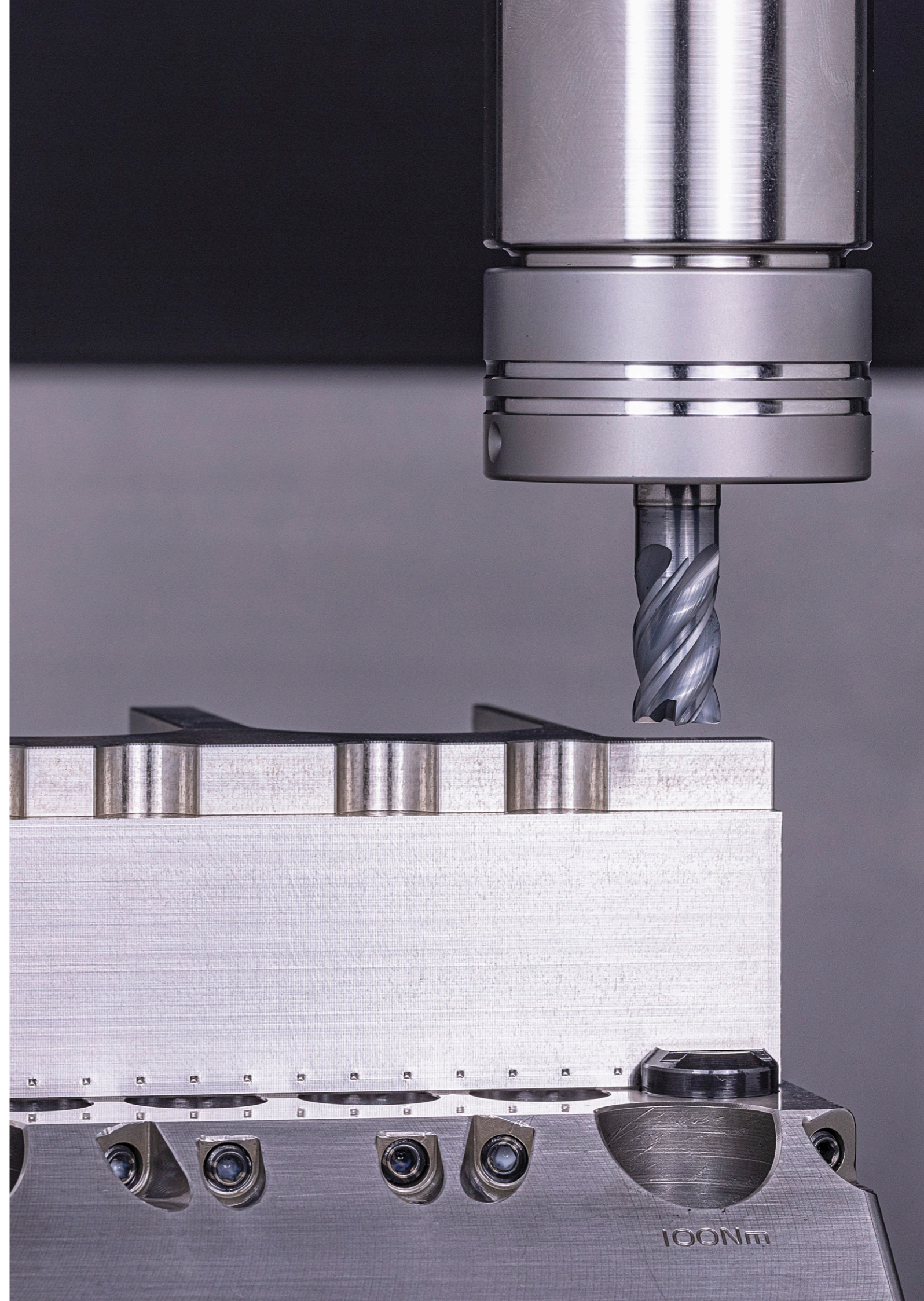
BASIC U1 ROUNDMAKER (M11) Z4

- For the universal production of radii on components
- Deburring edges with contours
- Available as HA
- With BUI coating



BASIC U1 FB ROUNDMAKER (M12) Z4

- For universal attachment of radii to components
- Narrow tolerance for high dimensional accuracy
- Forward and backward cutting
- Available as HA
- With BUI coating

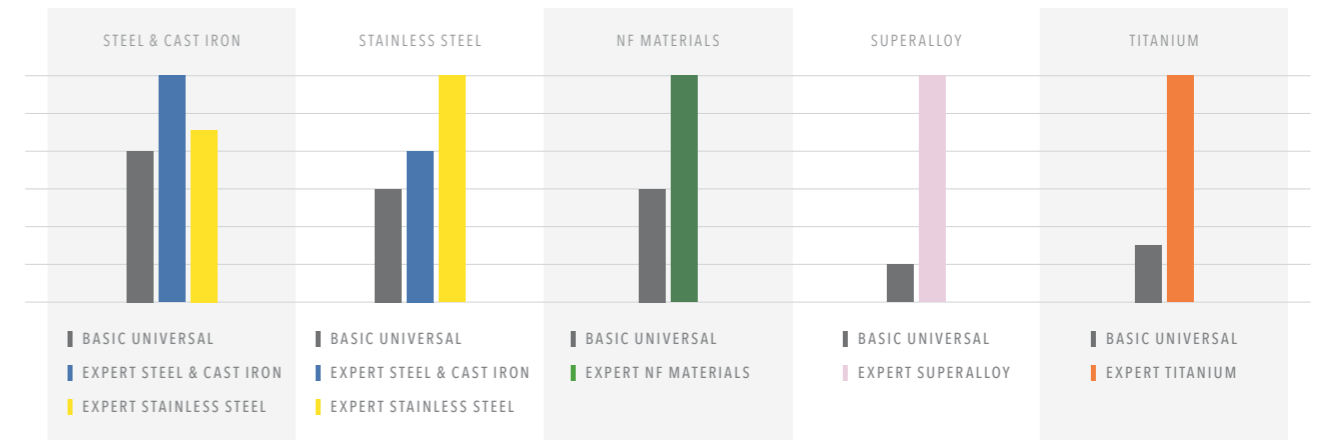


APPLICATION EXAMPLES

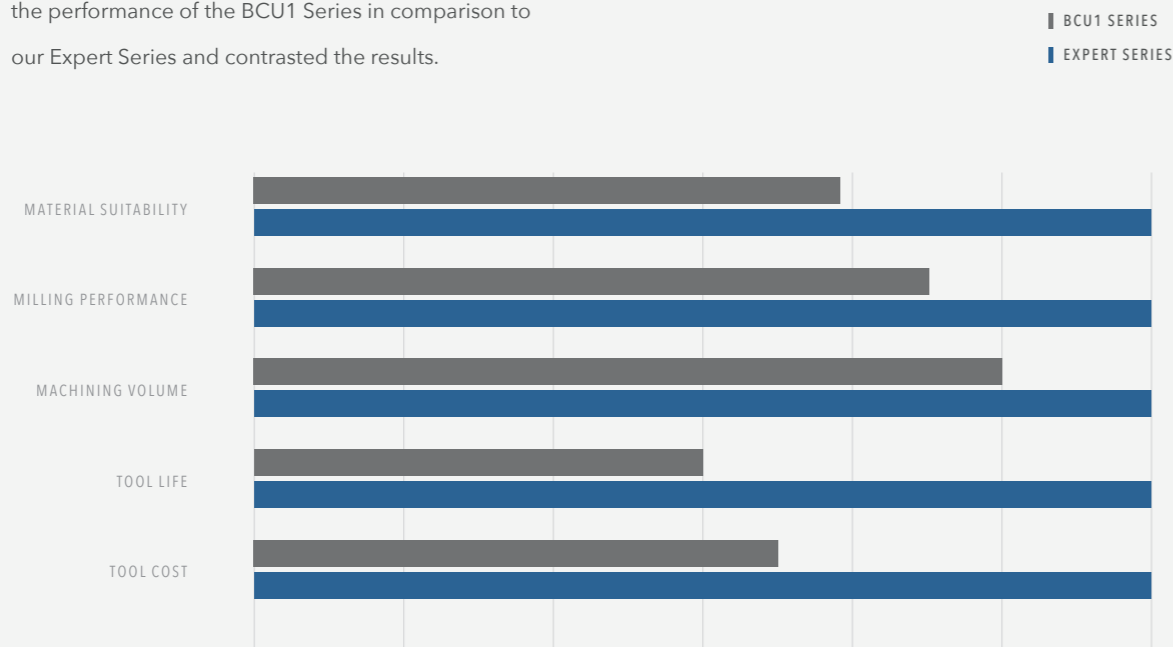
THE BCU1 SERIES IN COMPARISON TO OUR EXPERT SERIES

The **BCU1 series** stands out due to its excellent price/performance ratio and the wide range of possible uses for the tools. The milling cutters in this range can be used on different materials with solid results. Our Expert Series, on the other hand, are specially tailored to one particular area of application and deliver optimum machining performance with the corresponding materials. In order to illustrate the differences in terms of equipment and performance between the BCU1 Series and the Expert Series, we carried out various scenarios and presented the results visually.

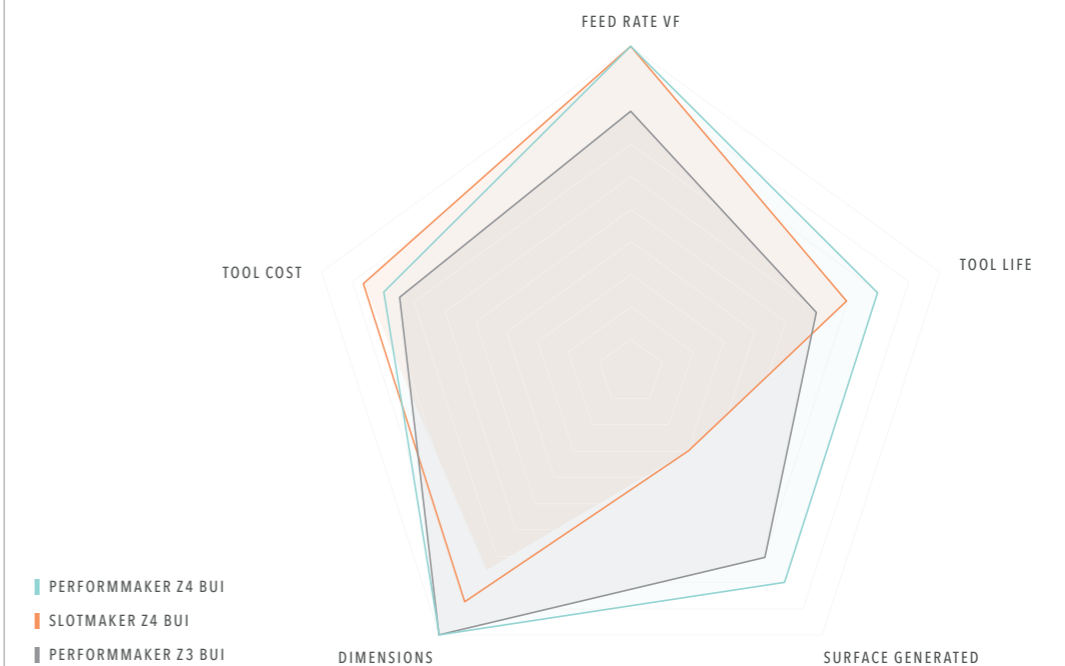
We have tested both the BCU1 Series and the Expert Series with the materials mentioned. Compared with the Expert Series, which are each specially designed for a specific area of application, the BCU1 Series has successfully proven its versatility in internal tests. The results of the service life comparisons are shown in the following diagrams.



Based on the aforementioned criteria, we determined the performance of the BCU1 Series in comparison to our Expert Series and contrasted the results.



The tool matrix for our BCU1 Series compares the performance of individual milling cutters within the series. The values clearly show the performance in relation to the respective property in order to help you choose the right tool for every requirement.



BETA UNI IRON

BUI | Cost-effective and reliable versatile coating for a wide range of applications

BetaUni Iron is an AlCrN-based coating that was developed for demanding universal machining. Thanks to a simple and proven composition, it delivers universally good results for price-sensitive applications.

Due to its nanostructuring, the coating can be used for a wide range of applications and is suitable for use on a wide variety of tool types such as mould tools, shank tools and roughing tools. This reliable universal coating delivers solid results when machining non-ferrous materials, stainless steel, steel and cast iron. It is even possible to machine hard-to-cut materials such as titanium, superalloy and hardened steel in secondary application areas.

PROPERTIES

Key features of the BetaUni Iron coating include the following:

- Smooth surfaces due to nanostructuring
- Reduction of built-up edges and cold welds
- High wear resistance thanks to high temperature stability and oxidation resistance

BETAUNI IRON AT A GLANCE

Structure	Nanostructured
Composition	Aluminium chromium nitride
Layer thickness	2-3 µm
Layer hardness	approx. 3200 HV
Adhesion factor	Friction coefficient: approx. 0.5 (dry on steel)
Max. operating temperature	approx. 1000 °C
Cooling	Dry and wet processing
Main application	Steel and cast iron, stainless steel, non-ferrous materials
Secondary application (limited suitability)	Titanium, superalloy and hardened steel

DIGITAL SERVICES



DISTRIBUTION PARTNERS

We enable companies around the world to manufacture their products. Therefore we work with reliable partners all over the world to ensure that our milling cutters are always available exactly where they are needed and can be delivered straight into your hands.

FIND OUT MORE ABOUT OUR GLOBAL SALES PARTNERS



Browse all BCU1 Series products in our shop

Discover the products in the BCU1 Series online or search for the ideal tool for your application based on various product features. We guarantee, that you will find the perfect milling cutter for your machining needs using our online platform.



WHAT ARE YOU WAITING FOR?

NUMBERING SYSTEM

DISTINGUISHING FEATURES

PRODUCT LINE

- BC Basic
- EX Expert

TOOL TYPE

- D Drilling
- M Milling
- T Threading
- R Reaming

TOOL VERSION

- M01 End mill cutter | PERFORMMAKER
- M02 Roughing cutter | SLOTMAKER
- M03 Trochoidal cutter | CHIPMAKER
- M04 Finishing cutter | MIRRORMAKER
- M05 Single flute cutter | BALANCEMAKER
- M06 Torus cutter | FORMMAKER
- M07 Face torus cutter | BLADEMAKER
- M08 Full radius cutter | ROWMAKER
- M09 Deburring cutter | CHAMFMAKER
- M10 Forward and backward deburring cutter | FB CHAMFMAKER
- M11 Corner rounding cutter | ROUNDMAKER
- M12 Forward and backward corner rounding cutter | FB ROUNDMAKER
- M13 Engraving cutter | TEXTMAKER
- M14 Conical cutter | SLOPEMAKER
- M15 Micro end mill cutter | PERFORMMAKER MICRO
- M16 Micro torus cutter | FORMMAKER MICRO
- M17 Micro full radius cutter | ROWMAKER MICRO

BC U 1 - M 01 - 0293

MAIN APPLICATION

- PK Steel & Cast Iron
- H Hardened Steel
- M Stainless Steel
- O Graphite, CRP/GRP
- T Titanium
- S Superalloy
- N NF Material
- U Universal

VERSION

- 1 Version 1.0
- 2 Version 2.0
- 3 Version 3.0

STILL CAN'T FIND A SUITABLE MILLING CUTTER?

No problem - simply customize an existing tool. Using our configurator for special milling cutters, you can customize existing tools to your needs in an instant or create your own tools based on predefined types.

WE WILL RESPOND TO ALL REQUESTS SUBMITTED VIA THE CONFIGURATOR WITHIN ONE WORKING DAY AT THE LATEST



OTHER DISTINGUISHING FEATURES

BC U 1 - M 01 - 0293 - 12/0,5

PRODUCT IDENT

e.g. 0023

DIMENSION

- 3x10 Cutting diameter x length of undercut
- 12/0,5 Cutting diameter / corner radius
- 10 Diameter

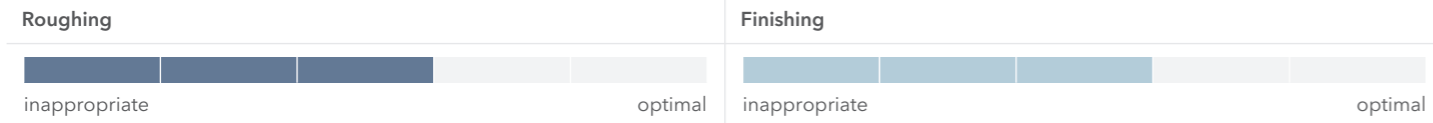
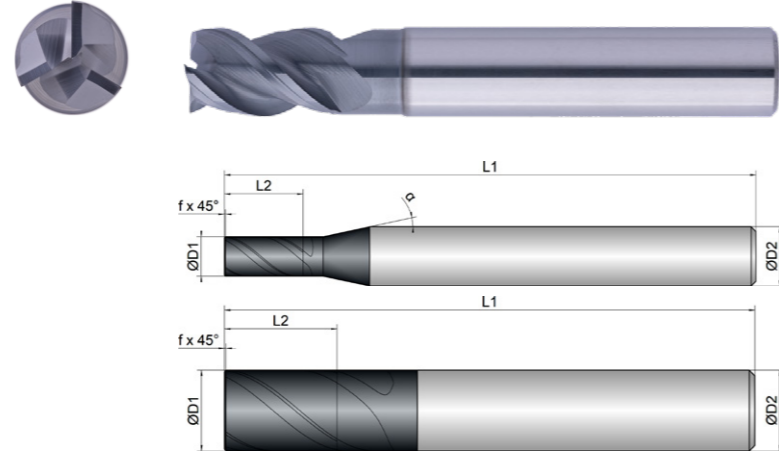
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				
Features	HA	≠	1,5xD	45°



Download Catalog Pages (PDF)

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



BCU1-M01-0103	D1	L2	L1	D2	z	45°		α
	mm	mm	mm	mm	#			
3	3.0	6.0	54.0	6.0	3	0.10	45	12
4	4.0	8.0	54.0	6.0	3	0.10	45	12
5	5.0	9.0	54.0	6.0	3	0.20	45	12
6	6.0	10.0	54.0	6.0	3	0.20	45	0
8	8.0	12.0	58.0	8.0	3	0.20	45	0
10	10.0	14.0	66.0	10.0	3	0.20	45	0
12	12.0	16.0	73.0	12.0	3	0.20	45	0
16	16.0	22.0	82.0	16.0	3	0.30	45	0
20	20.0	26.0	92.0	20.0	3	0.30	45	0

Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
3	6	0.5°	0.02	3	3	0.025	0.9	L2max	0.018	0.2	L2max	0.045	0.8	L2max	0.0398	
4	8	0.5°	0.02	4	4	0.025	1.2	L2max	0.021	0.2	L2max	0.06	1.1	L2max	0.0536	
5	9	0.5°	0.03	5	5	0.035	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614	
6	10	0.8°	0.04	6	6	0.045	1.8	L2max	0.025	0.2	L2max	0.09	1.6	L2max	0.0796	
8	12	1°	0.05	8	8	0.06	2.4	L2max	0.03	0.2	L2max	0.11	1.9	L2max	0.0936	
10	14	1.5°	0.055	10	10	0.07	3	L2max	0.035	0.2	L2max	0.13	2.3	L2max	0.1094	
12	16	2°	0.06	12	12	0.08	3.6	L2max	0.04	0.2	L2max	0.15	2.6	L2max	0.1236	
16	22	2.5°	0.07	16	16	0.09	4.8	L2max	0.045	0.2	L2max	0.17	3.3	L2max	0.1376	
20	26	3°	0.09	20	20	0.11	6	L2max	0.05	0.2	L2max	0.2	3.6	L2max	0.1537	

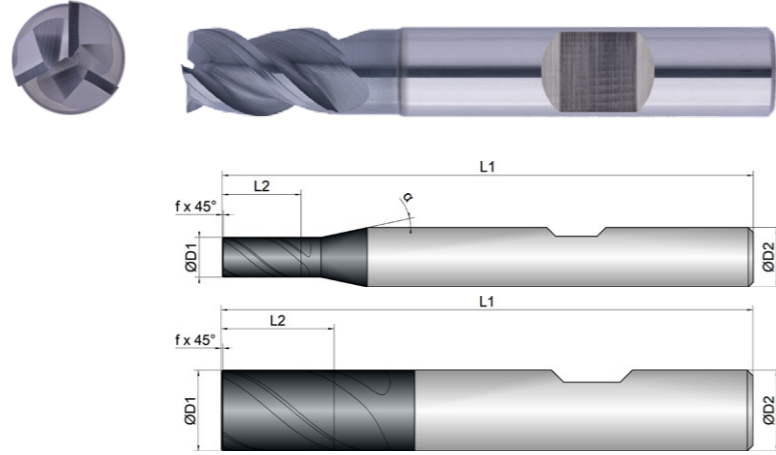
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI			
Application						
Features	HB	≠		1,5xD	45°	



Download Catalog Pages (PDF)

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing				Finishing			
inappropriate				optimal			

BCU1-M01-0104	D1 mm Ø	L2 mm	L1 mm	D2 mm Ø	z #	45° mm		α °
3	3.0	6.0	54.0	6.0	3	0.10	45	12
4	4.0	8.0	54.0	6.0	3	0.10	45	12
5	5.0	9.0	54.0	6.0	3	0.20	45	12
6	6.0	10.0	54.0	6.0	3	0.20	45	0
8	8.0	12.0	58.0	8.0	3	0.20	45	0
10	10.0	14.0	66.0	10.0	3	0.20	45	0
12	12.0	16.0	73.0	12.0	3	0.20	45	0
16	16.0	22.0	82.0	16.0	3	0.30	45	0
20	20.0	26.0	92.0	20.0	3	0.30	45	0

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	Finishing Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL							
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
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 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

