

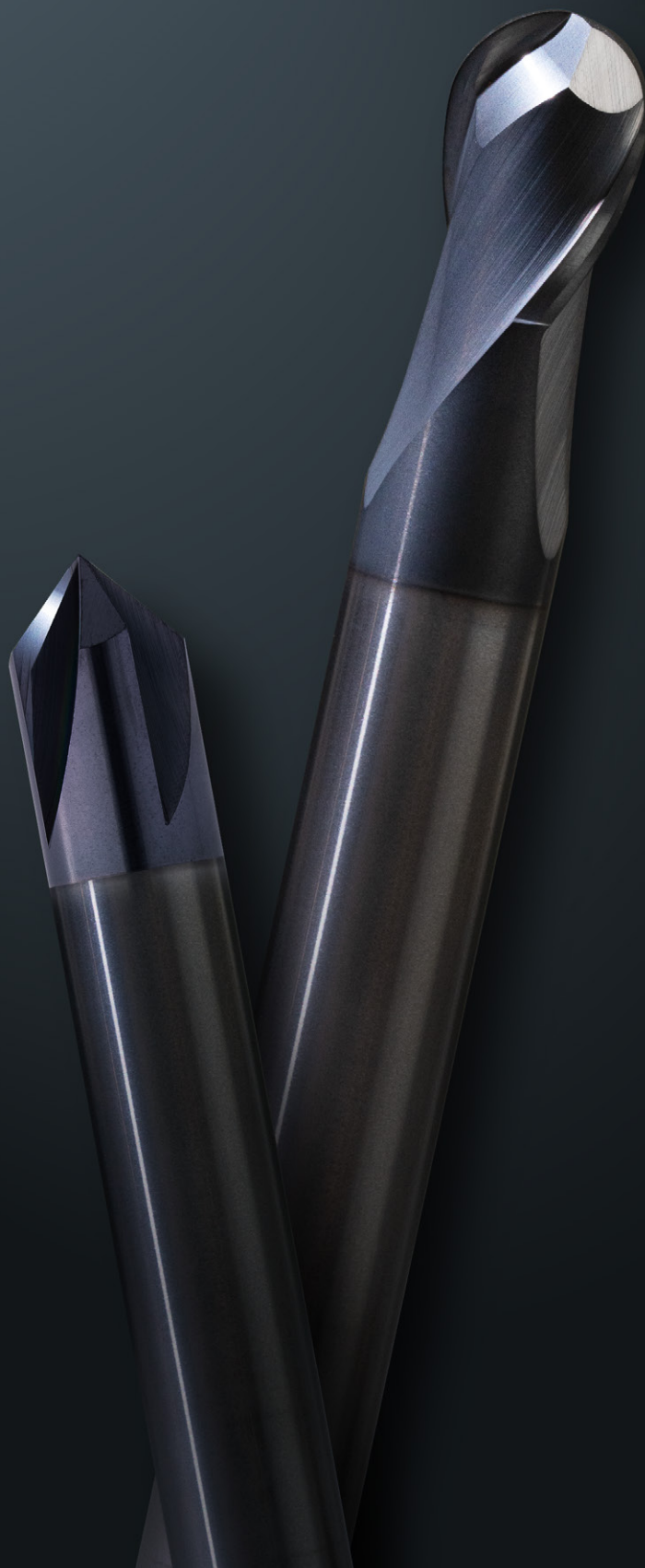
HOFMANN & VRATNY — BCU1 SERIES **EN**

BCU1 SERIES



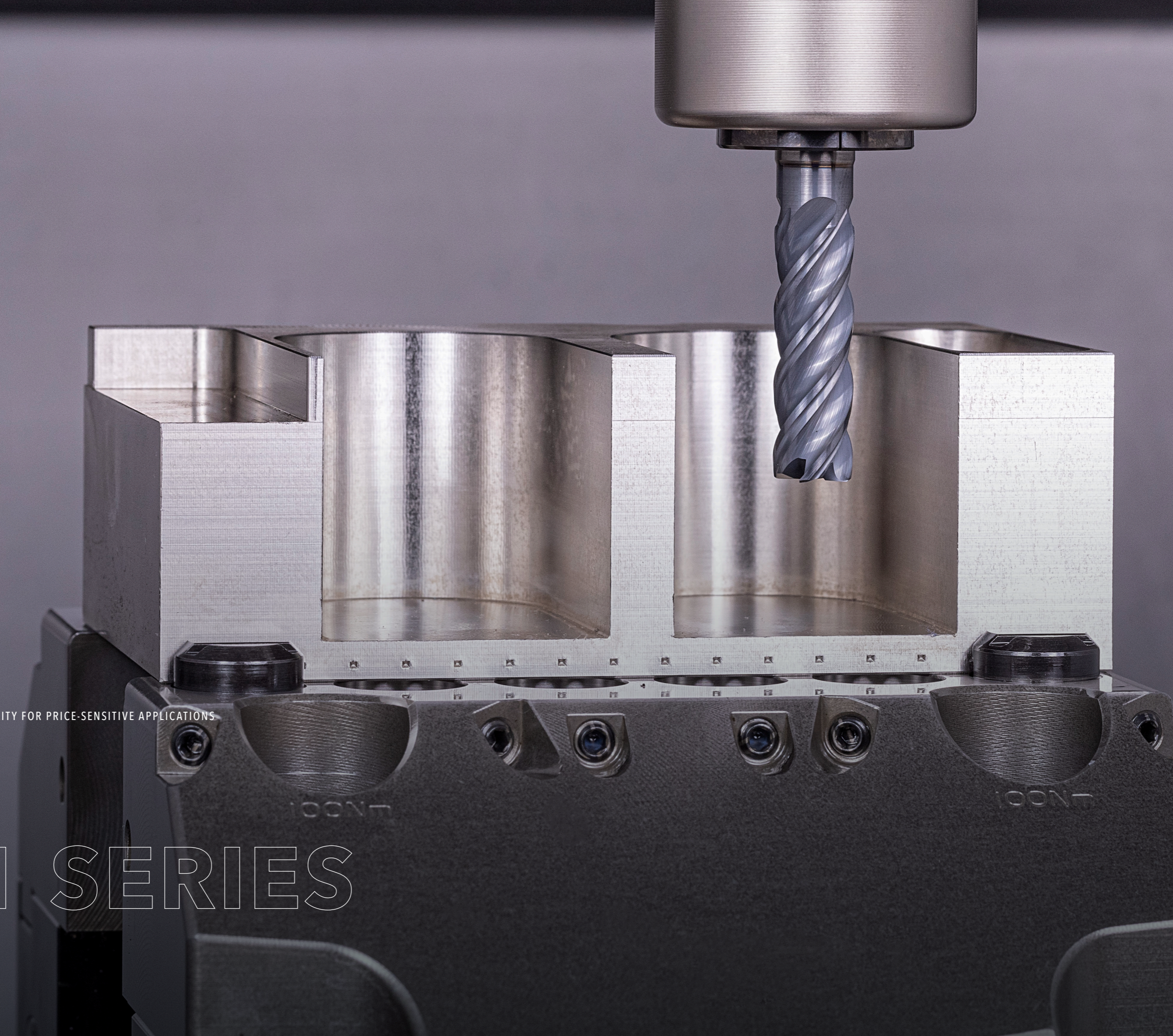
Basic

2022



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, semiconductor industry, machine and plant construction, aviation, aerospace engineering and, not least, the automotive industry have been using our milling cutters for many years now. Quality - Made in Bavaria.