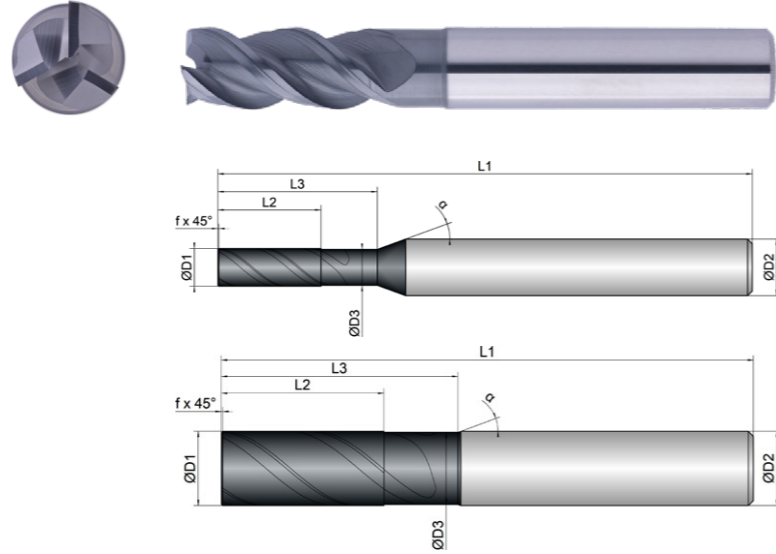
Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			Finishing			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.02	3	3	0.025	0.9	L2max	0.018	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.02	4	4	0.025	1.2	L2max	0.021	0.2	L2max	0.06	1.1	L2max	0.0536
5	9	0.5°	0.03	5	5	0.035	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614
6	10	0.8°	0.04	6	6	0.045	1.8	L2max	0.025	0.2	L2max	0.09	1.6	L2max	0.0796
8	12	1°	0.05	8	8	0.06	2.4	L2max	0.03	0.2	L2max	0.11	1.9	L2max	0.0936
10	14	1.5°	0.055	10	10	0.07	3	L2max	0.035	0.2	L2max	0.13	2.3	L2max	0.1094
12	16	2°	0.06	12	12	0.08	3.6	L2max	0.04	0.2	L2max	0.15	2.6	L2max	0.1236
16	22	2.5°	0.07	16	16	0.09	4.8	L2max	0.045	0.2	L2max	0.17	3.3	L2max	0.1376
20	26	3°	0.09	20	20	0.11	6	L2max	0.05	0.2	L2max	0.2	3.6	L2max	0.1537

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HA	≠	2xD	

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0113	D1	D3	L2	L3	L1	D2	z	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°
2	2.0	1.8	5.0	10.0	57.0	6.0	3	0.10	45
3	3.0	2.8	8.0	13.0	57.0	6.0	3	0.10	45
4	4.0	3.8	11.0	17.0	57.0	6.0	3	0.10	45
5	5.0	4.8	13.0	20.0	57.0	6.0	3	0.20	45
6	6.0	5.8	13.0	20.0	57.0	6.0	3	0.20	45
8	8.0	7.7	19.0	25.0	63.0	8.0	3	0.20	45
10	10.0	9.7	22.0	32.0	72.0	10.0	3	0.20	45
12	12.0	11.6	26.0	38.0	83.0	12.0	3	0.20	45
16	16.0	15.5	32.0	44.0	92.0	16.0	3	0.30	45
20	20.0	19.5	41.0	54.0	104.0	20.0	3	0.30	45



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
2	5	0.5°	0.015	2	2	0.02	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275	
3	8	0.5°	0.02	3	3	0.025	0.9	L2max	0.015	0.2	L2max	0.045	0.8	L2max	0.0398	
4	11	0.5°	0.02	4	4	0.025	1.2	L2max	0.018	0.2	L2max	0.06	1.1	L2max	0.0536	
5	13	0.5°	0.03	5	5	0.035	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614	
6	13	0.8°	0.04	6	6	0.045	1.8	L2max	0.022	0.2	L2max	0.09	1.6	L2max	0.0796	
8	19	1°	0.05	8	8	0.06	2.4	L2max	0.028	0.2	L2max	0.11	1.9	L2max	0.0936	
10	22	1.5°	0.055	10	10	0.07	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094	
12	26	2°	0.06	12	12	0.08	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236	
16	32	2.5°	0.07	16	16	0.09	4.8	L2max	0.038	0.2	L2max	0.17	3.3	L2max	0.1376	
20	41	3°	0.09	20	20	0.11	6	L2max	0.04	0.2	L2max	0.2	3.6	L2max	0.1537	

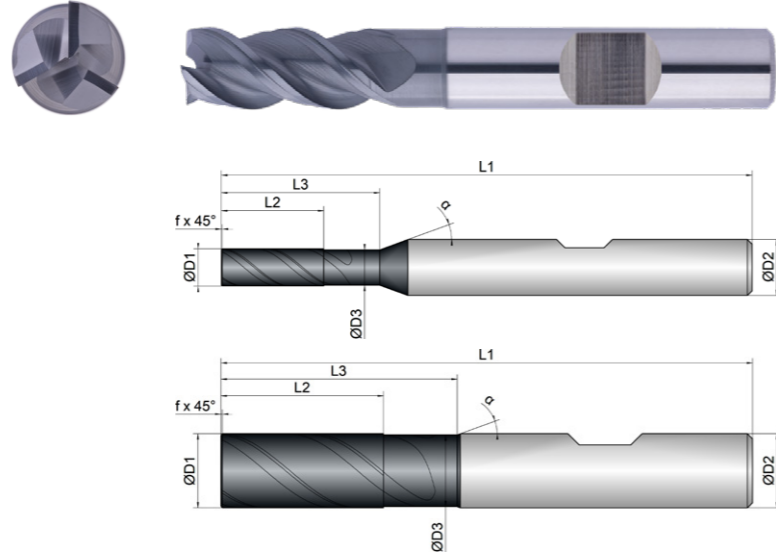
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application		Basic		
Features	HB	≠	2xD	



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- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0114	D1	D3	L2	L3	L1	D2	z	α	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°	°
2	2.0	1.8	5.0	10.0	57.0	6.0	3	0.10	45	20
3	3.0	2.8	8.0	13.0	57.0	6.0	3	0.10	45	20
4	4.0	3.8	11.0	17.0	57.0	6.0	3	0.10	45	20
5	5.0	4.8	13.0	20.0	57.0	6.0	3	0.20	45	20
6	6.0	5.8	13.0	20.0	57.0	6.0	3	0.20	45	20
8	8.0	7.7	19.0	25.0	63.0	8.0	3	0.20	45	20
10	10.0	9.7	22.0	32.0	72.0	10.0	3	0.20	45	20
12	12.0	11.6	26.0	38.0	83.0	12.0	3	0.20	45	20
16	16.0	15.5	32.0	44.0	92.0	16.0	3	0.30	45	20
20	20.0	19.5	41.0	54.0	104.0	20.0	3	0.30	45	20

Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

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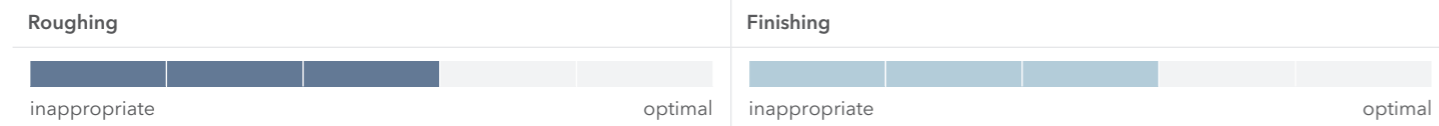
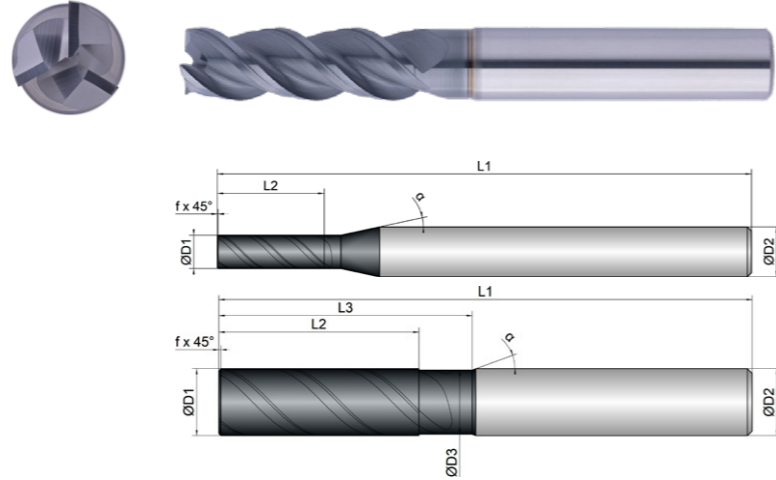
Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
2	5	0.5°	0.015	2	2	0.02	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275	
3	8	0.5°	0.02	3	3	0.025	0.9	L2max	0.015	0.2	L2max	0.045	0.8	L2max	0.0398	
4	11	0.5°	0.02	4	4	0.025	1.2	L2max	0.018	0.2	L2max	0.06	1.1	L2max	0.0536	
5	13	0.5°	0.03	5	5	0.035	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614	
6	13	0.8°	0.04	6	6	0.045	1.8	L2max	0.022	0.2	L2max	0.09	1.6	L2max	0.0796	
8	19	1°	0.05	8	8	0.06	2.4	L2max	0.028	0.2	L2max	0.11	1.9	L2max	0.0936	
10	22	1.5°	0.055	10	10	0.07	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094	
12	26	2°	0.06	12	12	0.08	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236	
16	32	2.5°	0.07	16	16	0.09	4.8	L2max	0.038	0.2	L2max	0.17	3.3	L2max	0.1376	
20	41	3°	0.09	20	20	0.11	6	L2max	0.04	0.2	L2max	0.2	3.6	L2max	0.1537	

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HA	≠	3xD	

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



BCU1-M01-0123	D1	D3	L2	L3	L1	D2	z	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°
4	4.0	0.0	13.0	0.0	65.0	6.0	3	0.10	45
5	5.0	0.0	16.0	0.0	65.0	6.0	3	0.20	45
6	6.0	5.6	18.0	24.0	65.0	6.0	3	0.20	45
8	8.0	7.6	24.0	30.0	70.0	8.0	3	0.20	45
10	10.0	9.6	30.0	38.0	80.0	10.0	3	0.20	45
12	12.0	11.4	36.0	46.0	93.0	12.0	3	0.20	45
16	16.0	15.4	48.0	58.0	110.0	16.0	3	0.30	45
20	20.0	19.4	60.0	74.0	126.0	20.0	3	0.30	45



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	190	190	210	305	1	1
2.1-2.2 low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2 high alloyed	<1100	160	160	180	188	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	200	200	220	232	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1 austenitic	<650		75	80	122	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	380	380	400	500	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	200	242	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		45	50	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		20	25	42	0.7	0.3

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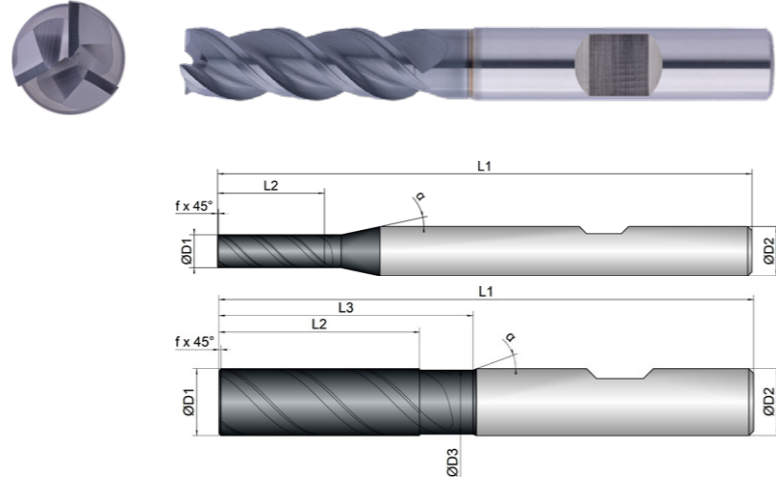
Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae	ap	fz	ae	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
4	13	0.5°	0.015	4	4	0.02	1.2	L2max	0.018	0.2	L2max	0.05	0.88	L2max	0.0414	
5	16	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.06	1.04	L2max	0.0487	
6	18	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.08	1.28	L2max	0.0655	
8	24	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.1	1.52	L2max	0.0785	
10	30	1.5°	0.05	10	10	0.065	3	L2max	0.035	0.2	L2max	0.12	1.84	L2max	0.093	
12	36	2°	0.055	12	12	0.075	3.6	L2max	0.04	0.2	L2max	0.14	2.08	L2max	0.106	
16	48	2.5°	0.065	16	16	0.085	4.8	L2max	0.045	0.2	L2max	0.15	2.64	L2max	0.1114	
20	60	3°	0.085	20	20	0.1	6	L2max	0.05	0.2	L2max	0.18	2.88	L2max	0.1264	

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HB	≠	3xD	

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0124	D1	D3	L2	L3	L1	D2	z	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°
4	4.0	0.0	13.0	0.0	65.0	6.0	3	0.10	45
5	5.0	0.0	16.0	0.0	65.0	6.0	3	0.20	45
6	6.0	5.6	18.0	24.0	65.0	6.0	3	0.20	45
8	8.0	7.6	24.0	30.0	70.0	8.0	3	0.20	45
10	10.0	9.6	30.0	38.0	80.0	10.0	3	0.20	45
12	12.0	11.4	36.0	46.0	93.0	12.0	3	0.20	45
16	16.0	15.4	48.0	58.0	110.0	16.0	3	0.30	45
20	20.0	19.4	60.0	74.0	126.0	20.0	3	0.30	45



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	190	190	210	305	1	1
2.1-2.2 low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2 high alloyed	<1100	160	160	180	188	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	200	200	220	232	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1 austenitic	<650		75	80	122	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	380	380	400	500	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	200	242	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		45	50	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		20	25	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae	ap	fz	ae	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
4	13	0.5°	0.015	4	4	0.02	1.2	L2max	0.018	0.2	L2max	0.05	0.88	L2max	0.0414	
5	16	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.06	1.04	L2max	0.0487	
6	18	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.08	1.28	L2max	0.0655	
8	24	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.1	1.52	L2max	0.0785	
10	30	1.5°	0.05	10	10	0.065	3	L2max	0.035	0.2	L2max	0.12	1.84	L2max	0.093	
12	36	2°	0.055	12	12	0.075	3.6	L2max	0.04	0.2	L2max	0.14	2.08	L2max	0.106	
16	48	2.5°	0.065	16	16	0.085	4.8	L2max	0.045	0.2	L2max	0.15	2.64	L2max	0.1114	
20	60	3°	0.085	20	20	0.1	6	L2max	0.05	0.2	L2max	0.18	2.88	L2max	0.1264	

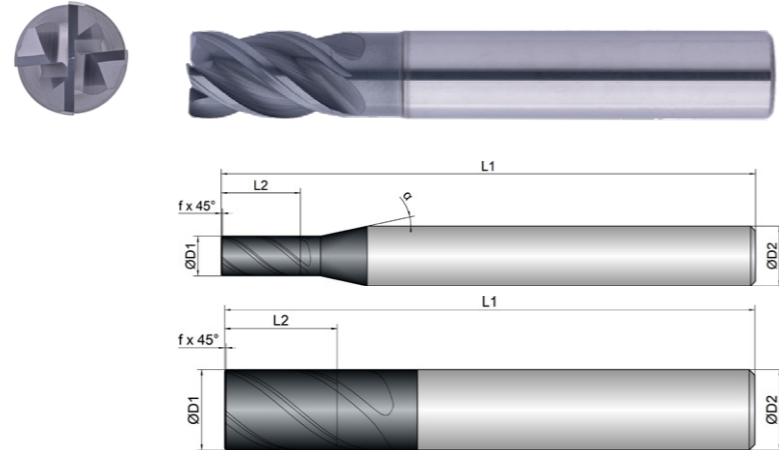
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				Basic
Features	HA	≠		



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- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing				Finishing			
inappropriate		optimal		inappropriate		optimal	

BCU1-M01-0203	D1 mm Ø	L2 mm	L1 mm	D2 mm Ø	z #	45° mm	°	α °
3	3.0	6.0	54.0	6.0	4	0.10	40	12
4	4.0	8.0	54.0	6.0	4	0.10	40	12
5	5.0	9.0	54.0	6.0	4	0.20	40	12
6	6.0	10.0	54.0	6.0	4	0.20	40	0
8	8.0	12.0	58.0	8.0	4	0.20	40	0
10	10.0	14.0	66.0	10.0	4	0.20	40	0
12	12.0	16.0	73.0	12.0	4	0.20	40	0
16	16.0	22.0	82.0	16.0	4	0.30	40	0
20	20.0	26.0	92.0	20.0	4	0.30	40	0

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	Finishing Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL							
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			Finishing			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.015	4	4	0.02	1.2	L2max	0.013	0.2	L2max	0.06	1.1	L2max	0.0536
5	9	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614
6	10	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.09	1.6	L2max	0.0796
8	12	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.11	1.9	L2max	0.0936
10	14	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094
12	16	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236
16	22	2.5°	0.065	16	16	0.085	4.8	L2max	0.04	0.2	L2max	0.17	3.3	L2max	0.1376
20	26	3°	0.08	20	20	0.1	6	L2max	0.045	0.2	L2max	0.2	3.6	L2max	0.1537

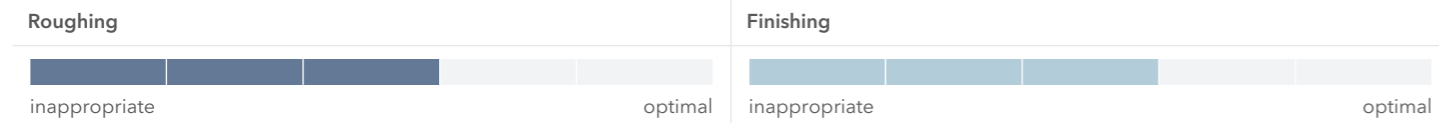
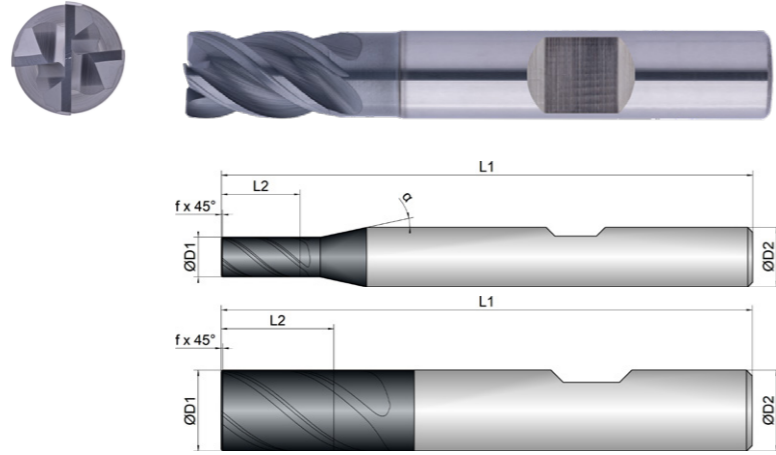
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI			
Application						
Features	HB	≠		1,5xD	45°	



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- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



BCU1-M01-0204	D1	L2	L1	D2	z	45°		α
	mm	mm	mm	mm	#			
3	3.0	6.0	54.0	6.0	4	0.10	40	12
4	4.0	8.0	54.0	6.0	4	0.10	40	12
5	5.0	9.0	54.0	6.0	4	0.20	40	12
6	6.0	10.0	54.0	6.0	4	0.20	40	0
8	8.0	12.0	58.0	8.0	4	0.20	40	0
10	10.0	14.0	66.0	10.0	4	0.20	40	0
12	12.0	16.0	73.0	12.0	4	0.20	40	0
16	16.0	22.0	82.0	16.0	4	0.30	40	0
20	20.0	26.0	92.0	20.0	4	0.30	40	0

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	Finishing Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL							
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

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Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.015	4	4	0.02	1.2	L2max	0.013	0.2	L2max	0.06	1.1	L2max	0.0536
5	9	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614
6	10	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.09	1.6	L2max	0.0796
8	12	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.11	1.9	L2max	0.0936
10	14	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094
12	16	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236
16	22	2.5°	0.065	16	16	0.085	4.8	L2max	0.04	0.2	L2max	0.17	3.3	L2max	0.1376
20	26	3°	0.08	20	20	0.1	6	L2max	0.045	0.2	L2max	0.2	3.6	L2max	0.1537

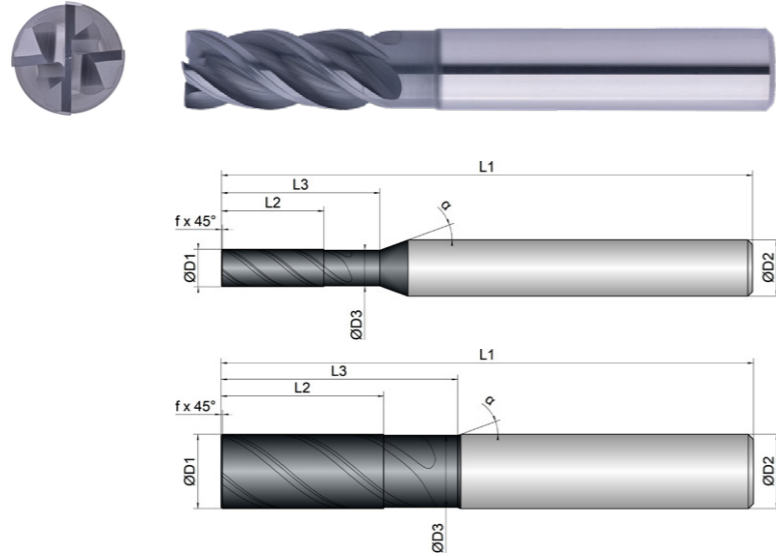
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HA	≠	2xD	



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- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0213	D1	D3	L2	L3	L1	D2	z	α	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°	°
2	2.0	1.8	5.0	10.0	57.0	6.0	4	0.10	40	20
3	3.0	2.8	8.0	13.0	57.0	6.0	4	0.10	40	20
4	4.0	3.8	11.0	17.0	57.0	6.0	4	0.10	40	20
5	5.0	4.8	13.0	20.0	57.0	6.0	4	0.20	40	20
6	6.0	5.8	13.0	20.0	57.0	6.0	4	0.20	40	20
8	8.0	7.7	19.0	25.0	63.0	8.0	4	0.20	40	20
10	10.0	9.7	22.0	32.0	72.0	10.0	4	0.20	40	20
12	12.0	11.6	26.0	38.0	83.0	12.0	4	0.20	40	20
16	16.0	15.5	32.0	44.0	92.0	16.0	4	0.30	40	20
20	20.0	19.5	41.0	54.0	104.0	20.0	4	0.30	40	20

Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

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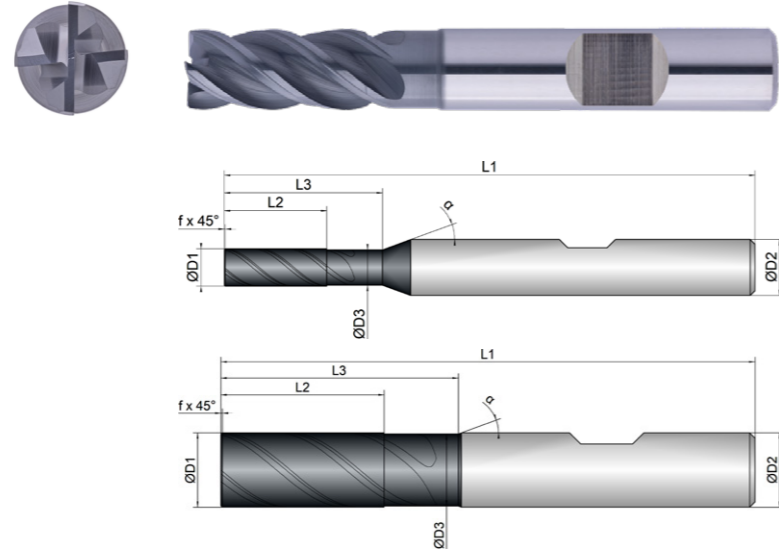
Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
2	5	0.5°	0.012	2	2	0.015	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275	
3	8	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398	
4	11	0.5°	0.015	4	4	0.02	1.2	L2max	0.013	0.2	L2max	0.06	1.1	L2max	0.0536	
5	13	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614	
6	13	0.8°	0.035	6	6	0.04	1.8	L2max	0.022	0.2	L2max	0.09	1.6	L2max	0.0796	
8	19	1°	0.045	8	8	0.055	2.4	L2max	0.028	0.2	L2max	0.11	1.9	L2max	0.0936	
10	22	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094	
12	26	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236	
16	32	2.5°	0.065	16	16	0.085	4.8	L2max	0.038	0.2	L2max	0.17	3.3	L2max	0.1376	
20	41	3°	0.08	20	20	0.1	6	L2max	0.04	0.2	L2max	0.2	3.6	L2max	0.1537	

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HB	≠	2xD	

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0214	D1	D3	L2	L3	L1	D2	z	α	α
	mm	mm	mm	mm	mm	mm	#	mm	°
2	2.0	1.8	5.0	10.0	57.0	6.0	4	0.10	40
3	3.0	2.8	8.0	13.0	57.0	6.0	4	0.10	40
4	4.0	3.8	11.0	17.0	57.0	6.0	4	0.10	40
5	5.0	4.8	13.0	20.0	57.0	6.0	4	0.20	40
6	6.0	5.8	13.0	20.0	57.0	6.0	4	0.20	40
8	8.0	7.7	19.0	25.0	63.0	8.0	4	0.20	40
10	10.0	9.7	22.0	32.0	72.0	10.0	4	0.20	40
12	12.0	11.6	26.0	38.0	83.0	12.0	4	0.20	40
16	16.0	15.5	32.0	44.0	92.0	16.0	4	0.30	40
20	20.0	19.5	41.0	54.0	104.0	20.0	4	0.30	40



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

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Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC				
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	fz	ae	ap	hmax	
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)	(mm)
2	5	0.5°	0.012	2	2	0.015	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275	
3	8	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398	
4	11	0.5°	0.015	4	4	0.02	1.2	L2max	0.013	0.2	L2max	0.06	1.1	L2max	0.0536	
5	13	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.07	1.3	L2max	0.0614	
6	13	0.8°	0.035	6	6	0.04	1.8	L2max	0.022	0.2	L2max	0.09	1.6	L2max	0.0796	
8	19	1°	0.045	8	8	0.055	2.4	L2max	0.028	0.2	L2max	0.11	1.9	L2max	0.0936	
10	22	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max	0.13	2.3	L2max	0.1094	
12	26	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max	0.15	2.6	L2max	0.1236	
16	32	2.5°	0.065	16	16	0.085	4.8	L2max	0.038	0.2	L2max	0.17	3.3	L2max	0.1376	
20	41	3°	0.08	20	20	0.1	6	L2max	0.04	0.2	L2max	0.2	3.6	L2max	0.1537	

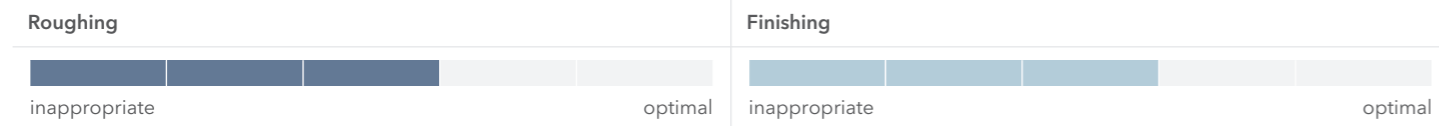
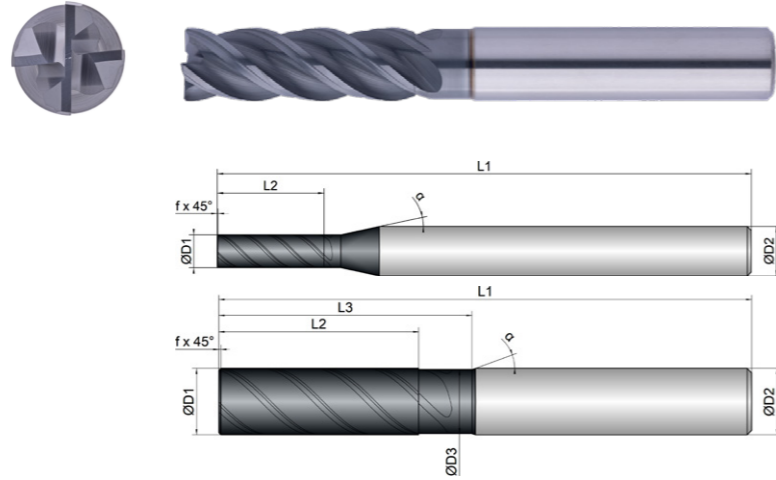
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				
Features	HA	≠	3xD	



Download Catalog Pages (PDF)

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



BCU1-M01-0223	D1 mm Ø	D3 mm Ø	L2 mm	L3 mm	L1 mm	D2 mm Ø	z #	45° mm	°	α °
4	4.0	0.0	13.0	0.0	65.0	6.0	4	0.10	40	12
5	5.0	0.0	16.0	0.0	65.0	6.0	4	0.20	40	12
6	6.0	5.6	18.0	24.0	65.0	6.0	4	0.20	40	20
8	8.0	7.6	24.0	30.0	70.0	8.0	4	0.20	40	20
10	10.0	9.6	30.0	38.0	80.0	10.0	4	0.20	40	20
12	12.0	11.4	36.0	46.0	93.0	12.0	4	0.20	40	20
16	16.0	15.4	48.0	58.0	110.0	16.0	4	0.30	40	20
20	20.0	19.4	60.0	74.0	126.0	20.0	4	0.30	40	20

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	Finishing Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL							
1.1-1.3 unalloyed	<850	190	190	210	305	1	1
2.1-2.2 low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2 high alloyed	<1100	160	160	180	188	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	200	200	220	232	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1 austenitic	<650		75	80	122	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	380	380	400	500	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	200	242	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		45	50	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		20	25	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			Finishing			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.012	4	4	0.018	1.2	L2max	0.015	0.2	L2max	0.04	0.48	L2max	0.026
5	16	0.5°	0.022	5	5	0.028	1.5	L2max	0.02	0.2	L2max	0.05	0.6	L2max	0.0325
6	18	0.8°	0.032	6	6	0.038	1.8	L2max	0.025	0.2	L2max	0.07	0.72	L2max	0.0455
8	24	1°	0.042	8	8	0.052	2.4	L2max	0.03	0.2	L2max	0.09	0.96	L2max	0.0585
10	30	1.5°	0.048	10	10	0.06	3	L2max	0.035	0.2	L2max	0.11	1.2	L2max	0.0715
12	36	2°	0.052	12	12	0.07	3.6	L2max	0.04	0.2	L2max	0.12	1.44	L2max	0.078
16	48	2.5°	0.06	16	16	0.08	4.8	L2max	0.045	0.2	L2max	0.14	1.92	L2max	0.091
20	60	3°	0.075	20	20	0.09	6	L2max	0.05	0.2	L2max	0.16	2.4	L2max	0.104

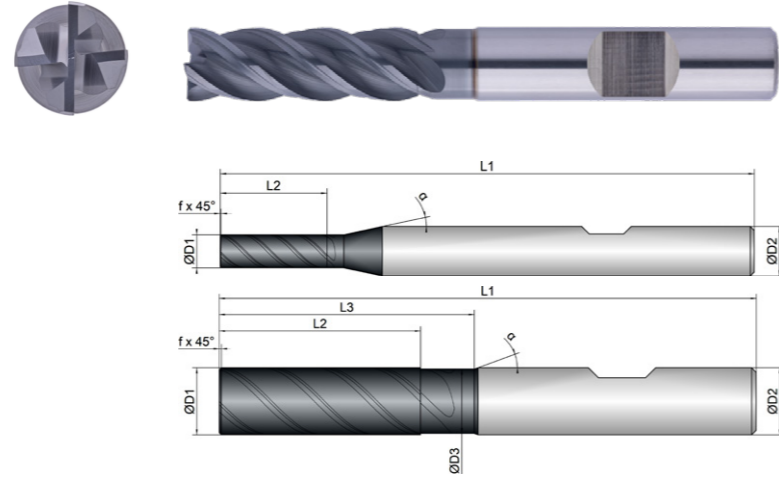
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application			Basic	
Features	HB	≠	3xD	



Download Catalog Pages (PDF)

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0224	D1 mm Ø	D3 mm Ø	L2 mm	L3 mm	L1 mm	D2 mm Ø	z #	45° mm	°	α °
4	4.0	0.0	13.0	0.0	65.0	6.0	4	0.10	40	12
5	5.0	0.0	16.0	0.0	65.0	6.0	4	0.20	40	12
6	6.0	5.6	18.0	24.0	65.0	6.0	4	0.20	40	20
8	8.0	7.6	24.0	30.0	70.0	8.0	4	0.20	40	20
10	10.0	9.6	30.0	38.0	80.0	10.0	4	0.20	40	20
12	12.0	11.4	36.0	46.0	93.0	12.0	4	0.20	40	20
16	16.0	15.4	48.0	58.0	110.0	16.0	4	0.30	40	20
20	20.0	19.4	60.0	74.0	126.0	20.0	4	0.30	40	20

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	Finishing Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL							
1.1-1.3 unalloyed	<850	190	190	210	305	1	1
2.1-2.2 low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2 high alloyed	<1100	160	160	180	188	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	200	200	220	232	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1 austenitic	<650		75	80	122	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	380	380	400	500	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	200	242	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		45	50	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		20	25	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			Finishing			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.012	4	4	0.018	1.2	L2max	0.015	0.2	L2max	0.04	0.48	L2max	0.026
5	16	0.5°	0.022	5	5	0.028	1.5	L2max	0.02	0.2	L2max	0.05	0.6	L2max	0.0325
6	18	0.8°	0.032	6	6	0.038	1.8	L2max	0.025	0.2	L2max	0.07	0.72	L2max	0.0455
8	24	1°	0.042	8	8	0.052	2.4	L2max	0.03	0.2	L2max	0.09	0.96	L2max	0.0585
10	30	1.5°	0.048	10	10	0.06	3	L2max	0.035	0.2	L2max	0.11	1.2	L2max	0.0715
12	36	2°	0.052	12	12	0.07	3.6	L2max	0.04	0.2	L2max	0.12	1.44	L2max	0.078
16	48	2.5°	0.06	16	16	0.08	4.8	L2max	0.045	0.2	L2max	0.14	1.92	L2max	0.091
20	60	3°	0.075	20	20	0.09	6	L2max	0.05	0.2	L2max	0.16	2.4	L2max	0.104

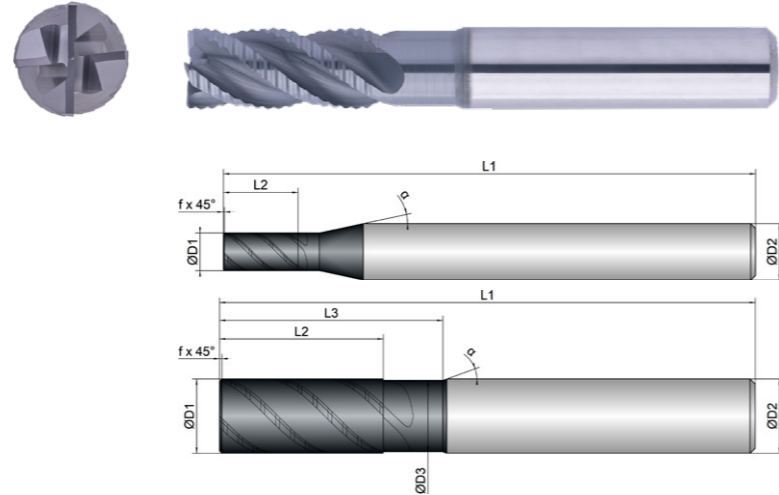
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				Basic
Features	HA	≠	2xD	



Download Catalog Pages (PDF)

- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips
- For roughing under HPC conditions



Roughing					Finishing				
inappropriate				optimal	inappropriate				optimal

BCU1-M02-0103	D1	D3	L2	L3	L1	D2	z	45°	α
	mm	mm	mm	mm	mm	mm	#	mm	°
4	4.0	0.0	8.0	0.0	57.0	6.0	4	0.10	45
5	5.0	0.0	9.0	0.0	57.0	6.0	4	0.20	45
6	6.0	5.6	13.0	19.0	57.0	6.0	4	0.20	20
8	8.0	7.6	19.0	25.0	63.0	8.0	4	0.20	20
10	10.0	9.6	22.0	30.0	72.0	10.0	4	0.32	20
12	12.0	11.4	26.0	36.0	83.0	12.0	4	0.32	20
16	16.0	15.4	32.0	42.0	92.0	16.0	4	0.32	20
20	20.0	19.4	41.0	52.0	104.0	20.0	4	0.50	20

Material	Strength (N/mm ²)	Full Slot	Side Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL		Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 unalloyed	<850	185	185	295	1	1
2.1-2.2 low alloyed	<950	175	175	212	0.9	0.8
3.1-3.2 high alloyed	<1100	165	165	182	0.8	0.7
K CASTINGS		Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.2 grey cast iron	<1000	200	200	224	0.9	0.8
M STAINLESS STEEL		Vc = m/min	Vc = m/min	Vc = m/min		
1.1 ferritic/martensitic	<850	85	85	132	0.9	0.7
2.1 austenitic	<650	75	75	114	0.8	0.5
N NON-FERROUS		Vc = m/min	Vc = m/min	Vc = m/min		
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	480	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	242	1.5	1.6
T TITANIUM		Vc = m/min	Vc = m/min	Vc = m/min		
2.1-2.2 pure/alloyed	<1000		40	62	0.8	0.5
S SUPER ALLOYS		Vc = m/min	Vc = m/min	Vc = m/min		
1.1-1.3 HRSA	<1450					

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
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 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			ETC			
			fz	ae = 1xD	ap = 1xD	fz	ae = 0.3xD	ap	fz	ae	ap	hmax
Ø	mm	α°	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm/Z)	(mm)	(mm)	(mm)
4	8	0.5°	0.015	4	4	0.02	1.2	L2max	0.05	0.58	L2max	0.0352
5	9	0.5°	0.02	5	5	0.03	1.5	L2max	0.06	0.73	L2max	0.0424
6	13	0.8°	0.03	6	6	0.04	1.8	L2max	0.077	0.9	L2max	0.055
8	19	1°	0.04	8	8	0.055	2.4	L2max	0.094	1.2	L2max	0.0671
10	22	1.5°	0.06	10	10	0.08	3	L2max	0.11	1.45	L2max	0.0775
12	26	2°	0.065	12	12	0.09	3.6	L2max	0.128	1.8	L2max	0.0914
16	32	2.5°	0.07	16	16	0.095	4.8	L2max	0.144	2.3	L2max	0.101
20	41	3°	0.08	20	20	0.12	6	L2max	0.17	2.9	L2max	0.1197

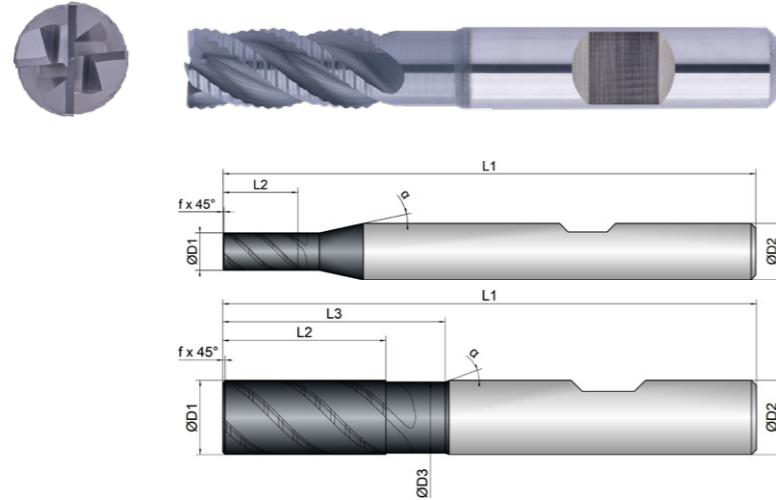
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				Basic
Features	HB	≠	2xD	



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- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips
- For roughing under HPC conditions



Roughing				Finishing			
inappropriate				optimal			

BCU1-M02-0104	D1 mm Ø	D3 mm Ø	L2 mm	L3 mm	L1 mm	D2 mm Ø	z #	45° mm	α °	α °
4	4.0	0.0	8.0	0.0	57.0	6.0	4	0.10	45	12
5	5.0	0.0	9.0	0.0	57.0	6.0	4	0.20	45	12
6	6.0	5.6	13.0	19.0	57.0	6.0	4	0.20	45	20
8	8.0	7.6	19.0	25.0	63.0	8.0	4	0.20	45	20
10	10.0	9.6	22.0	30.0	72.0	10.0	4	0.32	45	20
12	12.0	11.4	26.0	36.0	83.0	12.0	4	0.32	45	20
16	16.0	15.4	32.0	42.0	92.0	16.0	4	0.32	45	20
20	20.0	19.4	41.0	52.0	104.0	20.0	4	0.50	45	20

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL						
1.1-1.3 unalloyed	<850	185	185	295	1	1
2.1-2.2 low alloyed	<950	175	175	212	0.9	0.8
3.1-3.2 high alloyed	<1100	165	165	182	0.8	0.7
K CASTINGS						
1.1-1.2 grey cast iron	<1000	200	200	224	0.9	0.8
M STAINLESS STEEL						
1.1 ferritic/martensitic	<850	85	85	132	0.9	0.7
2.1 austenitic	<650	75	75	114	0.8	0.5
N NON-FERROUS						
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	480	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	242	1.5	1.6
T TITANIUM						
2.1-2.2 pure/alloyed	<1000		40	62	0.8	0.5
S SUPER ALLOYS						
1.1-1.3 HRSA	<1450					

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	8	0.5°	0.015	4	4	0.02	1.2	L2max	0.05	0.58	L2max	0.0352
5	9	0.5°	0.02	5	5	0.03	1.5	L2max	0.06	0.73	L2max	0.0424
6	13	0.8°	0.03	6	6	0.04	1.8	L2max	0.077	0.9	L2max	0.055
8	19	1°	0.04	8	8	0.055	2.4	L2max	0.094	1.2	L2max	0.0671
10	22	1.5°	0.06	10	10	0.08	3	L2max	0.11	1.45	L2max	0.0775
12	26	2°	0.065	12	12	0.09	3.6	L2max	0.128	1.8	L2max	0.0914
16	32	2.5°	0.07	16	16	0.095	4.8	L2max	0.144	2.3	L2max	0.101
20	41	3°	0.08	20	20	0.12	6	L2max	0.17	2.9	L2max	0.1197

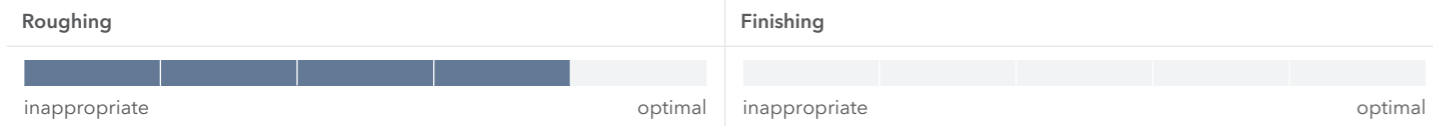
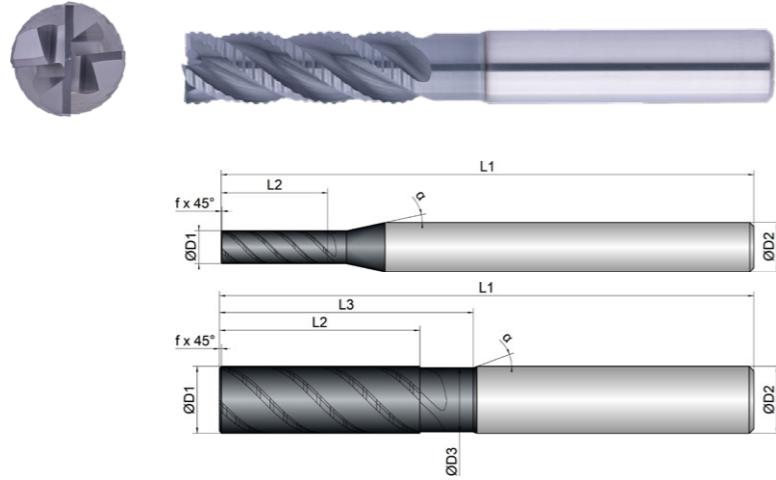
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				
Features	HA	≠	3xD	



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- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips
- For roughing under HPC conditions



BCU1-M02-0113	D1 mm Ø	D3 mm Ø	L2 mm	L3 mm	L1 mm	D2 mm Ø	z #	45° mm	°	α °
4	4.0	0.0	13.0	0.0	65.0	6.0	4	0.10	45	12
5	5.0	0.0	16.0	0.0	65.0	6.0	4	0.20	45	12
6	6.0	5.6	18.0	24.0	65.0	6.0	4	0.20	45	20
8	8.0	7.6	24.0	30.0	70.0	8.0	4	0.20	45	20
10	10.0	9.6	30.0	38.0	80.0	10.0	4	0.32	45	20
12	12.0	11.4	36.0	46.0	93.0	12.0	4	0.32	45	20
16	16.0	15.4	48.0	58.0	110.0	16.0	4	0.32	45	20
20	20.0	19.4	60.0	74.0	126.0	20.0	4	0.50	45	20