The success of our company is built on innovation, a culture of cooperation, open dealings on an equal footing and many years of successful and trustful collaboration with our business partners. You can count on us, our milling cutters and our irrepresible 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



MADE IN
BAVARIA

PROVEN QUALITY

46
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.





OUR BCU1 SERIES

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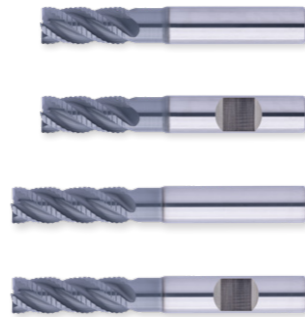
BCU1-M01 PERFORMMAKER

BCU1-M01-0103 BCU1 Performmaker Z3 1.5xD BUI	24
BCU1-M01-0104 BCU1 Performmaker Z3 1.5xD BUI	26
BCU1-M01-0113 BCU1 Performmaker Z3 2xD BUI	28
BCU1-M01-0114 BCU1 Performmaker Z3 2xD BUI	30
BCU1-M01-0123 BCU1 Performmaker Z3 3xD BUI	32
BCU1-M01-0124 BCU1 Performmaker Z3 3xD BUI	34
BCU1-M01-0203 BCU1 Performmaker Z4 1.5xD BUI	36
BCU1-M01-0204 BCU1 Performmaker Z4 1.5xD BUI	38
BCU1-M01-0213 BCU1 Performmaker Z4 2xD BUI	40
BCU1-M01-0214 BCU1 Performmaker Z4 2xD BUI	42
BCU1-M01-0223 BCU1 Performmaker Z4 3xD BUI	44
BCU1-M01-0224 BCU1 Performmaker Z4 3xD BUI	46



BCU1-M02 SLOTMAKER

- BCU1-M02-0103** | BCU1 Slotmaker Z4 2xD BUI _____ 48
- BCU1-M02-0104** | BCU1 Slotmaker Z4 2xD BUI _____ 50
- BCU1-M02-0113** | BCU1 Slotmaker Z4 3xD BUI _____ 52
- BCU1-M02-0114** | BCU1 Slotmaker Z4 3xD BUI _____ 54



BCU1-M03 CHIPMAKER

- BCU1-M03-0123** | BCU1 Chipmaker Z5 3.5xD BUI _____ 56
- BCU1-M03-0124** | BCU1 Chipmaker Z5 3.5xD BUI _____ 58



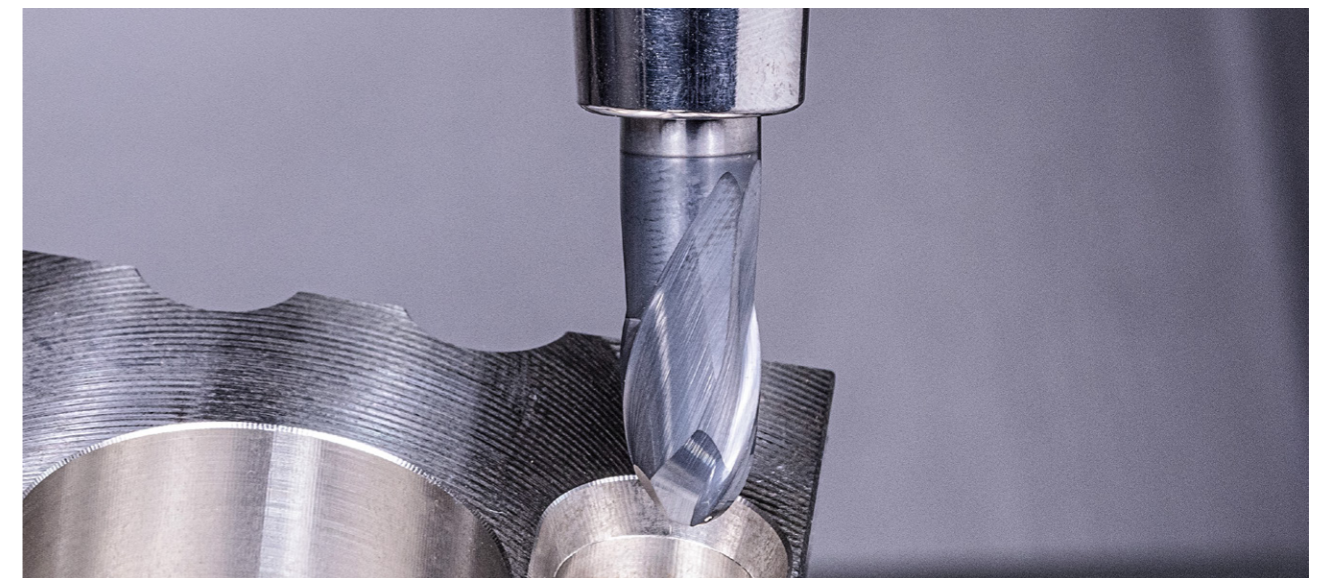
BCU1-M08 ROWMAKER

- BCU1-M08-0053** | BCU1 Rowmaker Z2 1.5xD short BUI _____ 60
- BCU1-M08-0063** | BCU1 Rowmaker Z2 1.5xD long BUI _____ 62
- BCU1-M08-0073** | BCU1 Rowmaker Z2 1.5xD overlong BUI _____ 64



BCU1-M09 CHAMFMAKER

- BCU1-M09-0103** | BCU1 Chamfmaker Z3-4 60° BUI _____ 66
- BCU1-M09-0104** | BCU1 Chamfmaker Z4 60° BUI _____ 68
- BCU1-M09-0153** | BCU1 Chamfmaker Z3-4 90° BUI _____ 70
- BCU1-M09-0154** | BCU1 Chamfmaker Z4 90° BUI _____ 72



BCU1-M10 FB-CHAMFMAKER

- BCU1-M10-0023** | BCU1 FB-Chamfmaker Z4 90° BUI _____ 74
- BCU1-M10-0123** | BCU1 FB-Chamfmaker Z4 90° BUI _____ 76



BCU1-M11 ROUNDMAKER

- BCU1-M11-0023** | BCU1 Roundmaker Z4 BUI _____ 78



BCU1-M12 FB-ROUNDMAKER

- BCU1-M12-0023** | BCU1 FB-Roundmaker Z4 BUI _____ 80



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OUR BCU1 SERIES

Solid quality for price-sensitive applications



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



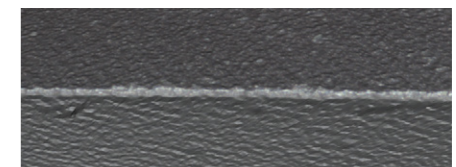
OUR BCU1 SERIES PERFORMS WELL IN ALL AREAS OF APPLICATION.

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

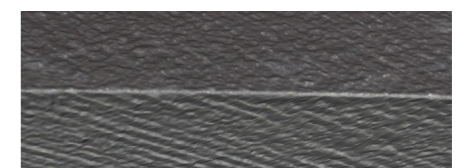
The geometry, material and coating are optimised to ensure an attractive price/performance ratio. Therefore, our milling cutters are ideal for price-conscious users in almost all areas of application.

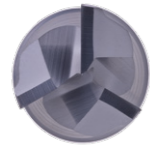
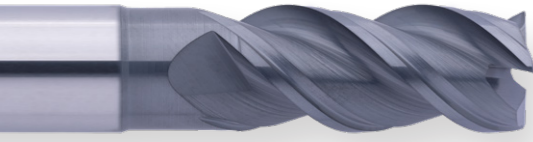
- Versatile application thanks to tried-and-tested geometries
- Stable universal coating for machining, even suitable for the most demanding materials in roughing and finishing
- Special fine grain substrate for reduced cracking and improved resistance to cutting edge breakouts

BEFORE EDGE PREPARATION



AFTER EDGE PREPARATION

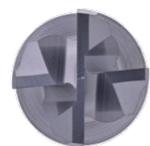
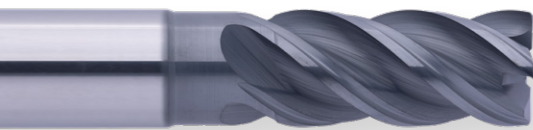




BASIC U1 PERFORMMAKER (M01) Z3



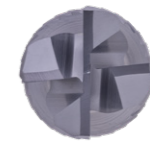
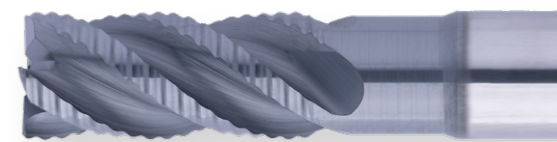
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating



BASIC U1 PERFORMMAKER (M01) Z4



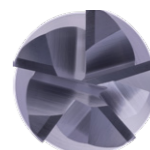
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating



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



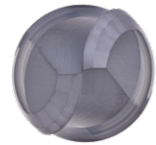
BASIC U1 CHIPMAKER (M03) Z5

- 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
- 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 short, long and overlong versions
- With BUI coating