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL						
1.1-1.3 unalloyed	<850	175	175	285	1	1
2.1-2.2 low alloyed	<950	165	165	202	0.9	0.8
3.1-3.2 high alloyed	<1100	155	155	176	0.8	0.7
K CASTINGS						
1.1-1.2 grey cast iron	<1000	180	180	214	0.9	0.8
M STAINLESS STEEL						
1.1 ferritic/martensitic	<850	80	80	122	0.9	0.7
2.1 austenitic	<650	70	70	104	0.8	0.5
N NON-FERROUS						
1.1-2.3 ALUMINIUM alloyed/cast	<600	360	360	460	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	222	1.5	1.6
T TITANIUM						
2.1-2.2 pure/alloyed	<1000		35	52	0.8	0.5
S SUPER ALLOYS						
1.1-1.3 HRSA	<1450					

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.012	4	4	0.015	1.2	L2max	0.04	0.48	L2max	0.026
5	16	0.5°	0.015	5	5	0.022	1.5	L2max	0.05	0.63	L2max	0.0332
6	18	0.8°	0.022	6	6	0.032	1.8	L2max	0.067	0.8	L2max	0.0456
8	24	1°	0.032	8	8	0.048	2.4	L2max	0.084	1.1	L2max	0.0579
10	30	1.5°	0.05	10	10	0.07	3	L2max	0.1	1.25	L2max	0.0661
12	36	2°	0.055	12	12	0.08	3.6	L2max	0.118	1.6	L2max	0.0802
16	48	2.5°	0.06	16	16	0.085	4.8	L2max	0.134	2.1	L2max	0.0905
20	60	3°	0.07	20	20	0.1	6	L2max	0.16	2.6	L2max	0.1076

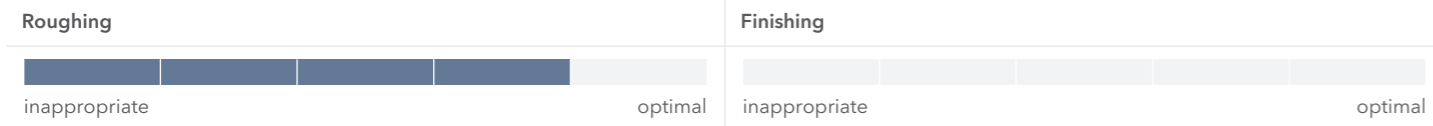
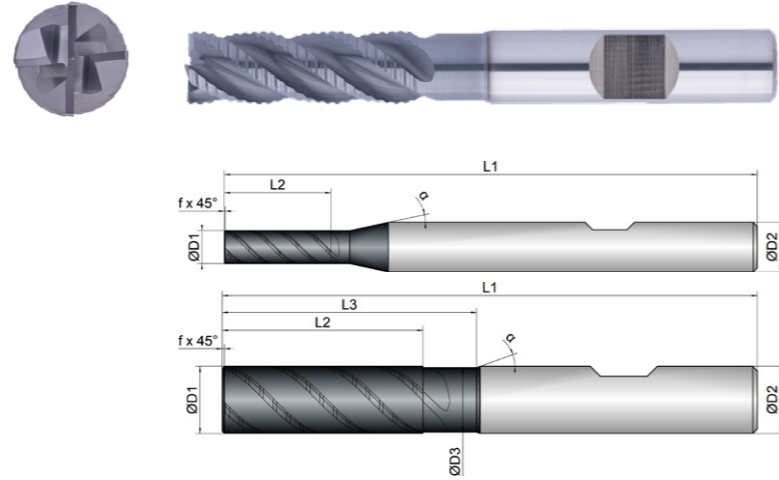
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HPC	UNI	
Application				
Features	HB	≠	3xD	



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- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips
- For roughing under HPC conditions



BCU1-M02-0114	D1 mm Ø	D3 mm Ø	L2 mm	L3 mm	L1 mm	D2 mm Ø	z #	45° mm	°	°
4	4.0	0.0	13.0	0.0	65.0	6.0	4	0.10	45	12
5	5.0	0.0	16.0	0.0	65.0	6.0	4	0.20	45	12
6	6.0	5.6	18.0	24.0	65.0	6.0	4	0.20	45	20
8	8.0	7.6	24.0	30.0	70.0	8.0	4	0.20	45	20
10	10.0	9.6	30.0	38.0	80.0	10.0	4	0.32	45	20
12	12.0	11.4	36.0	46.0	93.0	12.0	4	0.32	45	20
16	16.0	15.4	48.0	58.0	110.0	16.0	4	0.32	45	20
20	20.0	19.4	60.0	74.0	126.0	20.0	4	0.50	45	20

Material	Strength (N/mm ²)	Full Slot Vc = m/min	Side Milling Vc = m/min	ETC Vc = m/min	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P STEEL						
1.1-1.3 unalloyed	<850	175	175	285	1	1
2.1-2.2 low alloyed	<950	165	165	202	0.9	0.8
3.1-3.2 high alloyed	<1100	155	155	176	0.8	0.7
K CASTINGS						
1.1-1.2 grey cast iron	<1000	180	180	214	0.9	0.8
M STAINLESS STEEL						
1.1 ferritic/martensitic	<850	80	80	122	0.9	0.7
2.1 austenitic	<650	70	70	104	0.8	0.5
N NON-FERROUS						
1.1-2.3 ALUMINIUM alloyed/cast	<600	360	360	460	1.6	2
3.1-3.3 COPPER alloyed	<600	180	180	222	1.5	1.6
T TITANIUM						
2.1-2.2 pure/alloyed	<1000		35	52	0.8	0.5
S SUPER ALLOYS						
1.1-1.3 HRSA	<1450					

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical and ramping use fz 50 % of the full slot.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			ETC			
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.012	4	4	0.015	1.2	L2max	0.04	0.48	L2max	0.026
5	16	0.5°	0.015	5	5	0.022	1.5	L2max	0.05	0.63	L2max	0.0332
6	18	0.8°	0.022	6	6	0.032	1.8	L2max	0.067	0.8	L2max	0.0456
8	24	1°	0.032	8	8	0.048	2.4	L2max	0.084	1.1	L2max	0.0579
10	30	1.5°	0.05	10	10	0.07	3	L2max	0.1	1.25	L2max	0.0661
12	36	2°	0.055	12	12	0.08	3.6	L2max	0.118	1.6	L2max	0.0802
16	48	2.5°	0.06	16	16	0.085	4.8	L2max	0.134	2.1	L2max	0.0905
20	60	3°	0.07	20	20	0.1	6	L2max	0.16	2.6	L2max	0.1076

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	UNI	
Application			
Features	HA	≠	
		3,5xD	R

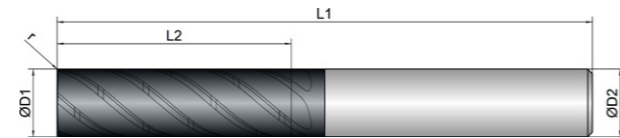


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- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



- For roughing and finishing due to the adapted positioning of the chip breakers



Roughing				Finishing			
inappropriate				optimal			

BCU1-M03-0123	D1 mm 	L2 mm 	L1 mm 	D2 mm 	z # 	r mm 	
6	6.0	22.0	65.0	6.0	5	0.15	40
8	8.0	28.0	70.0	8.0	5	0.20	40
10	10.0	35.0	80.0	10.0	5	0.20	40
12	12.0	43.0	93.0	12.0	5	0.20	40
16	16.0	56.0	110.0	16.0	5	0.30	40

Material	Strength (N/mm ²)	ETC Vc = m/min	Finishing Vc = m/min	Materialgroup Factor fz	Materialgroup Factor ae ETC
P STEEL					
1.1-1.3 unalloyed	<850	274	230	1	1
2.1-2.2 low alloyed	<950	226	170	0.9	0.8
3.1-3.2 high alloyed	<1100	198	140	0.8	0.7
K CASTINGS					
1.1-1.2 grey cast iron	<1000	234	190	0.9	0.8
M STAINLESS STEEL					
1.1 ferritic/martensitic	<850	158	90	0.9	0.7
2.1 austenitic	<650	134	80	0.8	0.5
N NON-FERROUS					
1.1-2.3 ALUMINIUM alloyed/cast	<600	460	460	1.6	2
3.1-3.3 COPPER alloyed	<600	198	222	1.5	1.6
T TITANIUM					
2.1-2.2 pure/alloyed	<1000	80	50	0.8	0.5
S SUPER ALLOYS					
1.1-1.3 HRSA	<1450				

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical, use fz 50 %.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material group T, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1 mm 	L2 mm 	Immersion Angle α° 	ETC high dynamic 				ETC low dynamic 				Finishing 	
			fz (mm/Z)	ae = 0.07xD (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae = 0.15xD (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae (mm)
6	22	0.8°	0.08	0.42	L2max	0.0408	0.066	0.9	L2max	0.0471	0.022	0.2
8	28	1°	0.095	0.56	L2max	0.0485	0.078	1.2	L2max	0.0557	0.028	0.2
10	35	1°	0.11	0.7	L2max	0.0561	0.090	1.5	L2max	0.0643	0.032	0.2
12	43	1.3°	0.125	0.84	L2max	0.0638	0.103	1.8	L2max	0.0736	0.034	0.2
16	56	1.3°	0.15	1.12	L2max	0.0765	0.123	2.4	L2max	0.0878	0.036	0.2

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	UNI	
Application			
Features	HB	≠	
		3,5xD	R

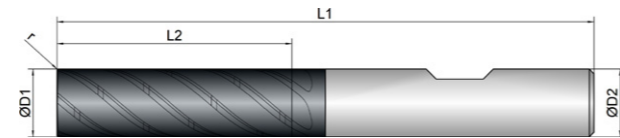


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- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation



- For roughing and finishing due to the adapted positioning of the chip breakers



Roughing				Finishing			
inappropriate				inappropriate			
optimal				optimal			

BCU1-M03-0124	D1 mm 	L2 mm 	L1 mm 	D2 mm 	z # 	r mm 	
6	6.0	22.0	65.0	6.0	5	0.15	40
8	8.0	28.0	70.0	8.0	5	0.20	40
10	10.0	35.0	80.0	10.0	5	0.20	40
12	12.0	43.0	93.0	12.0	5	0.20	40
16	16.0	56.0	110.0	16.0	5	0.30	40

Material	Strength (N/mm ²)	ETC Vc = m/min	Finishing Vc = m/min	Materialgroup Factor fz	Materialgroup Factor ae ETC
P STEEL					
1.1-1.3 unalloyed	<850	274	230	1	1
2.1-2.2 low alloyed	<950	226	170	0.9	0.8
3.1-3.2 high alloyed	<1100	198	140	0.8	0.7
K CASTINGS					
1.1-1.2 grey cast iron	<1000	234	190	0.9	0.8
M STAINLESS STEEL					
1.1 ferritic/martensitic	<850	158	90	0.9	0.7
2.1 austenitic	<650	134	80	0.8	0.5
N NON-FERROUS					
1.1-2.3 ALUMINIUM alloyed/cast	<600	460	460	1.6	2
3.1-3.3 COPPER alloyed	<600	198	222	1.5	1.6
T TITANIUM					
2.1-2.2 pure/alloyed	<1000	80	50	0.8	0.5
S SUPER ALLOYS					
1.1-1.3 HRSA	<1450				

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical, use fz 50 %.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material group T, the use of cooling lubricant is recommended!

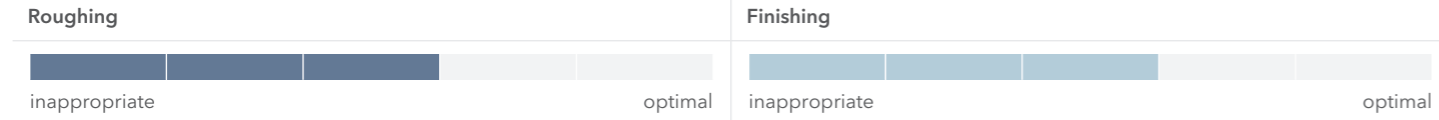
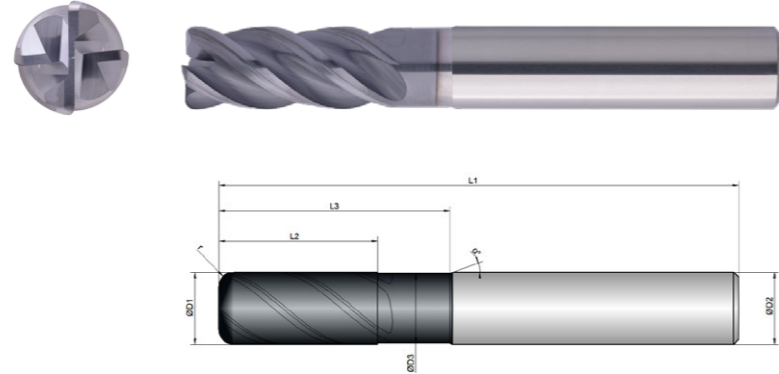
Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	ETC high dynamic				ETC low dynamic				Finishing	
			fz (mm/Z)	ae = 0.07xD (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae = 0.15xD (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae (mm)
6	22	0.8°	0.08	0.42	L2max	0.0408	0.066	0.9	L2max	0.0471	0.022	0.2
8	28	1°	0.095	0.56	L2max	0.0485	0.078	1.2	L2max	0.0557	0.028	0.2
10	35	1°	0.11	0.7	L2max	0.0561	0.090	1.5	L2max	0.0643	0.032	0.2
12	43	1.3°	0.125	0.84	L2max	0.0638	0.103	1.8	L2max	0.0736	0.034	0.2
16	56	1.3°	0.15	1.12	L2max	0.0765	0.123	2.4	L2max	0.0878	0.036	0.2

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HSC	HPC	UNI	
Application					
Features	HA	≠	2xD		

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation
- With big corner radius for 3D contours



BCU1-M06-0123	D1 mm ∅	D3 mm ∅	L2 mm	L3 mm	L1 mm	D2 mm ∅	z #	r mm		α °
6/0,5	6.0	5.8	13.0	20.0	57.0	6.0	4	0.50	40	20
6/1	6.0	5.8	13.0	20.0	57.0	6.0	4	1.00	40	20
6/1,5	6.0	5.8	13.0	20.0	57.0	6.0	4	1.50	40	20
8/0,5	8.0	7.7	19.0	25.0	63.0	8.0	4	0.50	40	20
8/1	8.0	7.7	19.0	25.0	63.0	8.0	4	1.00	40	20
8/2	8.0	7.7	19.0	25.0	63.0	8.0	4	2.00	40	20
8/3	8.0	7.7	19.0	25.0	63.0	8.0	4	3.00	40	20
10/0,5	10.0	9.7	22.0	32.0	72.0	10.0	4	0.50	40	20
10/1	10.0	9.7	22.0	32.0	72.0	10.0	4	1.00	40	20
10/2	10.0	9.7	22.0	32.0	72.0	10.0	4	2.00	40	20
10/3	10.0	9.7	22.0	32.0	72.0	10.0	4	3.00	40	20
12/0,5	12.0	11.6	26.0	38.0	83.0	12.0	4	0.50	40	20

BCU1-M06-0123	D1 mm ∅	D3 mm ∅	L2 mm	L3 mm	L1 mm	D2 mm ∅	z #	r mm		α °
12/1	12.0	11.6	26.0	38.0	83.0	12.0	4	1.00	40	20
12/2	12.0	11.6	26.0	38.0	83.0	12.0	4	2.00	40	20
12/3	12.0	11.6	26.0	38.0	83.0	12.0	4	3.00	40	20
16/0,5	16.0	15.5	32.0	44.0	92.0	16.0	4	0.50	40	20
16/1	16.0	15.5	32.0	44.0	92.0	16.0	4	1.00	40	20
16/2	16.0	15.5	32.0	44.0	92.0	16.0	4	2.00	40	20
16/3	16.0	15.5	32.0	44.0	92.0	16.0	4	3.00	40	20
20/1	20.0	19.5	41.0	54.0	104.0	20.0	4	1.00	40	20
20/2	20.0	19.5	41.0	54.0	104.0	20.0	4	2.00	40	20
20/3	20.0	19.5	41.0	54.0	104.0	20.0	4	3.00	40	20
20/4	20.0	19.5	41.0	54.0	104.0	20.0	4	4.00	40	20



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing / Multipass Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
P STEEL							
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical, use fz 50 %.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!
 For coarser roughing operations and ETC operations, we recommend a Weldon in conjunction with a Weldon chuck.

Material P 1.1-1.3

D1	L2	ETC				Multipass Milling		
		fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae = 0.04xD (mm)	ap = 0.04xD (mm)
6	13	0.09	1.6	L2max	0.0796	0.045	0.24	0.24
8	19	0.11	1.9	L2max	0.0936	0.06	0.32	0.32
10	22	0.13	2.3	L2max	0.1094	0.07	0.4	0.4
12	26	0.15	2.6	L2max	0.1236	0.085	0.48	0.48
16	32	0.17	3.3	L2max	0.1376	0.095	0.64	0.64
20	41	0.2	3.6	L2max	0.1537	0.11	0.8	0.8

Material P 1.1-1.3

D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing		
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)
6	13	0.8°	0.035	6	6	0.04	1.8	L2max	0.022	0.2	L2max
8	19	1°	0.045	8	8	0.055	2.4	L2max	0.028	0.2	L2max
10	22	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max
12	26	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max
16	32	2.5°	0.065	16	16	0.085	4.8	L2max	0.038	0.2	L2max
20	41	3°	0.085	20	20	0.1	6	L2max	0.04	0.2	L2max

STILL CAN'T FIND A SUITABLE MILLING CUTTER?

No problem - simply customize an existing tool. Using our configurator for special milling cutters, you can customize existing tools to your needs in an instant or create your own tools based on predefined types.



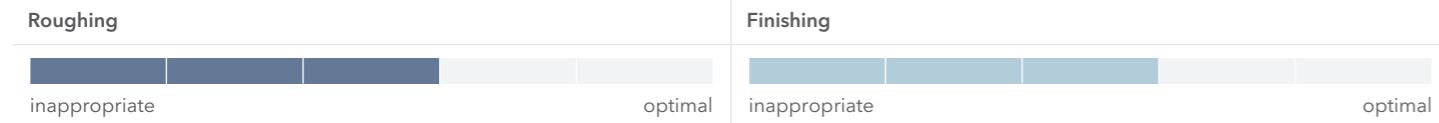
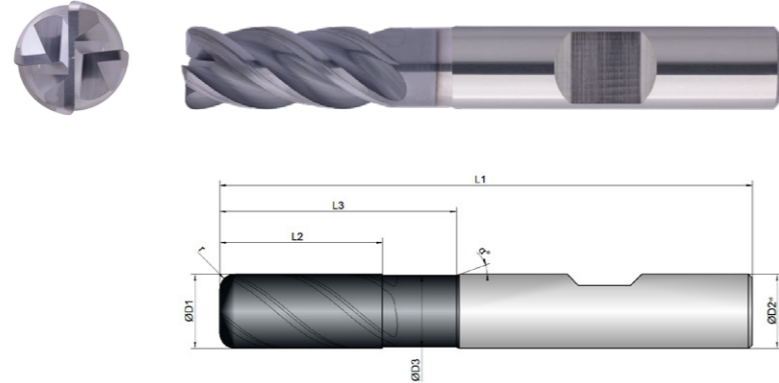
WE WILL RESPOND TO ALL REQUESTS SUBMITTED VIA THE CONFIGURATOR WITHIN ONE WORKING DAY AT THE LATEST



Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	HSC	HPC	UNI	
Application					
Features	HB	≠	2xD		R

- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip evacuation
- With big corner radius for 3D contours



BCU1-M06-0124	D1 mm ∅	D3 mm ∅	L2 mm	L3 mm	L1 mm	D2 mm ∅	z #	r mm	α °
6/0,5	6.0	5.8	13.0	20.0	57.0	6.0	4	0.50	40
6/1	6.0	5.8	13.0	20.0	57.0	6.0	4	1.00	40
6/1,5	6.0	5.8	13.0	20.0	57.0	6.0	4	1.50	40
8/0,5	8.0	7.7	19.0	25.0	63.0	8.0	4	0.50	40
8/1	8.0	7.7	19.0	25.0	63.0	8.0	4	1.00	40
8/2	8.0	7.7	19.0	25.0	63.0	8.0	4	2.00	40
8/3	8.0	7.7	19.0	25.0	63.0	8.0	4	3.00	40
10/0,5	10.0	9.7	22.0	32.0	72.0	10.0	4	0.50	40
10/1	10.0	9.7	22.0	32.0	72.0	10.0	4	1.00	40
10/2	10.0	9.7	22.0	32.0	72.0	10.0	4	2.00	40
10/3	10.0	9.7	22.0	32.0	72.0	10.0	4	3.00	40

BCU1-M06-0124	D1 mm ∅	D3 mm ∅	L2 mm	L3 mm	L1 mm	D2 mm ∅	z #	r mm	α °
12/0,5	12.0	11.6	26.0	38.0	83.0	12.0	4	0.50	40
12/1	12.0	11.6	26.0	38.0	83.0	12.0	4	1.00	40
12/2	12.0	11.6	26.0	38.0	83.0	12.0	4	2.00	40
12/3	12.0	11.6	26.0	38.0	83.0	12.0	4	3.00	40
16/0,5	16.0	15.5	32.0	44.0	92.0	16.0	4	0.50	40
16/1	16.0	15.5	32.0	44.0	92.0	16.0	4	1.00	40
16/2	16.0	15.5	32.0	44.0	92.0	16.0	4	2.00	40
16/3	16.0	15.5	32.0	44.0	92.0	16.0	4	3.00	40
20/1	20.0	19.5	41.0	54.0	104.0	20.0	4	1.00	40
20/2	20.0	19.5	41.0	54.0	104.0	20.0	4	2.00	40
20/3	20.0	19.5	41.0	54.0	104.0	20.0	4	3.00	40
20/4	20.0	19.5	41.0	54.0	104.0	20.0	4	4.00	40



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Material	Strength (N/mm ²)	Full Slot	Side Milling	Finishing / Multipass Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
		Vc = m/min	Vc = m/min	Vc = m/min	Vc = m/min		
P STEEL							
1.1-1.3 unalloyed	<850	200	200	220	315	1	1
2.1-2.2 low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2 high alloyed	<1100	170	170	190	198	0.8	0.7
K CASTINGS							
1.1-1.2 grey cast iron	<1000	210	210	230	242	0.9	0.8
M STAINLESS STEEL							
1.1 ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1 austenitic	<650		80	85	132	0.8	0.5
N NON-FERROUS							
1.1-2.3 ALUMINIUM alloyed/cast	<600	400	400	420	500	1.6	2
3.1-3.3 COPPER alloyed	<600	200	200	220	262	1.5	1.6
T TITANIUM							
2.1-2.2 pure/alloyed	<1000		50	53	75	0.8	0.5
S SUPER ALLOYS							
1.1-1.3 HRSA	<1450		25	28	42	0.7	0.3

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 When helical, use fz 50 %.
 The specified values represent starting values for a solid clamping situation.
 To determine the hmax values, please use the provided calculator.
 For material groups T and S, the use of cooling lubricant is recommended!