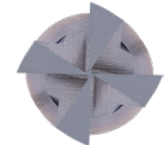
BASIC U1 CHAMFMAKER (M09) Z3-4

- 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
- With BUI coating



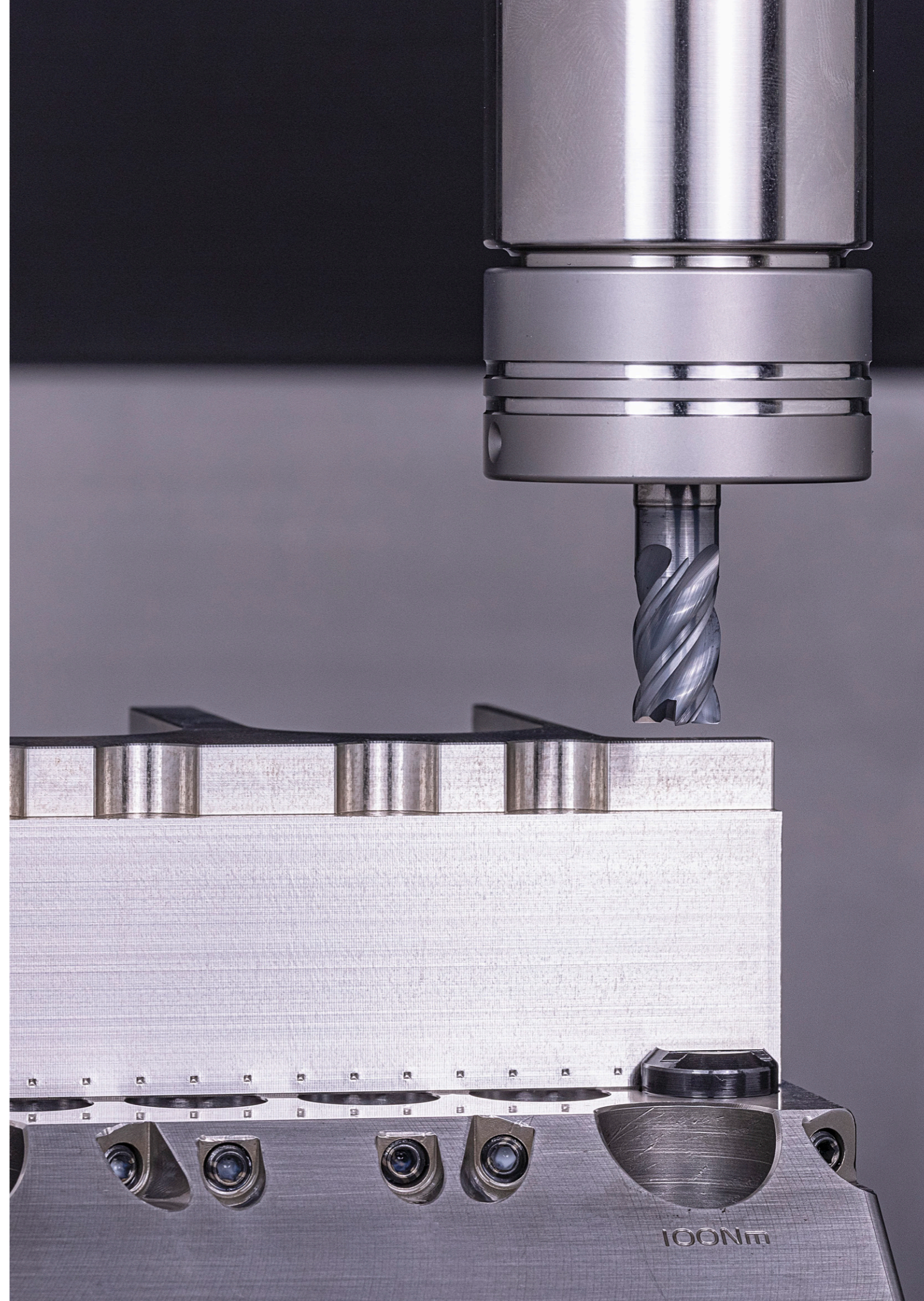
BASIC U1 ROUNDMAKER (M11) Z4

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

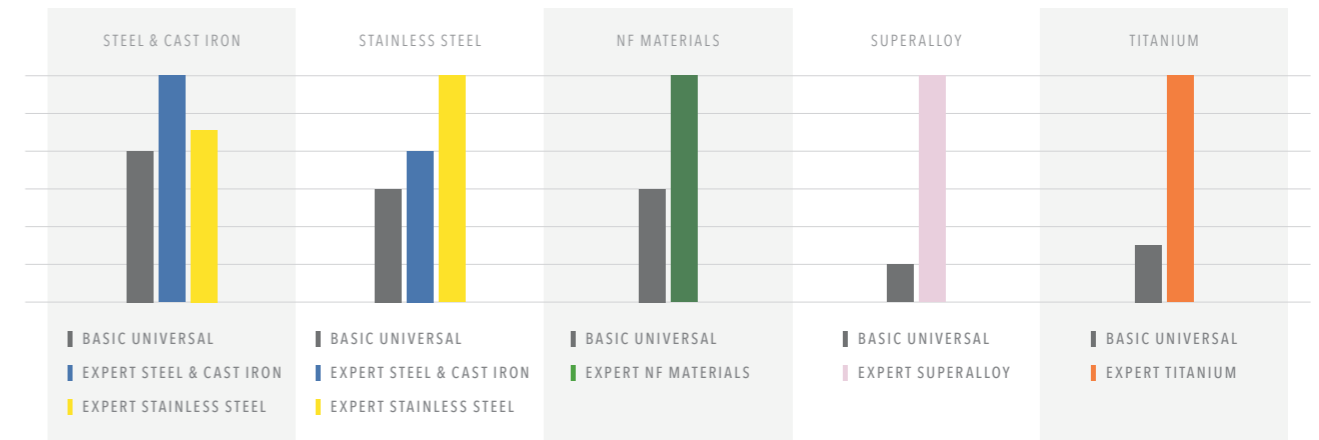


APPLICATION EXAMPLES

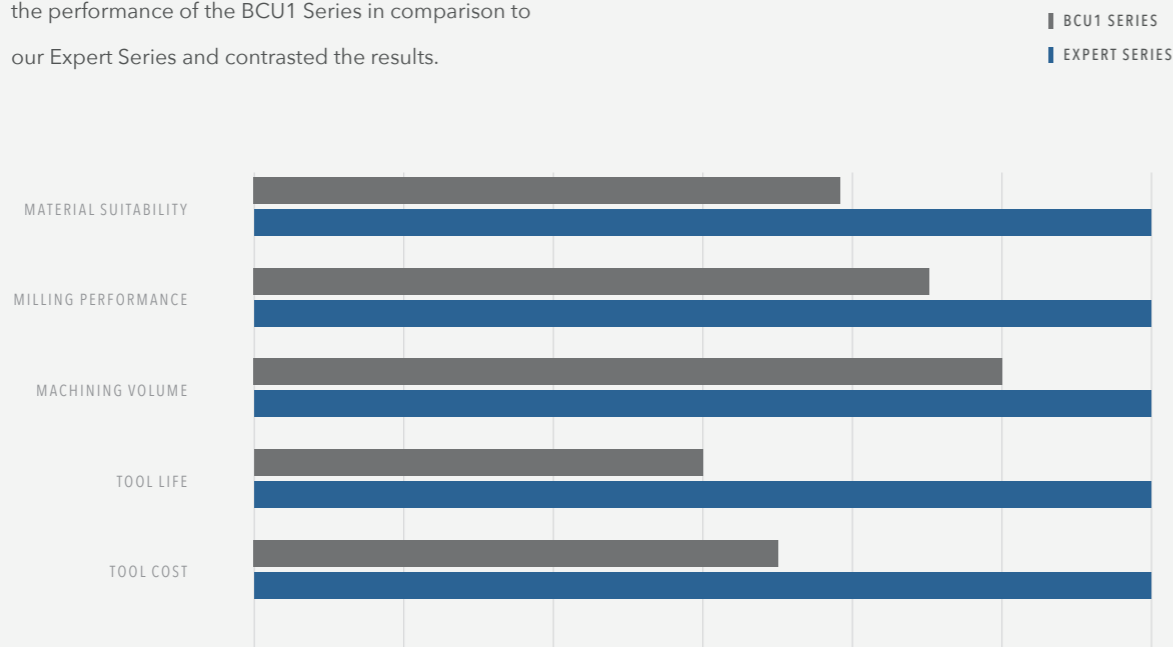
THE BCU1 SERIES IN COMPARISON TO OUR EXPERT SERIES

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.

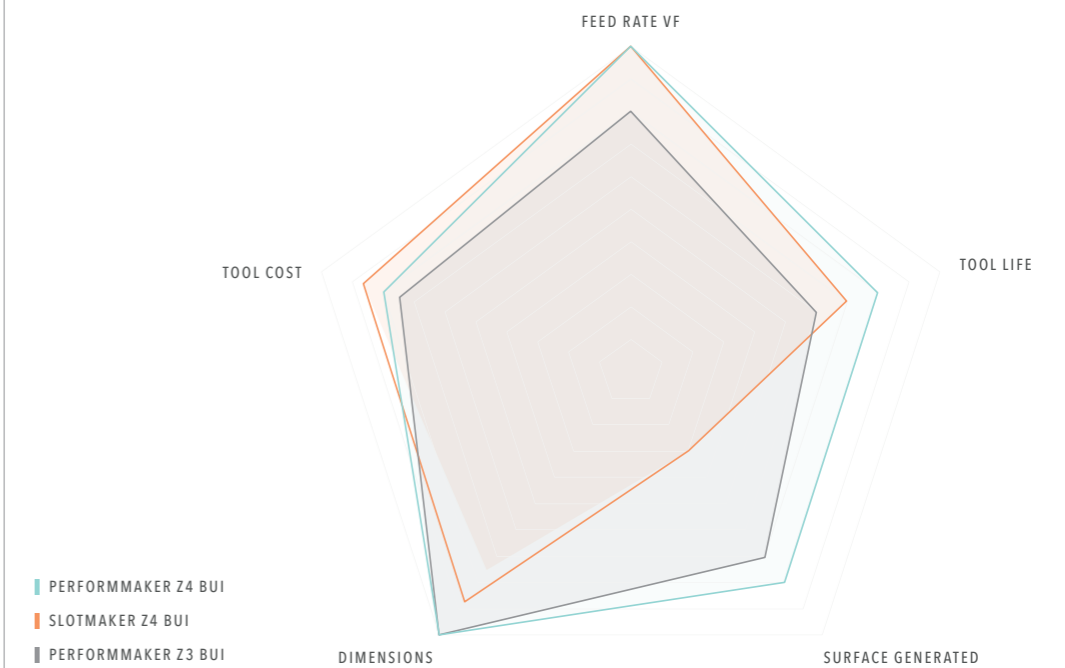
We have tested both the BCU1 Series and the Expert Series with the materials mentioned. Compared with the Expert Series, which are each specially designed for a specific area of application, the BCU1 Series has successfully proven its versatility in internal tests. The results of the service life comparisons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

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



NUMBERING SYSTEM

DISTINGUISHING FEATURES

PRODUCT LINE	TOOL TYPE	MILLING CUTTER TYPE
BC Basic	D Drilling	01 End mill cutter PERFORMMAKER
EX Expert	M Milling	02 Roughing cutter SLOTMAKER
		03 Trochoidal cutter CHIPMAKER
		04 Finishing cutter MIRRORMAKER
		05 Single flute cutter BALANCEMAKER
		06 Torus cutter FORMMAKER
		07 Face torus cutter BLADEMAKER
		08 Full radius cutter ROWMAKER
		09 Deburring cutter CHAMFMAKER
		10 Forward and backward deburring cutter FB CHAMFMAKER
		11 Corner rounding cutter ROUNDMAKER
		12 Forward and backward corner rounding cutter FB ROUNDMAKER
		13 Engraving cutter TEXTMAKER
		14 Conical cutter SLOPEMAKER
		15 Micro end mill cutter PERFORMMAKER MICRO
		16 Micro torus cutter FORMMAKER MICRO
		17 Micro full radius cutter ROWMAKER MICRO

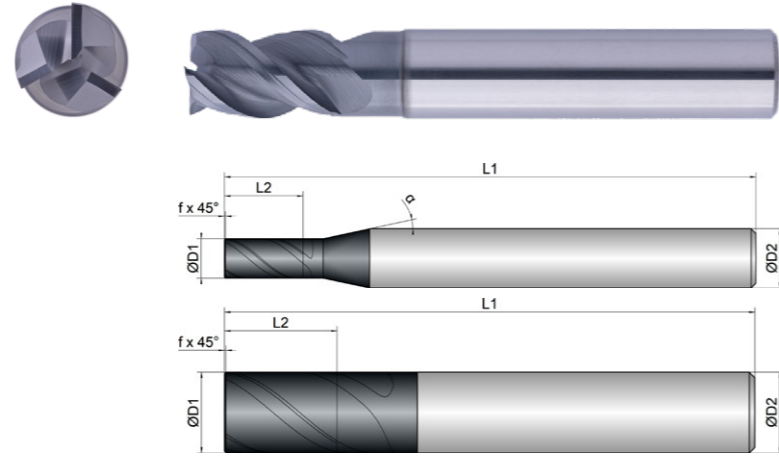
BC	U	1	-	M	01	-	0293
MAIN APPLICATION		VERSION					
PK	Steel & Cast Iron	0	Origin Version				
H	Hardened Steel	1	Version 1.0				
M	Stainless Steel	2	Version 2.0				
O	Graphite, CRP/GRP	3	Version 3.0				
T	Titanium						
S	Superalloy						
N	NF Material						
U	Universal						

OTHER DISTINGUISHING FEATURES

BC	U	1	-	M	01	-	0293	-	12/0,5
PRODUCT IDENT							DIMENSION		
e.g. 0023							3x10	Cutting diameter x length of undercut	
							12/0,5	Cutting diameter / corner radius	
							10	Diameter	

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA	≠	



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

Roughing				Finishing			
inappropriate				optimal			

BCU1-M01-0103	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



Download Catalog Pages (PDF)

Dimension	Ø3		Ø4		Ø5		Ø6		Ø8		Ø10	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz		
P STEEL															
Vc (m/min)															
1.1-1.3	unalloyed	<850	200	0.02	0.025	0.02	0.025	0.03	0.035	0.04	0.045	0.05	0.06	0.055	0.07
2.1-2.2	low-alloyed	<950	190	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
3.1-3.2	high-alloyed	<1100	170	0.012	0.018	0.012	0.018	0.022	0.028	0.032	0.038	0.042	0.052	0.045	0.06
K CASTINGS															
Vc (m/min)															
1.1-1.2	Grey cast iron	<1000	210	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
M STAINLESS STEEL															
Vc (m/min)															
1.1	ferritic/martensitic	<850	95		0.018		0.02		0.028		0.035		0.052		0.06
2.1	austenitic	<650	90		0.015		0.018		0.025		0.032		0.048		0.055
N NON-FERROUS															
Vc (m/min)															
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.02	0.025	0.025	0.04	0.04	0.045	0.045	0.065	0.065	0.085	0.085	0.11
3.1-3.3	COPPER alloyed	<600	200	0.015	0.02	0.02	0.03	0.03	0.035	0.035	0.055	0.055	0.075	0.075	0.1
T TITANIUM															
Vc (m/min)															
2.1-2.2	pure/alloyed	<1000	50		0.015		0.018		0.025		0.03		0.045		0.055
S SUPER ALLOYS															
Vc (m/min)															
1.1-1.3	HRSA	<1450	25		0.01		0.013		0.02		0.025		0.04		0.05