Material P 1.1-1.3

D1 Ø	L2 mm	ETC				Multipass Milling		
		fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)	fz (mm/Z)	ae = 0.04xD (mm)	ap = 0.04xD (mm)
6	13	0.09	1.6	L2max	0.0796	0.045	0.24	0.24
8	19	0.11	1.9	L2max	0.0936	0.06	0.32	0.32
10	22	0.13	2.3	L2max	0.1094	0.07	0.4	0.4
12	26	0.15	2.6	L2max	0.1236	0.085	0.48	0.48
16	32	0.17	3.3	L2max	0.1376	0.095	0.64	0.64
20	41	0.2	3.6	L2max	0.1537	0.11	0.8	0.8

Material P 1.1-1.3

D1 Ø	L2 mm	Immersion Angle α°	Full Slot			Side Milling			Finishing		
			fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)
6	13	0.8°	0.035	6	6	0.04	1.8	L2max	0.022	0.2	L2max
8	19	1°	0.045	8	8	0.055	2.4	L2max	0.028	0.2	L2max
10	22	1.5°	0.05	10	10	0.065	3	L2max	0.033	0.2	L2max
12	26	2°	0.055	12	12	0.075	3.6	L2max	0.035	0.2	L2max
16	32	2.5°	0.065	16	16	0.085	4.8	L2max	0.038	0.2	L2max
20	41	3°	0.085	20	20	0.1	6	L2max	0.04	0.2	L2max

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Cooling	
Tolerance	f8
Coating	BetaUni Iron

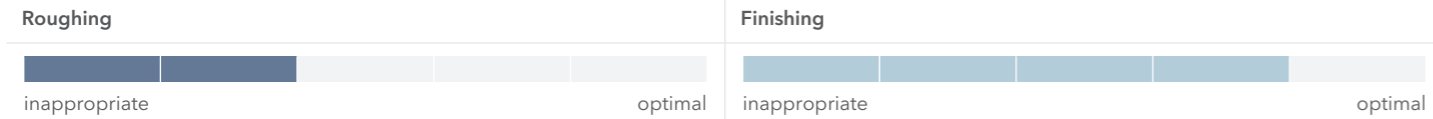
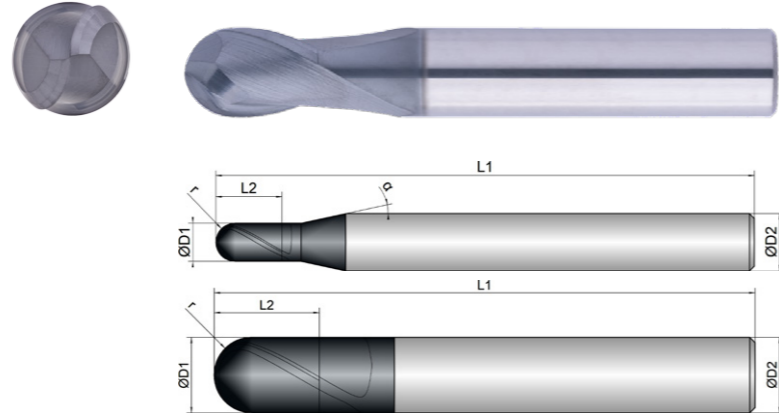
Strategy	HSC	UNI		
Application				
Features	HA		1xD	



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	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz

- Geometry of the face cutting edge designed for a soft and even cut
- Adapted chip chambers for roughing and finishing
- Suitable for wet and dry machining
- Short version



BCU1-M08-0053	D1	L2	L1	D2	z	r	α	
	mm ∅	mm	mm	mm ∅	#	mm	°	°
0,5	0.5	1.5	57.0	6.0	2	0.25	30	12
1	1.0	2.0	57.0	6.0	2	0.50	30	12
1,5	1.5	3.0	57.0	6.0	2	0.75	30	12
2	2.0	4.0	57.0	6.0	2	1.00	30	12
2,5	2.5	5.0	57.0	6.0	2	1.25	30	12
3	3.0	6.0	57.0	6.0	2	1.50	30	12
4	4.0	7.0	57.0	6.0	2	2.00	30	12
5	5.0	8.0	57.0	6.0	2	2.50	30	12
6	6.0	10.0	57.0	6.0	2	3.00	30	0
8	8.0	12.0	63.0	8.0	2	4.00	30	0
10	10.0	14.0	72.0	10.0	2	5.00	30	0
12	12.0	16.0	83.0	12.0	2	6.00	30	0

Material	Strength (N/mm ²)	Vc = m/min	Vc = m/min	Vc = m/min	Materialgroup Factor fz
P STEEL					
1.1-1.3 unalloyed	<850	260	280	290	1
2.1-2.2 low alloyed	<950	210	230	240	0.9
3.1-3.2 high alloyed	<1100	200	220	230	0.8
K CASTINGS					
1.1-1.2 grey cast iron	<1000	270	290	300	0.9
M STAINLESS STEEL					
1.1 ferritic/martensitic	<850	90	95	100	1
2.1 austenitic	<650	75	80	85	0.9
N NON-FERROUS					
1.1-2.3 ALUMINIUM alloyed/cast	<600	470	490	500	1.6
3.1-3.3 COPPER alloyed	<600	190	210	220	1.5
T TITANIUM					
2.1-2.2 pure/alloyed	<1000	40	45	50	0.8
S SUPER ALLOYS					
1.1-1.3 HRSA	<1450	30	35	40	0.7

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 The specified values represent starting values.
 Depending on the material, it may be necessary to change the Vc or Fz value.

Material P 1.1-1.3

D1 ∅	Roughing			Semi Finishing			Finishing		
	fz (mm/Z)	ae 0.3xD (mm)	ap 0.3xD (mm)	fz (mm/Z)	ae 0.1xD (mm)	ap 0.1xD (mm)	fz (mm/Z)	ae 0.05xD (mm)	ap 0.05xD (mm)
0.5	0.007	0.15	0.15	0.012	0.05	0.05	0.01	0.025	0.025
1	0.013	0.3	0.3	0.023	0.1	0.1	0.02	0.05	0.05
1.5	0.020	0.45	0.45	0.035	0.15	0.15	0.03	0.075	0.075
2	0.026	0.6	0.6	0.046	0.2	0.2	0.04	0.1	0.1
2.5	0.029	0.75	0.75	0.052	0.25	0.25	0.045	0.125	0.125
3	0.033	0.9	0.9	0.058	0.3	0.3	0.05	0.15	0.15
4	0.039	1.2	1.2	0.069	0.4	0.4	0.06	0.2	0.2
5	0.046	1.5	1.5	0.081	0.5	0.5	0.07	0.25	0.25
6	0.055	1.8	1.8	0.098	0.6	0.6	0.085	0.3	0.3
8	0.078	2.4	2.4	0.138	0.8	0.8	0.12	0.4	0.4
10	0.085	3	3	0.150	1	1	0.13	0.5	0.5
12	0.091	3.6	3.6	0.161	1.2	1.2	0.14	0.6	0.6

Cooling	
Tolerance	f8
Coating	BetaUni Iron

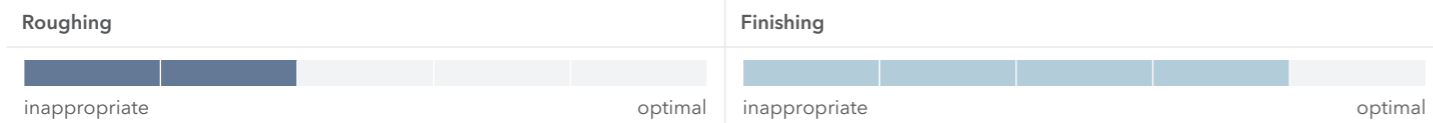
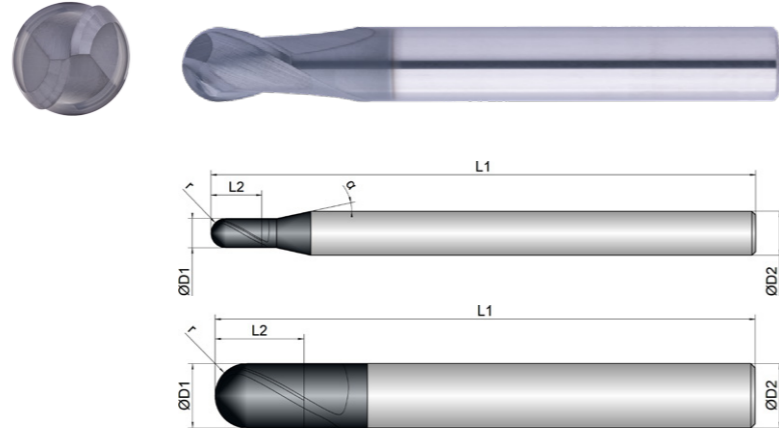
Strategy	HSC	UNI	
Application			
Features	HA		1xD



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	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz

- Geometry of the face cutting edge designed for a soft and even cut
- Adapted chip chambers for roughing and finishing
- Suitable for wet and dry machining
- Long version



BCU1-M08-0063	D1	L2	L1	D2	z	r		α
	mm \varnothing	mm	mm	mm \varnothing	#	mm		
0,5	0.5	1.5	75.0	6.0	2	0.25	30	12
1	1.0	2.0	75.0	6.0	2	0.50	30	12
1,5	1.5	3.0	75.0	6.0	2	0.75	30	12
2	2.0	4.0	75.0	6.0	2	1.00	30	12
2,5	2.5	5.0	75.0	6.0	2	1.25	30	12
3	3.0	6.0	75.0	6.0	2	1.50	30	12
4	4.0	7.0	75.0	6.0	2	2.00	30	12
5	5.0	8.0	75.0	6.0	2	2.50	30	12
6	6.0	10.0	75.0	6.0	2	3.00	30	0
8	8.0	12.0	75.0	8.0	2	4.00	30	0
10	10.0	14.0	85.0	10.0	2	5.00	30	0
12	12.0	16.0	100.0	12.0	2	6.00	30	0

Material	Strength (N/mm ²)	Vc = m/min	Vc = m/min	Vc = m/min	
P STEEL					
1.1-1.3 unalloyed	<850	240	260	270	1
2.1-2.2 low alloyed	<950	190	210	220	0.9
3.1-3.2 high alloyed	<1100	180	200	210	0.8
K CASTINGS					
1.1-1.2 grey cast iron	<1000	250	270	280	0.9
M STAINLESS STEEL					
1.1 ferritic/martensitic	<850	80	85	90	1
2.1 austenitic	<650	65	70	75	0.9
N NON-FERROUS					
1.1-2.3 ALUMINIUM alloyed/cast	<600	440	460	470	1.6
3.1-3.3 COPPER alloyed	<600	170	190	200	1.5
T TITANIUM					
2.1-2.2 pure/alloyed	<1000	40	42	45	0.8
S SUPER ALLOYS					
1.1-1.3 HRSA	<1450	30	33	35	0.7

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 The specified values represent starting values.
 Depending on the material, it may be necessary to change the Vc or Fz value.

Material P 1.1-1.3

D1	Roughing			Semi Finishing			Finishing		
	fz (mm/Z)	ae 0.3xD (mm)	ap 0.3xD (mm)	fz (mm/Z)	ae 0.1xD (mm)	ap 0.1xD (mm)	fz (mm/Z)	ae 0.05xD (mm)	ap 0.05xD (mm)
0.5	0.007	0.15	0.15	0.012	0.05	0.05	0.01	0.025	0.025
1	0.013	0.3	0.3	0.023	0.1	0.1	0.02	0.05	0.05
1.5	0.020	0.45	0.45	0.035	0.15	0.15	0.03	0.075	0.075
2	0.026	0.6	0.6	0.046	0.2	0.2	0.04	0.1	0.1
2.5	0.029	0.75	0.75	0.052	0.25	0.25	0.045	0.125	0.125
3	0.033	0.9	0.9	0.058	0.3	0.3	0.05	0.15	0.15
4	0.039	1.2	1.2	0.069	0.4	0.4	0.06	0.2	0.2
5	0.046	1.5	1.5	0.081	0.5	0.5	0.07	0.25	0.25
6	0.055	1.8	1.8	0.098	0.6	0.6	0.085	0.3	0.3
8	0.078	2.4	2.4	0.138	0.8	0.8	0.12	0.4	0.4
10	0.085	3	3	0.150	1	1	0.13	0.5	0.5
12	0.091	3.6	3.6	0.161	1.2	1.2	0.14	0.6	0.6

Cooling	
Tolerance	f8
Coating	BetaUni Iron

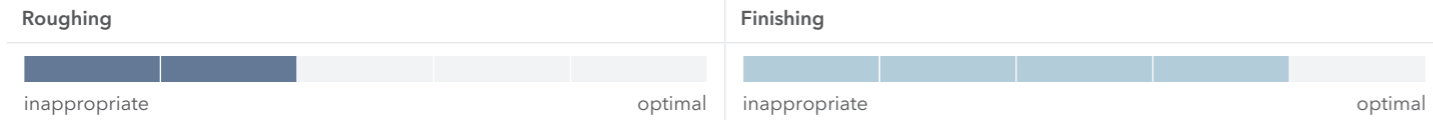
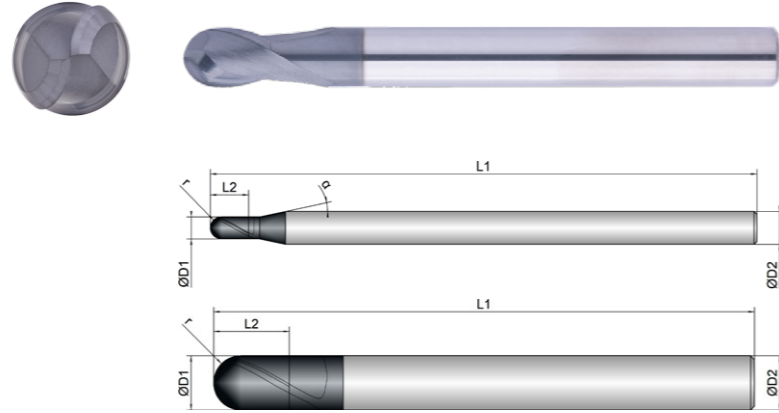
Strategy	HSC	UNI	
Application			
Features	HA		1xD



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	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz

- Geometry of the face cutting edge designed for a soft and even cut
- Adapted chip chambers for roughing and finishing
- Suitable for wet and dry machining
- Overlong version



BCU1-M08-0073	D1	L2	L1	D2	z	r	α	
	mm	mm	mm	mm	#	mm		
1	1.0	2.0	100.0	6.0	2	0.50	30	12
1,5	1.5	3.0	100.0	6.0	2	0.75	30	12
2	2.0	4.0	100.0	6.0	2	1.00	30	12
2,5	2.5	5.0	100.0	6.0	2	1.25	30	12
3	3.0	6.0	100.0	6.0	2	1.50	30	12
4	4.0	7.0	100.0	6.0	2	2.00	30	12
5	5.0	8.0	100.0	6.0	2	2.50	30	12
6	6.0	10.0	100.0	6.0	2	3.00	30	0
8	8.0	12.0	100.0	8.0	2	4.00	30	0
10	10.0	14.0	100.0	10.0	2	5.00	30	0
12	12.0	16.0	120.0	12.0	2	6.00	30	0

Material	Strength (N/mm ²)	Vc = m/min	Vc = m/min	Vc = m/min	Materialgroup Factor fz
P STEEL					
1.1-1.3 unalloyed	<850	210	230	240	1
2.1-2.2 low alloyed	<950	170	190	200	0.9
3.1-3.2 high alloyed	<1100	165	185	195	0.8
K CASTINGS					
1.1-1.2 grey cast iron	<1000	230	250	260	0.9
M STAINLESS STEEL					
1.1 ferritic/martensitic	<850	75	80	85	1
2.1 austenitic	<650	60	65	70	0.9
N NON-FERROUS					
1.1-2.3 ALUMINIUM alloyed/cast	<600	410	430	440	1.6
3.1-3.3 COPPER alloyed	<600	150	170	180	1.5
T TITANIUM					
2.1-2.2 pure/alloyed	<1000	30	35	40	0.8
S SUPER ALLOYS					
1.1-1.3 HRSA	<1450	25	28	30	0.7

ADVICE | The values marked in turquoise are side applications!
 All fz/a values in the table for material group 1.1, consider factors for the other groups!
 The specified values represent starting values.
 Depending on the material, it may be necessary to change the Vc or Fz value.

Material P 1.1-1.3

D1	Roughing			Semi Finishing			Finishing		
Ø	fz (mm/Z)	ae 0.3xD (mm)	ap 0.3xD (mm)	fz (mm/Z)	ae 0.1xD (mm)	ap 0.1xD (mm)	fz (mm/Z)	ae 0.05xD (mm)	ap 0.05xD (mm)
1	0.013	0.3	0.3	0.023	0.1	0.1	0.02	0.05	0.05
1.5	0.020	0.45	0.45	0.035	0.15	0.15	0.03	0.075	0.075
2	0.026	0.6	0.6	0.046	0.2	0.2	0.04	0.1	0.1
2.5	0.029	0.75	0.75	0.052	0.25	0.25	0.045	0.125	0.125
3	0.033	0.9	0.9	0.058	0.3	0.3	0.05	0.15	0.15
4	0.039	1.2	1.2	0.069	0.4	0.4	0.06	0.2	0.2
5	0.046	1.5	1.5	0.081	0.5	0.5	0.07	0.25	0.25
6	0.055	1.8	1.8	0.098	0.6	0.6	0.085	0.3	0.3
8	0.078	2.4	2.4	0.138	0.8	0.8	0.12	0.4	0.4
10	0.085	3	3	0.150	1	1	0.13	0.5	0.5
12	0.091	3.6	3.6	0.161	1.2	1.2	0.14	0.6	0.6

Cooling

Tolerance a9

Coating BetaUni Iron

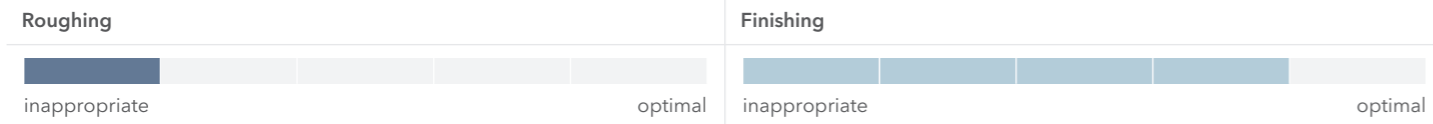
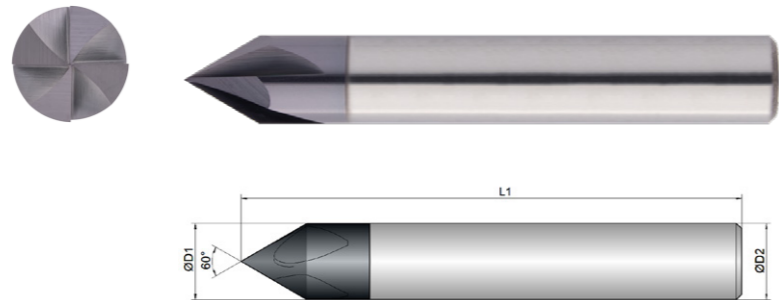
Strategy **UNI**

Application

Features **HA**

Basic

■ For universal chamfering of work pieces



BCU1-M09-0103	D1 mm ø	L1 mm	D2 mm ø	z #	α °
1	1.0	50.0	3.0	3	8
2	2.0	50.0	3.0	3	8
3	3.0	50.0	3.0	3	
4	4.0	50.0	4.0	4	
6	6.0	50.0	6.0	4	
8	8.0	58.0	8.0	4	
10	10.0	66.0	10.0	4	
12	12.0	73.0	12.0	4	
16	16.0	82.0	16.0	4	



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Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16		
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max		
Application											
Material	Strength (N/mm²)										
P STEEL	Vc (m/min)										
1.1-1.3 unalloyed	<850	110	0.012	0.014	0.018	0.024	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.008	0.01	0.012	0.016	0.025	0.035	0.045	0.055	0.07
K CASTINGS	Vc (m/min)										
1.1-1.2 grey cast iron	<1000	95	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL	Vc (m/min)										
1.1 ferritic/martensitic	<850	75	0.008	0.01	0.011	0.015	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.006	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS	Vc (m/min)										
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.015	0.022	0.025	0.03	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
T TITANIUM	Vc (m/min)										
2.1-2.2 pure/alloyed	<1000	40	0.008	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS	Vc (m/min)										
1.1-1.3 HRSA	<1450	30	0.006	0.007	0.008	0.012	0.018	0.026	0.035	0.042	0.055

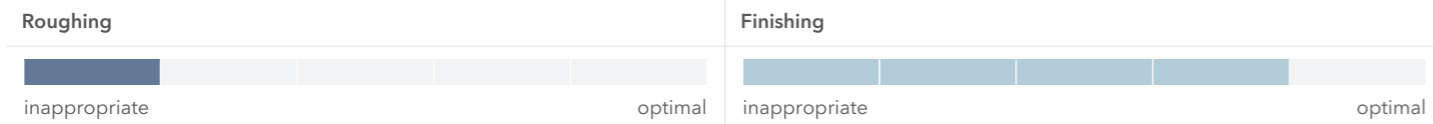
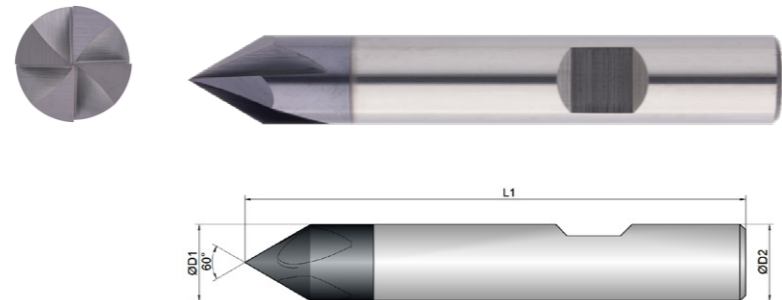
ADVICE | The values marked in turquoise are side applications!

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HB



■ For universal chamfering of work pieces



BCU1-M09-0104	D1 mm ø	L1 mm	D2 mm ø	Z #
6	6.0	50.0	6.0	4
8	8.0	58.0	8.0	4
10	10.0	66.0	10.0	4
12	12.0	73.0	12.0	4
16	16.0	82.0	16.0	4



Download Catalog Pages (PDF)

Dimension	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application					

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3 unalloyed	<850	110	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)					
1.1-1.2 grey cast iron	<1000	95	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)					
1.1 ferritic/martensitic	<850	75	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	40	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3 HRSA	<1450	30	0.018	0.026	0.035	0.042	0.055

ADVICE | The values marked in turquoise are side applications!

STILL CAN'T FIND A SUITABLE MILLING CUTTER?

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WE WILL RESPOND TO ALL REQUESTS SUBMITTED VIA THE CONFIGURATOR WITHIN ONE WORKING DAY AT THE LATEST



Cooling

Tolerance a9

Coating BetaUni Iron

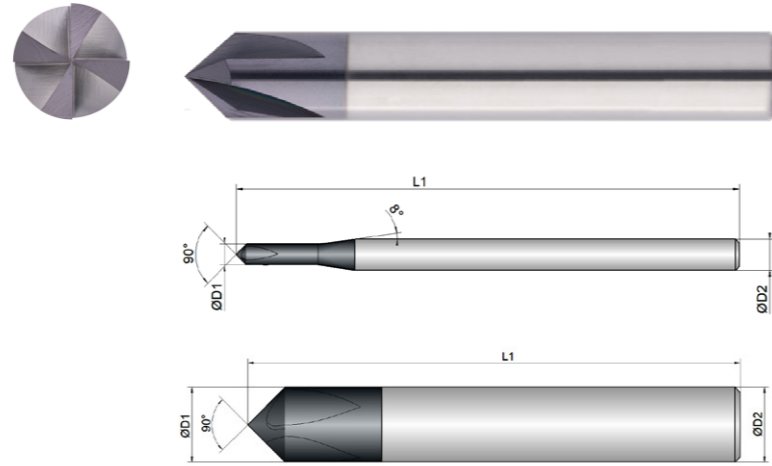
Strategy **UNI**

Application

Features **HA**

Basic

■ For universal chamfering of work pieces



Roughing inappropriate optimal

Finishing inappropriate optimal

	D1 mm Ø	L1 mm	D2 mm Ø	z #	α °
BCU1-M09-0153					
1	1.0	50.0	3.0	3	8
2	2.0	50.0	3.0	3	8
3	3.0	50.0	3.0	3	
4	4.0	50.0	4.0	4	
6	6.0	50.0	6.0	4	
8	8.0	58.0	8.0	4	
10	10.0	66.0	10.0	4	
12	12.0	73.0	12.0	4	
16	16.0	82.0	16.0	4	



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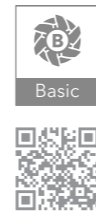
Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application									

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)									
1.1-1.3 unalloyed	<850	110	0.012	0.014	0.018	0.024	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.008	0.01	0.012	0.016	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)									
1.1-1.2 grey cast iron	<1000	95	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)									
1.1 ferritic/martensitic	<850	75	0.008	0.01	0.011	0.015	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.006	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)									
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.015	0.022	0.025	0.03	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)									
2.1-2.2 pure/alloyed	<1000	40	0.008	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)									
1.1-1.3 HRSA	<1450	30	0.006	0.007	0.008	0.012	0.018	0.026	0.035	0.042	0.055

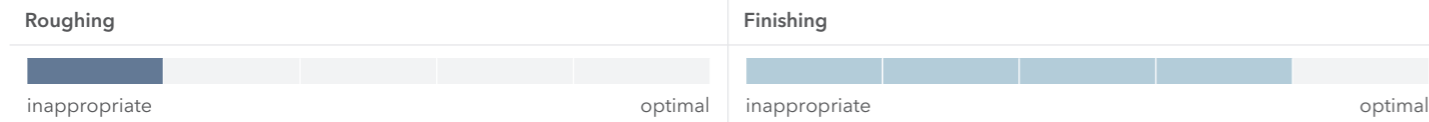
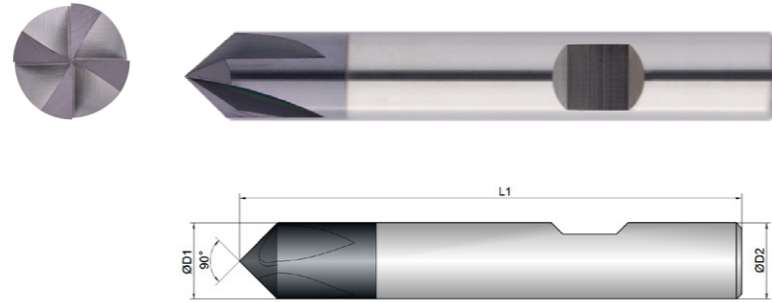
ADVICE | The values marked in turquoise are side applications!

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HB



■ For universal chamfering of work pieces



BCU1-M09-0154	D1 mm ∅	L1 mm	D2 mm ∅	z #
6	6.0	50.0	6.0	4
8	8.0	58.0	8.0	4
10	10.0	66.0	10.0	4
12	12.0	73.0	12.0	4
16	16.0	82.0	16.0	4



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Dimension	∅6	∅8	∅10	∅12	∅16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application					

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3 unalloyed	<850	110	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)					
1.1-1.2 grey cast iron	<1000	95	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)					
1.1 ferritic/martensitic	<850	75	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	40	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3 HRSA	<1450	30	0.018	0.026	0.035	0.042	0.055

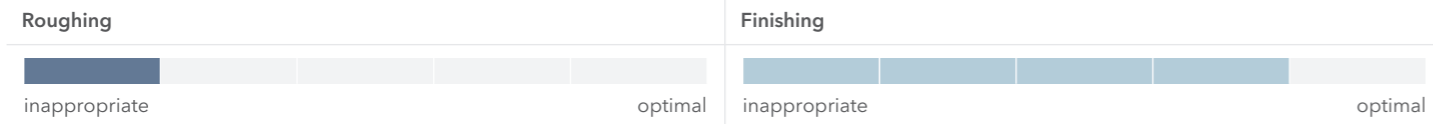
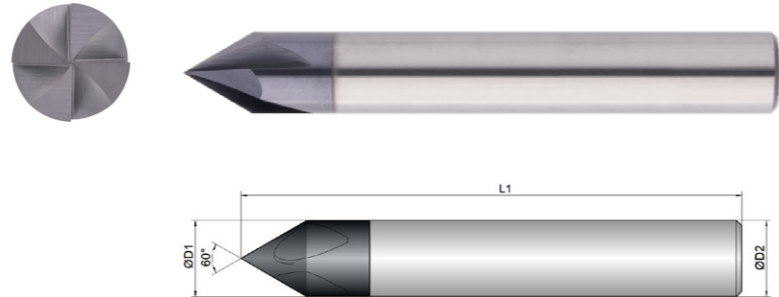
ADVICE | The values marked in turquoise are side applications!

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA



■ For universal chamfering of work pieces



BCU1-M09-0203	D1 mm Ø	L1 mm	D2 mm Ø	z #
4	4.0	54.0	4.0	4
6	6.0	57.0	6.0	4
8	8.0	63.0	8.0	4
10	10.0	72.0	10.0	4
12	12.0	83.0	12.0	4
16	16.0	92.0	16.0	4



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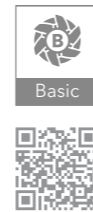
Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application									

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)									
1.1-1.3 unalloyed	<850	110	0.012	0.014	0.018	0.024	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.008	0.01	0.012	0.016	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)									
1.1-1.2 grey cast iron	<1000	95	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)									
1.1 ferritic/martensitic	<850	75	0.008	0.01	0.011	0.015	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.006	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)									
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.015	0.022	0.025	0.03	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)									
2.1-2.2 pure/alloyed	<1000	40	0.008	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)									
1.1-1.3 HRSA	<1450	30	0.006	0.007	0.008	0.012	0.018	0.026	0.035	0.042	0.055

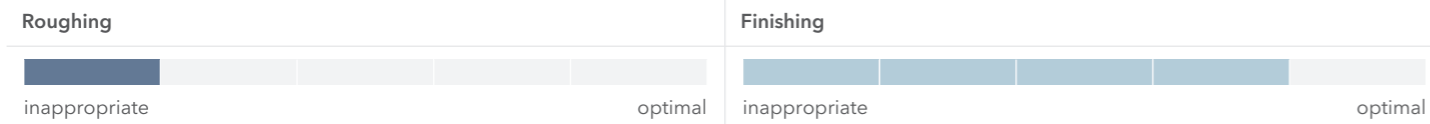
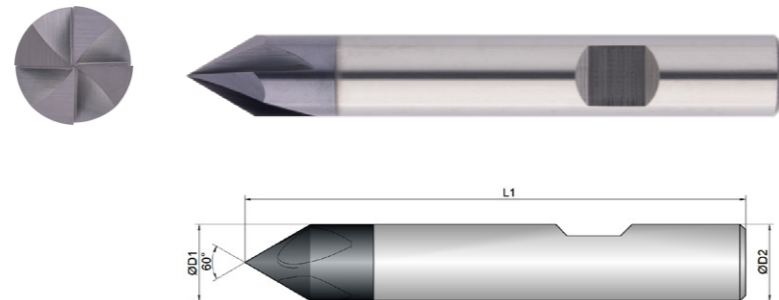
ADVICE | The values marked in turquoise are side applications!

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HB



■ For universal chamfering of work pieces



BCU1-M09-0204	D1 mm ø	L1 mm	D2 mm ø	z #
6	6.0	57.0	6.0	4
8	8.0	63.0	8.0	4
10	10.0	72.0	10.0	4
12	12.0	83.0	12.0	4
16	16.0	92.0	16.0	4



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Dimension	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application					

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3 unalloyed	<850	110	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)					
1.1-1.2 grey cast iron	<1000	95	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)					
1.1 ferritic/martensitic	<850	75	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	40	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3 HRSA	<1450	30	0.018	0.026	0.035	0.042	0.055

ADVICE | The values marked in turquoise are side applications!

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Cooling

Tolerance a9

Coating BetaUni Iron

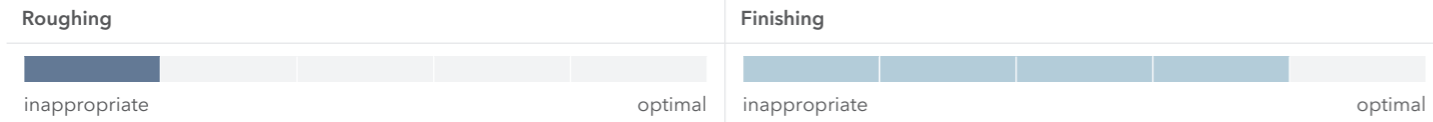
Strategy **UNI**

Application

Features **HA**

Basic

■ For universal chamfering of work pieces



BCU1-M09-0253	D1 mm ∅	L1 mm	D2 mm ∅	z #
4	4.0	54.0	4.0	4
6	6.0	57.0	6.0	4
8	8.0	63.0	8.0	4
10	10.0	72.0	10.0	4
12	12.0	83.0	12.0	4
16	16.0	92.0	16.0	4



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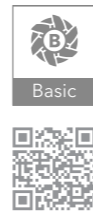
Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application									

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)									
1.1-1.3 unalloyed	<850	110	0.012	0.014	0.018	0.024	0.035	0.045	0.055	0.065	0.09
2.1-2.2 low-alloyed	<950	100	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
3.1-3.2 high-alloyed	<1100	70	0.008	0.01	0.012	0.016	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)									
1.1-1.2 grey cast iron	<1000	95	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)									
1.1 ferritic/martensitic	<850	75	0.008	0.01	0.011	0.015	0.023	0.032	0.042	0.05	0.065
2.1 austenitic	<650	55	0.006	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)									
1.1-2.3 ALUMINIUM alloyed/cast	<600	280	0.015	0.022	0.025	0.03	0.04	0.05	0.06	0.07	0.1
3.1-3.3 COPPER alloyed	<600	150	0.01	0.012	0.015	0.02	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)									
2.1-2.2 pure/alloyed	<1000	40	0.008	0.009	0.01	0.014	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)									
1.1-1.3 HRSA	<1450	30	0.006	0.007	0.008	0.012	0.018	0.026	0.035	0.042	0.055

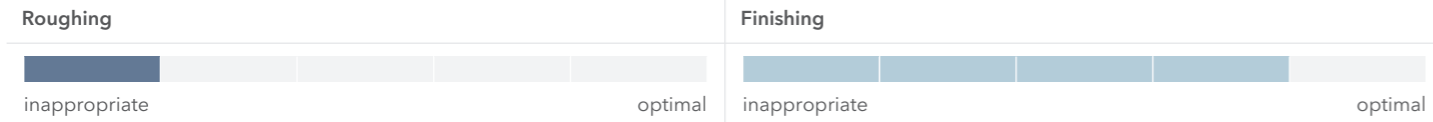
ADVICE | The values marked in turquoise are side applications!

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HB



■ For universal chamfering of work pieces



BCU1-M09-0254	D1 mm ∅	L1 mm	D2 mm ∅	z #
6	6.0	57.0	6.0	4
8	8.0	63.0	8.0	4
10	10.0	72.0	10.0	4
12	12.0	83.0	12.0	4
16	16.0	92.0	16.0	4



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Dimension	∅6	∅8	∅10	∅12	∅16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application					

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3	unalloyed <850	110	0.035	0.045	0.055	0.065	0.09
2.1-2.2	low-alloyed <950	100	0.03	0.04	0.05	0.06	0.08
3.1-3.2	high-alloyed <1100	70	0.025	0.035	0.045	0.055	0.07
K CASTINGS		Vc (m/min)					
1.1-1.2	grey cast iron <1000	95	0.03	0.04	0.05	0.06	0.08
M STAINLESS STEEL		Vc (m/min)					
1.1	ferritic/martensitic <850	75	0.023	0.032	0.042	0.05	0.065
2.1	austenitic <650	55	0.021	0.03	0.04	0.048	0.062
N NON-FERROUS		Vc (m/min)					
1.1-2.3	ALUMINIUM alloyed/cast <600	280	0.04	0.05	0.06	0.07	0.1
3.1-3.3	COPPER alloyed <600	150	0.03	0.04	0.05	0.06	0.08
T TITANIUM		Vc (m/min)					
2.1-2.2	pure/alloyed <1000	40	0.021	0.03	0.04	0.048	0.062
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3	HRSA <1450	30	0.018	0.026	0.035	0.042	0.055

ADVICE | The values marked in turquoise are side applications!

Cooling

Tolerance -

Coating BetaUni Iron

Strategy **UNI**

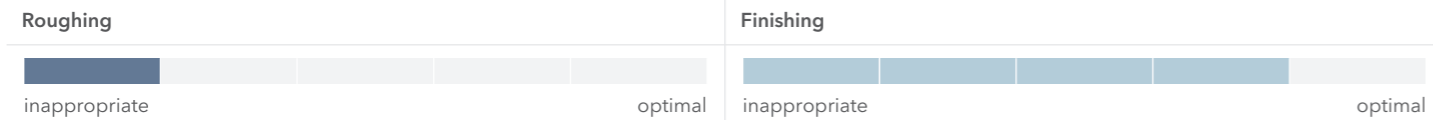
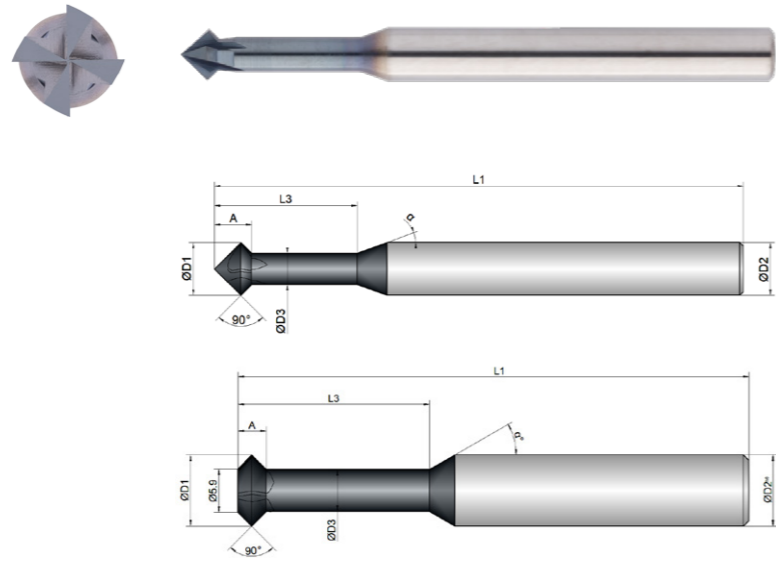
Application

Features **HA**

Basic

For universal chamfering of work pieces

Forwards and backwards cutting



BCU1-M10-0023	D1 mm 	D3 mm 	A mm 	L3 mm 	L1 mm 	D2 mm 	z # 	α °
2	2.0	1.0	1.5	9.5	50.0	4.0	4	20
3	3.0	2.2	2.0	12.0	50.0	4.0	4	20
4	4.0	2.9	2.5	12.5	50.0	4.0	4	20
5	5.0	3.9	3.0	18.0	65.0	6.0	4	20
6	6.0	3.9	4.0	19.0	65.0	6.0	4	20
8	8.0	5.9	2.5	22.5	70.0	8.0	4	30
10	10.0	5.9	4.0	27.0	72.0	10.0	4	30
12	12.0	5.9	6.0	29.0	73.0	12.0	4	30



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Dimension	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12
Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD
Application								

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)								
1.1-1.3	unalloyed	<850	75	0.012	0.015	0.018	0.02	0.025	0.03	0.035
2.1-2.2	low-alloyed	<950	55	0.01	0.012	0.016	0.018	0.023	0.028	0.033
3.1-3.2	high-alloyed	<1100	40	0.008	0.01	0.014	0.015	0.02	0.025	0.03
K CASTINGS		Vc (m/min)								
1.1-1.2	grey cast iron	<1000	45	0.01	0.012	0.016	0.018	0.023	0.028	0.033
M STAINLESS STEEL		Vc (m/min)								
1.1	ferritic/martensitic	<850	35	0.008	0.01	0.014	0.016	0.02	0.024	0.028
2.1	austenitic	<650	30	0.006	0.008	0.012	0.014	0.018	0.022	0.026
N NON-FERROUS		Vc (m/min)								
1.1-2.3	ALUMINIUM alloyed/cast	<600	150	0.018	0.02	0.023	0.025	0.03	0.035	0.04
3.1-3.3	COPPER alloyed	<600	80	0.01	0.012	0.014	0.015	0.02	0.025	0.03
T TITANIUM		Vc (m/min)								
2.1-2.2	pure/alloyed	<1000	30	0.006	0.008	0.012	0.014	0.018	0.022	0.026
S SUPER ALLOYS		Vc (m/min)								
1.1-1.3	HRSA	<1450	20	0.005	0.007	0.01	0.012	0.016	0.02	0.024

ADVICE | The values marked in turquoise are side applications!

STILL CAN'T FIND A SUITABLE MILLING CUTTER?

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Cooling

Tolerance rs

Coating BetaUni Iron

Strategy **UNI**

Application

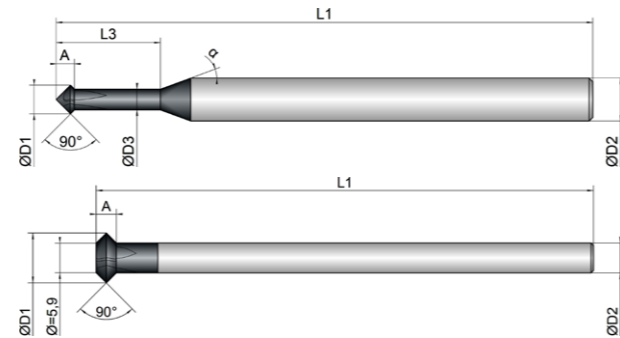
Features **HA**

Basic

■ For universal chamfering of work pieces

■ Variant made of blank form for deep cavities

■ Forwards and backwards cutting



Roughing **Finishing**

inappropriate optimal inappropriate optimal

BCU1-M10-0123	D1 mm ø	D3 mm ø	A mm	L3 mm	L1 mm	D2 mm ø	z #	α °
3	3.0	2.2	2.0	10.0	75.0	4.0	4	20
3,8	3.8	2.9	2.7	13.0	75.0	4.0	4	20
4	4.0	2.9	2.7	13.0	75.0	4.0	4	20
4,8	4.8	3.9	3.0	15.0	75.0	5.0	4	20
5	5.0	3.9	3.0	15.0	75.0	5.0	4	20
5,8	5.8	3.9	4.0	15.0	100.0	6.0	4	20
6	6.0	3.9	4.0	15.0	100.0	6.0	4	20
7,8	7.8		2.0		100.0	6.0	4	0
8	8.0		2.0		100.0	6.0	4	0
9,8	9.8		4.0		100.0	6.0	4	0
10	10.0		4.0		100.0	6.0	4	0
11,8	11.8		6.0		100.0	6.0	4	0
12	12.0		6.0		100.0	6.0	4	0



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Dimension	Ø3	Ø3.8	Ø4	Ø4.8	Ø5	Ø5.8	Ø6	Ø7.8	Ø8	Ø9.8
Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD
Application										

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)										
1.1-1.3 unalloyed	<850	75	0.015	0.018	0.018	0.02	0.02	0.025	0.025	0.03	0.03	0.035
2.1-2.2 low-alloyed	<950	55	0.012	0.016	0.016	0.018	0.018	0.023	0.023	0.028	0.028	0.033
3.1-3.2 high-alloyed	<1100	40	0.01	0.014	0.014	0.015	0.015	0.02	0.02	0.025	0.025	0.03
K CASTINGS		Vc (m/min)										
1.1-1.2 grey cast iron	<1000	45	0.012	0.016	0.016	0.018	0.018	0.023	0.023	0.028	0.028	0.033
M STAINLESS STEEL		Vc (m/min)										
1.1 ferritic/martensitic	<850	35	0.01	0.014	0.014	0.016	0.016	0.02	0.02	0.024	0.024	0.028
2.1 austenitic	<650	30	0.008	0.012	0.012	0.014	0.014	0.018	0.018	0.022	0.022	0.026
N NON-FERROUS		Vc (m/min)										
1.1-2.3 ALUMINIUM alloyed/cast	<600	150	0.02	0.023	0.023	0.025	0.025	0.03	0.03	0.035	0.035	0.04
3.1-3.3 COPPER alloyed	<600	80	0.012	0.014	0.014	0.015	0.015	0.02	0.02	0.025	0.025	0.03
T TITANIUM		Vc (m/min)										
2.1-2.2 pure/alloyed	<1000	30	0.008	0.012	0.012	0.014	0.014	0.018	0.018	0.022	0.022	0.026
S SUPER ALLOYS		Vc (m/min)										
1.1-1.3 HRSA	<1450	20	0.007	0.01	0.01	0.012	0.012	0.016	0.016	0.02	0.02	0.024

Dimension	Ø10	Ø11.8	Ø12
Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD
Application			

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz
P STEEL		Vc (m/min)			
1.1-1.3 unalloyed	<850	75	0.035	0.04	0.04
2.1-2.2 low-alloyed	<950	55	0.033	0.038	0.038
3.1-3.2 high-alloyed	<1100	40	0.03	0.035	0.035
K CASTINGS		Vc (m/min)			
1.1-1.2 grey cast iron	<1000	45	0.033	0.038	0.038
M STAINLESS STEEL		Vc (m/min)			
1.1 ferritic/martensitic	<850	35	0.028	0.034	0.034
2.1 austenitic	<650	30	0.026	0.032	0.032
N NON-FERROUS		Vc (m/min)			
1.1-2.3 ALUMINIUM alloyed/cast	<600	150	0.04	0.045	0.045
3.1-3.3 COPPER alloyed	<600	80	0.03	0.035	0.035
T TITANIUM		Vc (m/min)			
2.1-2.2 pure/alloyed	<1000	30	0.026	0.032	0.032
S SUPER ALLOYS		Vc (m/min)			
1.1-1.3 HRSA	<1450	20	0.024	0.03	0.03

ADVICE | The values marked in turquoise are side applications!