Dimension	Ø12		Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

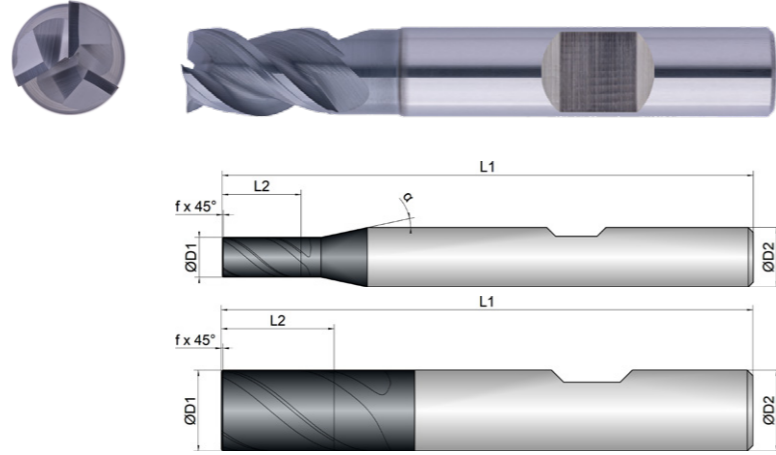
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	
P STEEL									
Vc (m/min)									
1.1-1.3	unalloyed	<850	200	0.06	0.08	0.07	0.09	0.09	0.11
2.1-2.2	low-alloyed	<950	190	0.055	0.075	0.06	0.08	0.08	0.1
3.1-3.2	high-alloyed	<1100	170	0.05	0.07	0.055	0.075	0.075	0.09
K CASTINGS									
Vc (m/min)									
1.1-1.2	Grey cast iron	<1000	210	0.055	0.075	0.07	0.08	0.08	0.1
M STAINLESS STEEL									
Vc (m/min)									
1.1	ferritic/martensitic	<850	95		0.07		0.075		0.09
2.1	austenitic	<650	90		0.065		0.07		0.08
N NON-FERROUS									
Vc (m/min)									
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.11	0.13	0.12	0.14	0.13	0.15
3.1-3.3	COPPER alloyed	<600	200	0.1	0.12	0.11	0.13	0.12	0.14
T TITANIUM									
Vc (m/min)									
2.1-2.2	pure/alloyed	<1000	50		0.065		0.07		0.08
S SUPER ALLOYS									
Vc (m/min)									
1.1-1.3	HRSA	<1450	25		0.06		0.065		0.075

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		

- 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



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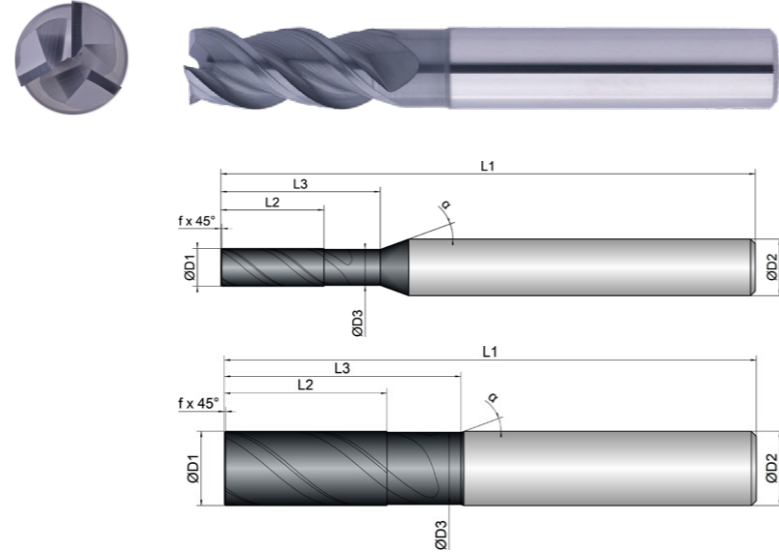
Material	Strength (N/mm ²)	Feed (mm/Z)	Ø3		Ø4		Ø5		Ø6		Ø8		Ø10	
			fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL	Vc (m/min)													
1.1-1.3 unalloyed	<850	200	0.02	0.025	0.02	0.025	0.03	0.035	0.04	0.045	0.05	0.06	0.055	0.07
2.1-2.2 low-alloyed	<950	190	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
3.1-3.2 high-alloyed	<1100	170	0.012	0.018	0.012	0.018	0.022	0.028	0.032	0.038	0.042	0.052	0.045	0.06
K CASTINGS	Vc (m/min)													
1.1-1.2 Grey cast iron	<1000	210	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
M STAINLESS STEEL	Vc (m/min)													
1.1 ferritic/martensitic	<850	95		0.018		0.02		0.028		0.035		0.052		0.06
2.1 austenitic	<650	90		0.015		0.018		0.025		0.032		0.048		0.055
N NON-FERROUS	Vc (m/min)													
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.02	0.025	0.025	0.04	0.04	0.045	0.045	0.065	0.065	0.085	0.085	0.11
3.1-3.3 COPPER alloyed	<600	200	0.015	0.02	0.02	0.03	0.03	0.035	0.035	0.055	0.055	0.075	0.075	0.1
T TITANIUM	Vc (m/min)													
2.1-2.2 pure/alloyed	<1000	50		0.015		0.018		0.025		0.03		0.045		0.055
S SUPER ALLOYS	Vc (m/min)													
1.1-1.3 HRSA	<1450	25		0.01		0.013		0.02		0.025		0.04		0.05

Material	Strength (N/mm ²)	Feed (mm/Z)	Ø12		Ø16		Ø20	
			fz	fz	fz	fz	fz	fz
P STEEL	Vc (m/min)							
1.1-1.3 unalloyed	<850	200	0.06	0.08	0.07	0.09	0.09	0.11
2.1-2.2 low-alloyed	<950	190	0.055	0.075	0.06	0.08	0.08	0.1
3.1-3.2 high-alloyed	<1100	170	0.05	0.07	0.055	0.075	0.075	0.09
K CASTINGS	Vc (m/min)							
1.1-1.2 Grey cast iron	<1000	210	0.055	0.075	0.07	0.08	0.08	0.1
M STAINLESS STEEL	Vc (m/min)							
1.1 ferritic/martensitic	<850	95		0.07		0.075		0.09
2.1 austenitic	<650	90		0.065		0.07		0.08
N NON-FERROUS	Vc (m/min)							
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.11	0.13	0.12	0.14	0.13	0.15
3.1-3.3 COPPER alloyed	<600	200	0.1	0.12	0.11	0.13	0.12	0.14
T TITANIUM	Vc (m/min)							
2.1-2.2 pure/alloyed	<1000	50		0.065		0.07		0.08
S SUPER ALLOYS	Vc (m/min)							
1.1-1.3 HRSA	<1450	25		0.06		0.065		0.075