Cooling

Tolerance V1

Coating BetaUni Iron

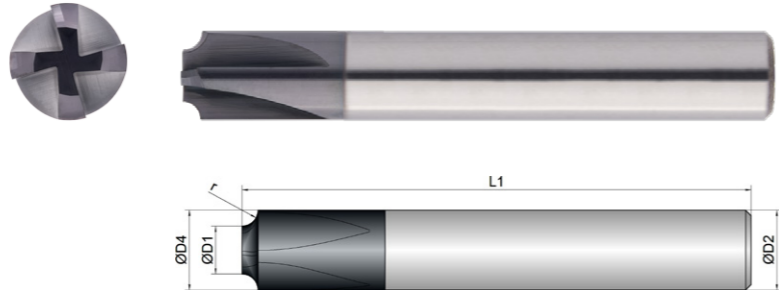
Strategy **UNI**

Application

Features **HA**

Basic

■ For the universal manufacturing of radii to components



Roughing **Finishing**

inappropriate optimal inappropriate optimal

BCU1-M11-0023	D1 mm ø	D4 mm ø	L1 mm	D2 mm ø	z #	r mm
3/0,5	3.0	4	50.0	4.0	4	0.50
3,2/0,4	3.2	4	50.0	4.0	4	0.40
3,4/0,3	3.4	4	50.0	4.0	4	0.30
3,6/0,2	3.6	4	50.0	4.0	4	0.20
4/1	4.0	6	50.0	6.0	4	1.00
4,4/0,8	4.4	6	50.0	6.0	4	0.80
4,8/0,6	4.8	6	50.0	6.0	4	0.60
5/10	5.0	25	100.0	25.0	4	10.00
6/2	6.0	10	66.0	10.0	4	2.00
6/3	6.0	12	73.0	12.0	4	3.00
7/1,5	7.0	10	66.0	10.0	4	1.50
7/2,5	7.0	12	73.0	12.0	4	2.50
7/4,5	7.0	16	82.0	16.0	4	4.50
8/4	8.0	16	82.0	16.0	4	4.00
8/6	8.0	20	80.0	20.0	4	6.00
9/3,5	9.0	16	82.0	16.0	4	3.50
9/8	9.0	25	100.0	25.0	4	8.00
10/5	10.0	20	80.0	20.0	4	5.00



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Material	Strength (N/mm ²)	Feed (mm/Z)	Dimension											
			Ø3.6 R0.2	Ø3.4 R0.3	Ø3.2 R0.4	Ø3 R0.5	Ø4.8 R0.6	Ø4.4 R0.8	Ø4 R1	Ø7 R1.5	Ø6 R2	Ø7 R2.5		
P STEEL		Vc (m/min)	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax
1.1-1.3 unalloyed	<850	170	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
2.1-2.2 low-alloyed	<950	150	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
3.1-3.2 high-alloyed	<1100	100	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
K CASTINGS		Vc (m/min)												
1.1-1.2 grey cast iron	<1000	125	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
M STAINLESS STEEL		Vc (m/min)												
1.1 ferritic/martensitic	<850	85	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
2.1 austenitic	<650	75	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
N NON-FERROUS		Vc (m/min)												
1.1-2.3 ALUMINIUM alloyed/cast	<600	500	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
3.1-3.3 COPPER alloyed	<600	180	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
T TITANIUM		Vc (m/min)												
2.1-2.2 pure/alloyed	<1000	40	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
S SUPER ALLOYS		Vc (m/min)												
1.1-1.3 HRSA	<1450	25	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz

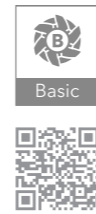
Material	Strength (N/mm ²)	Feed (mm/Z)	Dimension										
			Ø6 R3	Ø9 R3.5	Ø8 R4	Ø7 R4.5	Ø10 R5	Ø8 R6	Ø9 R8	Ø5 R10			
P STEEL		Vc (m/min)	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax
1.1-1.3 unalloyed	<850	170	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
2.1-2.2 low-alloyed	<950	150	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
3.1-3.2 high-alloyed	<1100	100	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
K CASTINGS		Vc (m/min)											
1.1-1.2 grey cast iron	<1000	125	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
M STAINLESS STEEL		Vc (m/min)											
1.1 ferritic/martensitic	<850	85	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
2.1 austenitic	<650	75	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
N NON-FERROUS		Vc (m/min)											
1.1-2.3 ALUMINIUM alloyed/cast	<600	500	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
3.1-3.3 COPPER alloyed	<600	180	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
T TITANIUM		Vc (m/min)											
2.1-2.2 pure/alloyed	<1000	40	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
S SUPER ALLOYS		Vc (m/min)											
1.1-1.3 HRSA	<1450	25	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz

ADVICE | The values marked in turquoise are side applications!

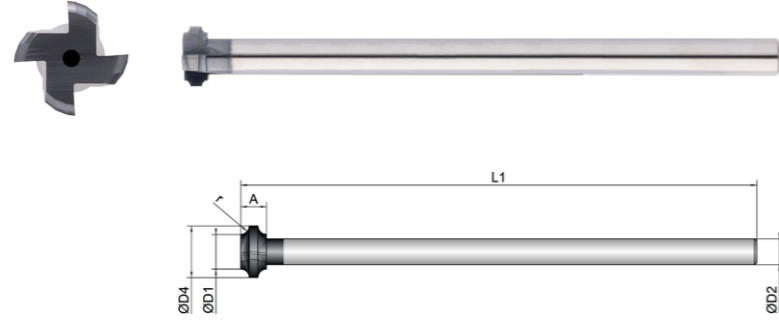
Please use the arithmetic average from D2 and D1 to calculate cutting data.
 For example tool Ø5 R10, D1=Ø5; R=10 calculated diameter = Ø15 Formula: D1+R= Result Example: 5mm+10mm=15mm

Cooling	
Tolerance	V1
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA



- For the universal manufacturing of radii to components
- Variant made of blank form for deep cavities
- Forwards and backwards cutting



Roughing				Finishing			
inappropriate				optimal			

BCU1-M12-0023	D1 mm Ø	D4 mm Ø	A mm	L1 mm	D2 mm Ø	z #	r mm
5/0,5	5.0	6	2.0	75.0	4.0	4	0.50
5,2/0,4	5.2	6	2.0	75.0	4.0	4	0.40
5,4/0,3	5.4	6	2.0	75.0	4.0	4	0.30
5,6/0,2	5.6	6	2.0	75.0	4.0	4	0.20
7/0,5	7.0	8	2.0	100.0	6.0	4	0.50
7/1,5	7.0	10	5.0	100.0	6.0	4	1.50
7/2,5	7.0	12	8.0	100.0	6.0	4	2.50
7,2/0,4	7.2	8	2.0	100.0	6.0	4	0.40
7,4/0,3	7.4	8	2.0	100.0	6.0	4	0.30
7,6/0,2	7.6	8	2.0	100.0	6.0	4	0.20
7,6/1,2	7.6	10	5.0	100.0	6.0	4	1.20
8/1	8.0	10	4.0	100.0	6.0	4	1.00
8/2	8.0	12	7.0	100.0	6.0	4	2.00
8,4/0,8	8.4	10	4.0	100.0	6.0	4	0.80
8,4/1,8	8.4	12	6.0	100.0	6.0	4	1.80



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Dimension	Ø5.6 R0.2	Ø7.6 R0.2	Ø5.4 R0.3	Ø7.4 R0.3	Ø5.2 R0.4	Ø7.2 R0.4	Ø5 R0.5	Ø7 R0.5	Ø8.4 R0.8	Ø8 R1
Infeed in mm	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax
Application										
Material	Strength (N/mm²)									
P STEEL	Vc (m/min)									
1.1-1.3 unalloyed	<850	70	0.012	0.015	0.012	0.015	0.012	0.015	0.012	0.015
2.1-2.2 low-alloyed	<950	40	0.01	0.013	0.01	0.013	0.01	0.013	0.01	0.013
3.1-3.2 high-alloyed	<1100	35	0.008	0.011	0.008	0.011	0.008	0.011	0.008	0.011
K CASTINGS	Vc (m/min)									
1.1-1.2 grey cast iron	<1000	40	0.01	0.013	0.01	0.013	0.01	0.013	0.01	0.013
M STAINLESS STEEL	Vc (m/min)									
1.1 ferritic/martensitic	<850	35	0.008	0.011	0.008	0.011	0.008	0.011	0.008	0.011
2.1 austenitic	<650	30	0.007	0.01	0.007	0.01	0.007	0.01	0.007	0.01
N NON-FERROUS	Vc (m/min)									
1.1-2.3 ALUMINIUM alloyed/cast	<600	120	0.014	0.018	0.014	0.018	0.014	0.018	0.014	0.018
3.1-3.3 COPPER alloyed	<600	60	0.01	0.013	0.01	0.013	0.01	0.013	0.01	0.013
T TITANIUM	Vc (m/min)									
2.1-2.2 pure/alloyed	<1000	20	0.008	0.011	0.008	0.011	0.008	0.011	0.008	0.011
S SUPER ALLOYS	Vc (m/min)									
1.1-1.3 HRSA	<1450	12	0.007	0.01	0.007	0.01	0.007	0.01	0.007	0.01

Dimension	Ø7.6 R1.2	Ø7 R1.5	Ø8.4 R1.8	Ø8 R2	Ø7 R2.5
Infeed in mm	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax
Application					
Material	Strength (N/mm²)				
P STEEL	Vc (m/min)				
1.1-1.3 unalloyed	<850	70	0.018	0.018	0.02
2.1-2.2 low-alloyed	<950	40	0.016	0.016	0.018
3.1-3.2 high-alloyed	<1100	35	0.014	0.014	0.016
K CASTINGS	Vc (m/min)				
1.1-1.2 grey cast iron	<1000	40	0.016	0.016	0.018
M STAINLESS STEEL	Vc (m/min)				
1.1 ferritic/martensitic	<850	35	0.014	0.014	0.016
2.1 austenitic	<650	30	0.013	0.013	0.015
N NON-FERROUS	Vc (m/min)				
1.1-2.3 ALUMINIUM alloyed/cast	<600	120	0.021	0.021	0.024
3.1-3.3 COPPER alloyed	<600	60	0.016	0.016	0.018
T TITANIUM	Vc (m/min)				
2.1-2.2 pure/alloyed	<1000	20	0.014	0.014	0.016
S SUPER ALLOYS	Vc (m/min)				
1.1-1.3 HRSA	<1450	12	0.013	0.013	0.015

ADVICE | The values marked in turquoise are side applications!
Please use the arithmetic average from D2 and D1 to calculate cutting data. For example tool Ø5 R10, D1=Ø5; R=10 calculated diameter = Ø15 Formula: D1+R= Result Example: 5mm+10mm=15mm

EXPLANATION

APPLICATIONS

Multipass milling	Trimming	Deburring	Engraving
Corner rounding	Full slot milling	Forward and backward deburring	

COOLINGS

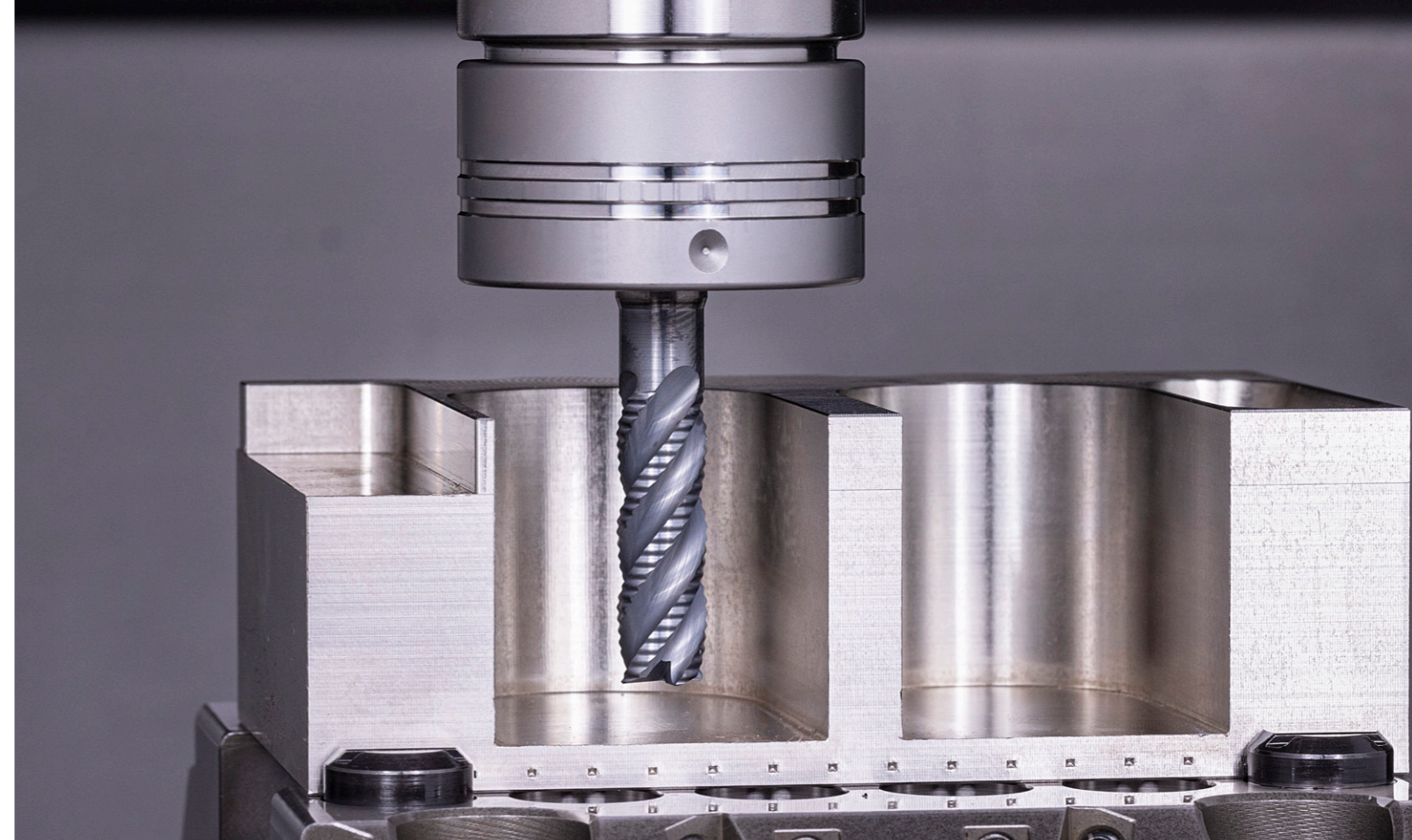
Air-cooling	Dry machining	Oil cooling	Cooling Lubricant
Minimum quantity lubrication			

FEATURES

0,5xD	1xD	1,5xD	2xD
2,5xD	3xD	3,5xD	4xD
5xD	Center cutting	Non-center cutting	Without Weldon
With Weldon	Internal cooling	Dynamic helical pitch	Chip breaker
Unequal tooth pitch	Roughing teeth	Helical immersion	Feed directions x,y
Feed directions x, y, z	Feed directions x, y, (z)	Corner radius	Corner bevel
Sharp edged			

STRATEGY

Extended Trochoidal Cutting	High Performance Cutting	High Speed Cutting	Multi Task Cutting
Universal Machining			



PROPERTIES

Cutting diameter	Small cutting diameter	Large cutting diameter	Undercut diameter
Cutting length	Total bevel length	Undercut length	Total length
Shank diameter	Number of teeth	Corner radius	Corner bevel
Programming radius	Maximum cutting depth	Helical angle	Alpha angle

APPLICATION TABLE

The values given in the application table are only guidelines. These values are largely dependent on the machining situation and application.

FIGURES

All technical drawings and photographs are given as an example. The product may deviate from the original in terms of colour and dimensions.

N 1.1 ALUMINIUM | alloyed <500 N/mm²

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 40 rows of material specifications.

N 1.2 ALUMINIUM | alloyed <600 N/mm²

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 7 rows of material specifications.

N 2.1 - 2.3 ALUMINIUM | cast <600 N/mm²

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 10 rows of material specifications.

N 3.1 - 3.3 COPPER | alloyed <600 N/mm²

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 20 rows of material specifications.

S 2.1 TITANIUM | commercially pure <600 N/mm²

Table with 10 columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 5 rows of material specifications.

S 2.2 TITANIUM | alloyed <1000 N/mm²

Table with 10 columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 8 rows of material specifications.

S 1.1 IRON-BASED ALLOY [HRSA] <1200 N/mm²

Table with 10 columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Contains 10 rows of material specifications.

S 1.2 NICKEL-BASED ALLOY [HRSA] <1450 N/mm²

Material-number	Tradename	Germany DIN	Europe EN	France AFNOR	GB BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
2.4602	INCONEL® 622	NiCr21Mo14W				INCONEL® 622				
2.4632	Nimonic® 90	NiCr20Co80Ti	HR 2	NC 20 KTA	NA 36	Nimonic® 90				N 07090
2.4642	INCONEL® 690	NiCr29Fe		NC 30 Fe		INCONEL® 690			NCF 690	N 06690
2.4650	Nimonic® C-263	NiCo20Cr20MoTi	HR 10	NCK 20 D	NA 38	Nimonic® C-263			NCF 690	N 07263
2.4654	Waspaloy®	NiCr19Co14Mo4Ti		NC 20 K14 Y		Waspaloy®				N 07001
2.4662	INCOLOY® 901	NiCr13Mo6Ti3		Z 8 NCDT 42						N 09901
2.4663	INCONEL® 617	NiCr23Co12Mo		NC 22 K12 D9 A		INCONEL® 617				N 06617
2.4665	Hastelloy® X	NiCr22Fe18Mo	HR 6	NC 22 FeD	NA 40	Hastelloy X				
2.4666	Nimonic® PK25	NiCr18CoMo		NKCD 20 ATU						
2.4668	INCONEL® 718	NiCr19FeNbMo	HR 8	NC 19 Fe Nb	INCONEL® 718	INCONEL® 718				N 07718
2.4669	INCONEL® X-750	NiCr15Fe7TiAl		NC 15 Fe 7 TA		INCONEL® X-750				N 07750
2.4694	INCONEL® 751	NiCr16Fe7TiAl								N 07751
2.4816	INCONEL® 600	NiCr15Fe		NC 15 Fe	NA 14	INCONEL® 600			NFC 600	N 06600
2.4819	Nimonic® C-276	NiMo16Cr15W		NC 17 D		Nimonic® C-276				N 10276
2.4851	INCONEL® 601	NiCr23Fe15		NC 23 Fe 14 A		INCONEL® 601			NCF 601	N 06601
2.4856	INCONEL® 625	NiCr22Mo9Nb		NC 22 Fe DNb	NA 21	INCONEL® 625			NCF 625	N 06625
2.4858	INCOLOY® 825	NiCr21Mo	3072.76	NC 21 Fe DU	NA 16	INCOLOY® 825			NCF 825 TB	N 08825
2.4869	Alloy 80/20	NiCr80-20								N 06003
2.4879	Centralloy® 4879	G-NiCr38W								
2.4883	Hastelloy® C276	G-NiMo16Cr								
2.4889	Nicrofer® 45 TM	NiCr28FeSiCe								N 06045
2.4951	Nicrofer® 7520	NiCr20Ti		NC 20 T	HR 5					N 06075

S 1.3 COBALT-BASED ALLOY [HRSA] <1450 N/mm²

Material-number	Tradename	Germany DIN	Europe EN	France AFNOR	GB BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
2.4681	ULTIMET® alloy	CoCr26Ni9Mo5W								
2.4682	Stellite® 31	G-CoCr25NiW		KC 25 WN						ASTM A567
2.4683	Conicro® 4023 W	CoCr22NiW								
2.4691	HS 21	G-CoCr28Mo		KC 27 D5 NFe						ASTM F-75
2.4964	Stellite® 25	CoCr20W15Ni		KC 22 WN	HR 240	L605 Haynes® 25				R 30605
2.4979	S 816	CoCr28Mo6								

Technical formulas

Calculate cutting speed (m/min)

$$V_c = \frac{D \cdot \pi \cdot n}{1000}$$

Calculate rotational speed (rpm)

$$n = \frac{V_c \cdot 1000}{D \cdot \pi}$$

Calculate feed rate (mm/min)

$$V_f = n \cdot z \cdot f_z$$

Calculate feed per tooth (mm/number of teeth)

$$f_z = \frac{V_f}{n \cdot z}$$

Calculate chip removal rate (cm³/min)

$$Q = \frac{a_p \cdot a_e \cdot V_f}{1000}$$

Calculate average chip thickness (mm)

$$h_m = f_z \cdot \sqrt{\frac{a_e}{D}}$$

Explanation of terms

V _c	Cutting speed	in m/min
n	Rotational speed	in rpm
V _f	Feed rate	in mm/min
F _z	Feed per tooth	in mm/number of teeth
z	Number of teeth (cutting)	
a _p	Depth of cut	in mm
a _e	Width of cut	in mm
h _m	Average chip thickness	in mm
Q	Chip removal rate	in cm ³ /min
D	Diameter of tool	in mm

GENERAL TERMS OF SALE

§ 1 SCOPE

1. These General Terms of Sale apply to all business relationships between Hofmann & Vratny OHG (hereinafter referred to as "Hofmann & Vratny") and its customers (hereinafter referred to individually as the "Ordering Party" and collectively as the "Ordering Parties").

2. These General Terms of Sale only apply to Ordering Parties that are entrepreneurs pursuant to §§ 14 and 310 para. 1 of the BGB (Civil Code of Germany), legal entities under public law, and/or special funds under public law.

3. The scope of application of these General Terms of Sale includes, but is not limited to, contracts regarding the sale and/or delivery of chattels (hereinafter referred to as "Goods") regardless of whether they are produced by Hofmann & Vratny or procured from suppliers (§§ 433 and 651 of the BGB). Unless agreed upon otherwise, the version of these General Terms of Sale applicable at the time the Ordering Party places an order and in any case the most recent version of these General Terms of Sale provided to the Ordering Party in writing in the form of a master agreement also shall apply to similar contracts made at a later date without Hofmann & Vratny being required to make reference to them in every individual case.

4. These General Terms of Sale shall apply exclusively. These General Terms of Sale also shall apply if and when Hofmann & Vratny executes a delivery without reservation despite having knowledge of the Ordering Party's terms of sale which contradict or deviate from these General Terms of Sale. Any of the Ordering Party's terms of sale which contradict or deviate from these General Terms of Sale shall become part of a contract only with Hofmann & Vratny's express prior consent. Such requirement to consent shall apply in any case even, for example, if the Ordering Party refers to its terms of sale as part of an order placement and Hofmann & Vratny does not object explicitly to such terms.

5. If Hofmann & Vratny and the Ordering Party have entered into any individual agreements, such individual agreements shall prevail over these General Terms of Sale. The content of such individual agreements only can be substantiated by a written contract or by written confirmation from Hofmann & Vratny. Individual agreements (e.g., outline delivery contracts, quality assurance agreements) and information provided in Hofmann & Vratny's order confirmation shall prevail over these General Terms of Sale. In case of doubt, commercial clauses shall be interpreted based on the Incoterms® issued by the International Chamber of Commerce in Paris (ICC) and applicable at the time the contract is entered into.

6. All of the Ordering Party's legal declarations and notifications made with regard to the contract (e.g., in connection with deadlines or notices of defects, rescission, or reduction) shall be made in writing to be effective. In the context of these General Terms of Sale, in writing shall include written and text forms (e.g., letters, e-mails, faxes). Legal requirements regarding form and other verifications including, but not limited to, cases of doubt regarding the legitimation of the notifying party shall remain unaffected.

7. All references to applicable laws shall be for the purpose of clarification only. Unless amended in or excluded expressly from these General Terms of Sale, laws shall apply even without express reference.

§ 2 OFFERS AND ACCEPTANCE

1. All offers made by Hofmann & Vratny shall be subject to change and shall be non-binding including if and when images, drawings, technical documentation, calculations, analyses, other documents or product descriptions of whatever nature (hereinafter referred to as "Documents") are provided to the Ordering Party if the proprietary rights and copyrights to those Documents are retained by Hofmann & Vratny.

2. All orders for Goods placed by the Ordering Party shall constitute binding offers. Unless stated otherwise in the respective order, Hofmann & Vratny shall be entitled to accept an offer within two weeks after receipt of said offer.

3. Hofmann & Vratny shall accept offers in writing (e.g., in the form of an order confirmation) or by delivering the respective Goods to the Ordering Party.

4. All proprietary rights and copyrights to Documents shall remain with Hofmann & Vratny. Documents marked as confidential shall be forwarded to third parties only with the express written consent of Hofmann & Vratny.

§ 3 DELIVERY DEADLINES AND DEFAULT OF DELIVERY

1. Delivery deadlines shall be agreed upon by Hofmann & Vratny and the individual Ordering Party or shall be specified by Hofmann & Vratny upon acceptance of the order or in the order confirmation.

2. Hofmann & Vratny's compliance with delivery obligations shall be conditional upon the Ordering Party's on-time and proper compliance with the Ordering Party's obligations including, but not limited to, the provision of the papers, permits and approvals required to be provided by the Ordering Party and the receipt by Hofmann & Vratny of the agreed-upon down payment, if any. In the event of delays, the delivery time shall be extended reasonably.

3. If Hofmann & Vratny is unable to meet any binding delivery deadlines for reasons beyond the control of Hofmann & Vratny (non-availability of services), the Ordering Party shall be notified without undue delay and shall be provided with an estimated new delivery deadline. If the agreed upon Goods do not become available before the new deadline expires, Hofmann & Vratny shall be entitled to rescind the contract in whole or in part and shall reimburse the Ordering Party without undue delay for any and all consideration paid up to that time. For the fulfillment of this clause, non-availability of services shall include, but shall not be limited to, delayed delivery from any of Hofmann & Vratny's suppliers for reasons beyond the control of Hofmann & Vratny or its suppliers, or if Hofmann & Vratny is not responsible for procuring the Goods.

4. If failure to comply with a delivery deadline is due to an act of God, industrial dispute or other event beyond the control of Hofmann & Vratny, the delivery time shall be extended reasonably. The same shall apply if and when any such act of God, industrial dispute or other event has arisen at any of Hofmann & Vratny's sub-suppliers which event can be demonstrated to have had an impact on compliance with the delivery deadline. Hofmann & Vratny shall notify the Ordering Party of such circumstances without undue delay. Events also shall be deemed to be beyond Hofmann & Vratny's control if and when they occur during a delay. In this case, the delay shall be deemed to be suspended for the duration of the respective event.

5. The beginning of a period of delivery default shall be in accordance with the law, but shall in any case require a reminder issued by the Ordering Party.

6. If a contract regarding stand-by delivery has been signed, Hofmann & Vratny shall deliver and invoice the Goods no later than 12 months after the date of such contract (hereinafter referred to as the "Recall Period"), even if the Ordering Party has failed to recall the Goods by that time. After the Recall Period has expired, Hofmann & Vratny can notify the Ordering Party of Hofmann & Vratny's readiness to deliver and can request that the Ordering Party recall the Goods within a reasonable period of time. If the Ordering Party fails to recall the Goods within such period, Hofmann & Vratny shall be entitled to demand an additional lumpsum compensation for warehousing costs (hereinafter referred to as the "Warehousing Allowance"). The Warehousing Allowance shall be 0.5% of the net value of the purchased Goods for every full week, but shall not exceed 5% of the net value of the purchased Goods in total. The Ordering Party shall be free to prove that Hofmann & Vratny did not incur any damages or that any damages incurred were lower than the Warehousing Allowance. If the Ordering Party fails to recall the Goods within the Recall Period determined by Hofmann & Vratny, Hofmann & Vratny shall be entitled to dispose of the Goods as Hofmann & Vratny sees fit. The statutory provisions regarding rescission shall remain unaffected.

§ 4 DELIVERY AND DEFAULT OF ACCEPTANCE

1. Unless agreed upon otherwise, all deliveries shall be ex works, that is, the

place of performance for deliveries and for all subsequent actions. Unless agreed upon otherwise, upon request and at the expense of the Ordering Party the Goods shall be delivered to another destination (hereinafter referred to as "Sales Involving the Carriage of Goods"). Unless agreed upon otherwise, Hofmann & Vratny shall be entitled to determine the shipment method (including, but not limited to, the forwarder, the type of shipment and the packaging).

2. Partial deliveries shall be admissible, provided the Ordering Party reasonably can be expected to accept them.

3. Delivered Goods shall be accepted by the Ordering Party even if the delivered Goods have minor defects provided the Ordering Party reasonably can be expected to accept such Goods.

4. The risk of accidental destruction and/or deterioration of the Goods shall transfer to the Ordering Party no later than upon surrender of the Goods. In the case of Sales Involving the Carriage of Goods, the risk of accidental destruction and/or deterioration of the Goods and the risk of delay shall transfer to the Ordering Party no later than at the time of delivery of the Goods to the forwarder, carrier, or any other person designated to execute shipment of the Goods. Delivery shall be deemed to have been effected even if the Ordering Party is in default of acceptance.

5. If the Ordering Party is in default of acceptance or fails to cooperate or if delivery is delayed for other reasons for which the Ordering Party is responsible, Hofmann & Vratny shall be entitled to demand reimbursement for the damages incurred in connection therewith including additional expenses (e.g., warehousing costs).

§ 5 TERMS OF PAYMENT

1. Unless agreed upon otherwise in individual cases, Hofmann & Vratny's prices plus statutory sales tax valid at the time the contract is signed shall apply. The prices indicated in Hofmann & Vratny's catalogs are non-binding and subject to change and/ or correction.

2. Unless agreed upon otherwise, in the case of Sales Involving the Carriage of Goods the Ordering Party shall bear the costs of packaging and transportation ex works and the costs, if any, for transportation insurance if such insurance is requested by the Ordering Party. All customs and other fees, taxes and other public charges also shall be borne by the Ordering Party unless agreed upon otherwise. Ownership of the packaging for transportation and otherwise pursuant to the Verpackungsordnung (Packaging Ordinance of Germany) shall transfer to the Ordering Party and such packaging shall not be returned to Hofmann & Vratny. Pallets shall be exempt from this rule.

3. Unless agreed upon otherwise in the order confirmation, the purchase price plus statutory sales tax shall be due and payable without any deductions within 14 days after the date of invoicing and delivery or acceptance of the Goods. However, Hofmann & Vratny reserves the right to make full or partial deliveries against cash in advance at any time including during an ongoing business relationship. The assertion of such right shall be communicated no later than at the time the order confirmation is issued. The Ordering Party shall be deemed to be in default of payment upon the expiration of the aforementioned payment deadline. The applicable rate of interest on the purchase price of the Goods shall become payable during the default period. The right to assert claims for more substantial compensation shall be reserved. Hofmann & Vratny's right to claim commercial-rate default interest (§ 353 of the HGB) shall remain unaffected.

4. The Ordering Party's rights of set-off and retention shall be limited to the extent the Ordering Party's claim is determined in a court of law or is undisputed. The Ordering Party's rights based on defects in the purchased Goods (see § 7 hereof) shall remain unaffected.

5. After the contract has been signed, if there is evidence that Hofmann & Vratny's claim to the purchase price will be compromised due to lack of performance on the part of the Ordering Party, Hofmann & Vratny shall be entitled to refuse performance pursuant to the applicable laws and, after setting a deadline, if applicable, shall be entitled to rescind the contract. In the case of contracts regarding the production of customized items, Hofmann & Vratny shall be entitled to rescind the contract immediately and the laws regarding the expendability of setting deadlines shall remain unaffected.

§ 6 RETENTION OF TITLE

1. Until all pending and future receivables in connection with the business relationship between Hofmann & Vratny and the Ordering Party are paid in full, Hofmann & Vratny shall retain ownership of the Goods. If the Ordering Party violates the contract including, but not limited to, default of payment, Hofmann & Vratny shall be entitled to rescind the contract pursuant to the applicable laws and to demand the surrender of the Goods.

2. Goods subject to retention of title shall not be pledged or assigned as collateral before the Ordering Party has paid in full. The Ordering Party shall notify Hofmann & Vratny in writing without undue delay in the event of a filing for commencement of insolvency proceedings or if third parties gain access (e.g., seizures) to Goods belonging to Hofmann & Vratny.

3. If the Ordering Party violates the contract including, but not limited to, by failing to pay the purchase price when due, Hofmann & Vratny shall be entitled to rescind the contract pursuant to the applicable laws and to demand the surrender of the Goods due to the retention of title and the rescission.

4. Until further notice, the Ordering Party shall be entitled to resell/and or process in the ordinary course of business any Goods subject to retention of title. In this case, the provisions below also shall apply.

a) The retention of title shall include title to the full value of work products resulting from processing, mixing or combining the Goods, in which case Hofmann & Vratny shall be deemed to be the manufacturer. If and when third-party goods are processed, mixed or combined and such third parties retain ownership, Hofmann & Vratny shall acquire coownership pro rata of the invoiced value of work products so processed, mixed or combined. In all other cases, the creation of work products shall be subject to the same provisions as the delivered Goods subject to retention of title.

b) The Ordering Party hereby agrees to assign to Hofmann & Vratny as collateral any and all receivables against third parties resulting from the resale of the Goods or work results in full or in the amount of Hofmann & Vratny's estimated share of co-ownership pursuant to a) above, and Hofmann & Vratny hereby accepts such assignment. The Ordering Party's obligations under § 6 2) hereof also shall apply with respect to the receivables assigned.

c) In addition to Hofmann & Vratny, the Ordering Party shall remain authorized to collect receivables. Hofmann & Vratny undertakes to refrain from collecting receivables as long as the Ordering Party meets its payment obligations vis-à-vis Hofmann & Vratny and does not fail to perform and Hofmann & Vratny does not assert its retention of title by asserting a right under § 6 3) hereof. Otherwise, Hofmann & Vratny shall be entitled to demand that the Ordering Party inform Hofmann & Vratny of such receivables assigned and of the names of the debtors, provide Hofmann & Vratny with all the information required for collecting such receivables and the pertinent documents, and inform the debtors (third parties) of the assignment. In addition, in this case Hofmann & Vratny shall be entitled to revoke the Ordering Party's authorization to resell and/or process Goods which are subject to retention of title.

5. Upon request of the Ordering Party, Hofmann & Vratny shall release the collateral to which Hofmann & Vratny is entitled insofar as the realizable value of such collateral exceeds the receivables to be collateralized by more than 10 percent. Hofmann & Vratny shall be free in its decision regarding which collateral to release.

§ 7 LIABILITY FOR DEFECTS AND CLAIMS FOR DEFECTS

1. Unless otherwise agreed upon herein, the Ordering Party's rights based on defects in quality and/or in title (including delivery of the wrong Goods or insufficient amounts, improper assembly/installation, or incomplete instructions) shall be subject to the applicable laws. The special legal stipulations regarding reimbursement of expenses at the time of delivery of newly produced Goods (supplier's recourse as specified in §§ 478, 445a, 445b and §§ 445c, 327 para. 5, 327u of the BGB) shall remain unaffected in any case, unless equal-value compensation has been agreed upon, for example, as part of a quality assurance agreement.

2. Hofmann & Vratny's liability for defects shall be based first and foremost on the respective agreement entered into regarding the quality and the postulated use of the Goods (including fittings and instructions). In this context,

an agreement regarding the quality of Goods shall be any and all product descriptions and manufacturer-provided information outlined in the individual agreement or made publicly known by Hofmann & Vratny (including, but not limited to, in catalogs or on Hofmann & Vratny's internet homepage) at the time the contract was signed. However, if and when no agreement regarding quality has been entered into, the presence or absence of a defect shall be determined based on the legal regulations (§ 434 para. 3 of the BGB). Statements made publicly by the manufacturer or on the manufacturer's behalf including, but not limited to, in advertising materials or on labels on the Goods shall prevail over other third parties' statements. In the case of Goods comprising digital elements or other digital content, Hofmann & Vratny shall be responsible for providing and, if required, updating the digital content only if defined expressly in an agreement regarding the quality of Goods, as stipulated above. Hofmann & Vratny shall not assume any liability for public statements made by the manufacturer or other third parties.

3. Hofmann & Vratny shall not assume liability for any defects of which the Ordering Party is aware, or for any defects of which the Ordering Party is grossly negligent if it is not aware (§ 442 of the BGB) at time the contract is signed. The assertion of claims by the Ordering Party regarding defects shall be conditional upon the Ordering Party's meeting of its statutory duty to inspect and to give notice of defects (§§ 377 and 381 of the HGB (Commercial Code of Germany)). If a defect in the Goods becomes apparent during or after inspection, the Ordering Party shall give written notice to Hofmann & Vratny without undue delay. Regardless of the Ordering Party's duty to inspect and to give notice of defects, the Ordering Party shall give written notice of obvious defects within two weeks after delivery, which notice shall be deemed to have been given in a timely manner if it is transmitted before the end of such period. If the Ordering Party fails to inspect the Goods properly and/or to give proper notice of any defects, Hofmann & Vratny shall not assume liability for any defects for which no notice was given.

4. If any of the Goods are defective, Hofmann & Vratny shall be free to offer supplementary action to remedy the defect or defects (supplementary remedy) or to deliver defect-free Goods (replacement) to the Ordering Party. In individual cases, the Ordering Party may refuse a supplementary action selected by Hofmann & Vratny that the Ordering Party considers to be unreasonable. It is Hofmann & Vratny's right to refuse to offer supplementary action under the applicable laws shall remain unaffected. The requirement for Hofmann & Vratny to provide any supplementary action owed shall be conditional upon the Ordering Party's paying of the purchase price when due. However, the Ordering Party shall be entitled to retain a reasonable portion of the purchase price pro rata in consideration of the defect. The Ordering Party shall give Hofmann & Vratny the time and the opportunity to provide the supplementary action owed including, but not limited to, providing Hofmann & Vratny the opportunity to inspect the Goods which are subject to complaint. If Hofmann & Vratny opts to replace the Goods, at Hofmann & Vratny's request the Ordering Party shall return the defective Goods to Hofmann & Vratny in accordance with the applicable laws; however, the Ordering Party shall not have the right to request to return the defective Goods. Supplementary action shall not include the disassembly, removal, or de-installation of defective Goods nor the assembly, mounting, or installation of defect-free Goods, provided Hofmann & Vratny was not originally obligated to provide such services; any rights the Ordering Party may have to be reimbursed for such costs (hereinafter referred to as "Disassembly and Assembly Costs") shall remain unaffected.

5. If in fact a defect is present, any and all expenses incurred in connection with inspections and supplementary action including, but not limited to, transportation, road, labor and material costs, and Disassembly and Assembly Costs shall be borne by Hofmann & Vratny in accordance with the laws and these General Terms of Sale. However, if the Ordering Party's demand for remedy of a defect is proven to be invalid because the Ordering Party was aware or was grossly negligent if it was not aware that no defect actually was present, Hofmann & Vratny can demand reimbursement from the Ordering Party for any costs incurred therewith. If the costs of supplementary remedy would be disproportionately high, the Ordering Party shall not be entitled to claim remedy of defects.

6. If and when a reasonable deadline for supplementary action set by the buyer has expired unsuccessfully or can be disregarded under the law, the Ordering Party can rescind the purchasing contract in accordance with the law or reduce the purchase price. However, no right to rescind shall apply in the case of insignificant defects.

7. The Ordering Party's claims for damages or reimbursement for wasted expenses shall be limited by the provisions of § 8 below and shall be excluded in all other cases.

8. The statute of limitations for claims for defects in quality and in title shall be one year after delivery of the Goods. The statute of limitations shall commence upon delivery of the Goods provided acceptance has been agreed upon. Other special legal stipulations regarding statutes of limitations (including, but not limited to, § 438 para. 1 no. 1, no. 2, para. 3, §§ 444, 445b of the BGB) shall remain unaffected. The aforementioned statutes of limitations specified in the purchasing laws also shall apply to any contractual and extra-contractual claims for reimbursement made by the Ordering Party based on a defect in the Goods, unless applying the regular statute of limitations stipulated by law (§§ 195, 199 of the BGB) would result in a reduced statute of limitations in individual cases. Any claims for reimbursement the Ordering Party may have pursuant to § 8 para. 2 p. 1 and p. 2 (a) and pursuant to the Produkthaftungsgesetz (Product Liability Act of Germany) shall be subject exclusively to the statutes of limitations stipulated by law.

§ 8 OTHER LIABILITIES

1. Unless agreed upon otherwise in these General Terms of Sale and in the provisions below, Hofmann & Vratny's liability for breach of contractual and non-contractual obligations shall be in accordance with the applicable laws.

2. Hofmann & Vratny's liability for damages, regardless of the legal reasons and of whether or not they are known, as part of Verschuldenshaftung (liability arising from damage caused by negligent act) shall include intent and gross negligence. Subject to the limitations of liability stipulated by law (e.g., diligence with its own affairs, insignificant breach of duty), in the event of minor negligence Hofmann & Vratny's liability shall be limited to (a) damages resulting from harm to life, body or health and/or (b) damages resulting from the not-insignificant breach of a material contractual obligation, that is, an obligation which must be met to make the proper fulfillment of the contract possible and the meeting of which the Ordering Party relies upon and can rely upon on a regular basis. In this case, however, Hofmann & Vratny's liability shall be limited to reimbursement of the foreseeable damages typical in such cases.

3. The limitation of liability specified above also shall apply vis-à-vis third parties and in the event of a breach of duty by any person (including to his/her own benefit) for which Hofmann & Vratny is responsible by law; however, it shall not apply if and when Hofmann & Vratny is found to have failed to disclose a defect maliciously or has assumed a guarantee for the quality of the Goods and for the Ordering Party's claims under the Produkthaftungsgesetz.

4. The Ordering Party can rescind or cancel a contract due to a breach of obligation other than a breach based on a defect only if and when Hofmann & Vratny is responsible for such breach of obligation. The Ordering Party shall not have an unrestricted right to terminate a contract. All other cases shall be subject to the applicable laws and legal consequences.

§ 9 APPLICABLE LAW AND JURISDICTION

1. These General Terms of Sale and all legal relationships between Hofmann & Vratny and the Ordering Party shall be subject to the laws of the Federal Republic of Germany under exclusion of the provisions of uniform international law. The CISG shall not apply.

2. Any and all disputes arising directly or indirectly from the contractual relationship shall be subject exclusively, including at an international level, to the jurisdiction of Aßling if the Ordering Party is a businessperson as defined in the Handelsgesetzbuch (Commercial Code of Germany), a legal entity under public law, or a special fund under public law. The same shall apply if the Ordering Party is an entrepreneur pursuant to §§ 14 of the BGB. However, in any case Hofmann & Vratny shall be entitled to sue the Ordering Party at the place of performance of the obligation to deliver under these General Terms of Sale and/or under a prevailing individual agreement or at the Ordering Party's general jurisdiction. Prevailing legal regulations including, but not limited to, regarding exclusive jurisdictions, shall remain unaffected.

Hofmann & Vratny OHG
June 2022

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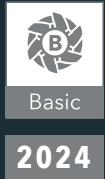
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EXPERT | Hardened steel



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