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA	≠	



- 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	45°	α
	mm Ø	mm Ø	mm	mm	mm	mm Ø	#	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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Dimension	Ø2		Ø3		Ø4		Ø5		Ø6		Ø8	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz		
P STEEL															
Vc (m/min)															
1.1-1.3	unalloyed	<850	200	0.015	0.02	0.02	0.025	0.02	0.025	0.03	0.035	0.04	0.045	0.05	0.06
2.1-2.2	low-alloyed	<950	190	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055
3.1-3.2	high-alloyed	<1100	170	0.01	0.012	0.012	0.018	0.012	0.018	0.022	0.028	0.032	0.038	0.042	0.052
K CASTINGS															
Vc (m/min)															
1.1-1.2	Grey cast iron	<1000	210	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055
M STAINLESS STEEL															
Vc (m/min)															
1.1	ferritic/martensitic	<850	95		0.015		0.018		0.02		0.028		0.035		0.052
2.1	austenitic	<650	90		0.012		0.015		0.018		0.025		0.032		0.048
N NON-FERROUS															
Vc (m/min)															
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.018	0.02	0.02	0.025	0.025	0.04	0.04	0.045	0.045	0.065	0.065	0.085
3.1-3.3	COPPER alloyed	<600	200	0.015	0.015	0.015	0.02	0.02	0.03	0.03	0.035	0.035	0.055	0.055	0.075
T TITANIUM															
Vc (m/min)															
2.1-2.2	pure/alloyed	<1000	50		0.12		0.015		0.018		0.025		0.03		0.045
S SUPER ALLOYS															
Vc (m/min)															
1.1-1.3	HRSA	<1450	25		0.008		0.01		0.013		0.02		0.025		0.04

Dimension	Ø12		Ø16		Ø20		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

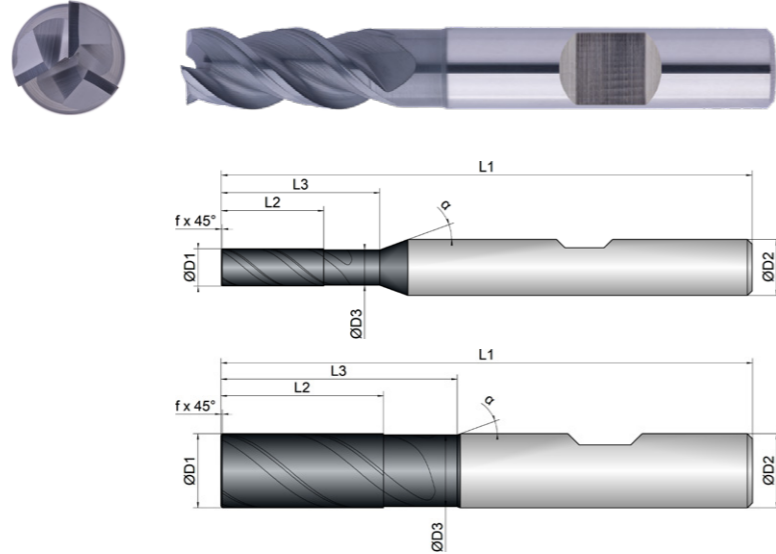
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz		
P STEEL											
Vc (m/min)											
1.1-1.3	unalloyed	<850	200	0.055	0.07	0.06	0.08	0.07	0.09	0.09	0.11
2.1-2.2	low-alloyed	<950	190	0.05	0.065	0.055	0.075	0.06	0.08	0.08	0.1
3.1-3.2	high-alloyed	<1100	170	0.045	0.06	0.05	0.07	0.055	0.075	0.075	0.09
K CASTINGS											
Vc (m/min)											
1.1-1.2	Grey cast iron	<1000	210	0.05	0.065	0.055	0.075	0.07	0.08	0.08	0.1
M STAINLESS STEEL											
Vc (m/min)											
1.1	ferritic/martensitic	<850	95		0.06		0.07		0.075		0.09
2.1	austenitic	<650	90		0.055		0.065		0.07		0.08
N NON-FERROUS											
Vc (m/min)											
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.085	0.11	0.11	0.13	0.12	0.14	0.13	0.15
3.1-3.3	COPPER alloyed	<600	200	0.075	0.1	0.1	0.12	0.11	0.13	0.12	0.14
T TITANIUM											
Vc (m/min)											
2.1-2.2	pure/alloyed	<1000	50		0.055		0.065		0.07		0.08
S SUPER ALLOYS											
Vc (m/min)											
1.1-1.3	HRSA	<1450	25		0.05		0.06		0.065		0.075

NOTIZ | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		

- 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
	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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Dimension	Ø2		Ø3		Ø4		Ø5		Ø6		Ø8	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)											
1.1-1.3 unalloyed	<850	200	0.015	0.02	0.02	0.025	0.02	0.025	0.03	0.035	0.04	0.045	0.05
2.1-2.2 low-alloyed	<950	190	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045
3.1-3.2 high-alloyed	<1100	170	0.01	0.012	0.012	0.018	0.012	0.018	0.022	0.028	0.032	0.038	0.042
K CASTINGS		Vc (m/min)											
1.1-1.2 Grey cast iron	<1000	210	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045
M STAINLESS STEEL		Vc (m/min)											
1.1 ferritic/martensitic	<850	95		0.015		0.018		0.02		0.028		0.035	0.052
2.1 austenitic	<650	90		0.012		0.015		0.018		0.025		0.032	0.048
N NON-FERROUS		Vc (m/min)											
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.018	0.02	0.02	0.025	0.025	0.04	0.04	0.045	0.045	0.065	0.065
3.1-3.3 COPPER alloyed	<600	200	0.015	0.015	0.015	0.02	0.02	0.03	0.03	0.035	0.035	0.055	0.055
T TITANIUM		Vc (m/min)											
2.1-2.2 pure/alloyed	<1000	50		0.12		0.015		0.018		0.025		0.03	0.045
S SUPER ALLOYS		Vc (m/min)											
1.1-1.3 HRSA	<1450	25		0.008		0.01		0.013		0.02		0.025	0.04

Dimension	Ø10		Ø12		Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application								

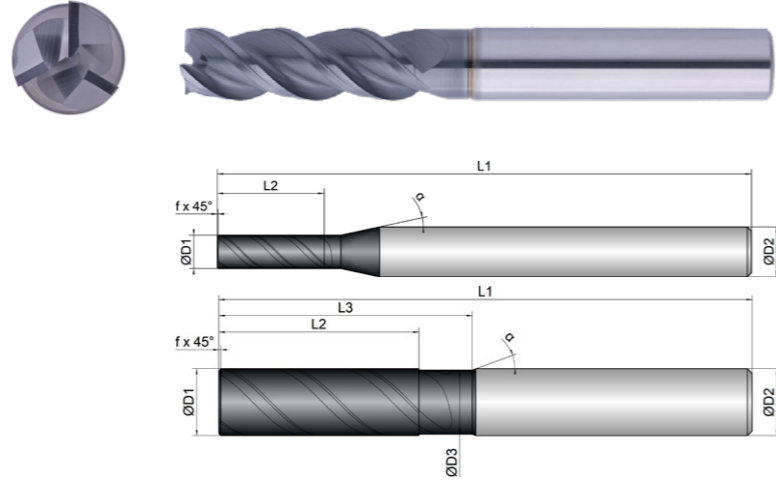
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)							
1.1-1.3 unalloyed	<850	200	0.055	0.07	0.06	0.08	0.07	0.09	0.09
2.1-2.2 low-alloyed	<950	190	0.05	0.065	0.055	0.075	0.06	0.08	0.08
3.1-3.2 high-alloyed	<1100	170	0.045	0.06	0.05	0.07	0.055	0.075	0.075
K CASTINGS		Vc (m/min)							
1.1-1.2 Grey cast iron	<1000	210	0.05	0.065	0.055	0.075	0.07	0.08	0.08
M STAINLESS STEEL		Vc (m/min)							
1.1 ferritic/martensitic	<850	95		0.06		0.07		0.075	0.09
2.1 austenitic	<650	90		0.055		0.065		0.07	0.08
N NON-FERROUS		Vc (m/min)							
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.085	0.11	0.11	0.13	0.12	0.14	0.13
3.1-3.3 COPPER alloyed	<600	200	0.075	0.1	0.1	0.12	0.11	0.13	0.12
T TITANIUM		Vc (m/min)							
2.1-2.2 pure/alloyed	<1000	50		0.055		0.065		0.07	0.08
S SUPER ALLOYS		Vc (m/min)							
1.1-1.3 HRSA	<1450	25		0.05		0.06		0.065	0.075

NOTIZ | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA	≠	

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



Roughing					Finishing				
inappropriate					optimal				

BCU1-M01-0123	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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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL		Vc (m/min)												
1.1-1.3 unalloyed	<850	190	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065	0.055	0.075
2.1-2.2 low-alloyed	<950	180	0.012	0.018	0.022	0.028	0.032	0.035	0.04	0.05	0.045	0.06	0.05	0.07
3.1-3.2 high-alloyed	<1100	160	0.01	0.015	0.02	0.025	0.03	0.032	0.038	0.048	0.04	0.055	0.045	0.065
K CASTINGS		Vc (m/min)												
1.1-1.2 Grey cast iron	<1000	200	0.012	0.018	0.025	0.028	0.032	0.035	0.04	0.05	0.045	0.06	0.05	0.07
M STAINLESS STEEL		Vc (m/min)												
1.1 ferritic/martensitic	<850	90		0.015		0.025		0.032		0.048		0.055		0.065
2.1 austenitic	<650	85		0.012		0.022		0.03		0.045		0.05		0.06
N NON-FERROUS		Vc (m/min)												
1.1-2.3 ALUMINIUM alloyed/casted	<600	380	0.025	0.04	0.04	0.045	0.045	0.065	0.065	0.085	0.085	0.11	0.11	0.13
3.1-3.3 COPPER alloyed	<600	180	0.02	0.03	0.03	0.035	0.035	0.055	0.055	0.075	0.075	0.1	0.1	0.12
T TITANIUM		Vc (m/min)												
2.1-2.2 pure/alloyed	<1000	45		0.012		0.022		0.03		0.045		0.05		0.06
S SUPER ALLOYS		Vc (m/min)												
1.1-1.3 HRSA	<1450	20		0.01		0.018		0.025		0.04		0.045		0.055

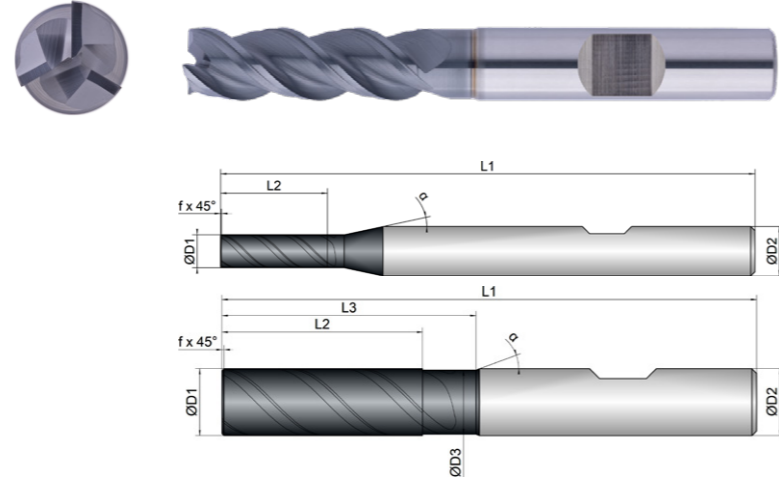
Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz
P STEEL		Vc (m/min)				
1.1-1.3 unalloyed	<850	190	0.065	0.085	0.085	0.1
2.1-2.2 low-alloyed	<950	180	0.055	0.075	0.075	0.09
3.1-3.2 high-alloyed	<1100	160	0.05	0.07	0.07	0.08
K CASTINGS		Vc (m/min)				
1.1-1.2 Grey cast iron	<1000	200	0.055	0.075	0.075	0.09
M STAINLESS STEEL		Vc (m/min)				
1.1 ferritic/martensitic	<850	90		0.07		0.08
2.1 austenitic	<650	85		0.06		0.07
N NON-FERROUS		Vc (m/min)				
1.1-2.3 ALUMINIUM alloyed/casted	<600	380	0.12	0.14	0.13	0.15
3.1-3.3 COPPER alloyed	<600	180	0.11	0.13	0.12	0.14
T TITANIUM		Vc (m/min)				
2.1-2.2 pure/alloyed	<1000	45		0.06		0.07
S SUPER ALLOYS		Vc (m/min)				
1.1-1.3 HRSA	<1450	20		0.055		0.065

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		



- 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	45°	α
	mm \varnothing	mm \varnothing	mm	mm	mm	mm \varnothing	#	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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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL		Vc (m/min)												
1.1-1.3 unalloyed	<850	190	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065	0.055	0.075
2.1-2.2 low-alloyed	<950	180	0.012	0.018	0.022	0.028	0.032	0.035	0.04	0.05	0.045	0.06	0.05	0.07
3.1-3.2 high-alloyed	<1100	160	0.01	0.015	0.02	0.025	0.03	0.032	0.038	0.048	0.04	0.055	0.045	0.065
K CASTINGS		Vc (m/min)												
1.1-1.2 Grey cast iron	<1000	200	0.012	0.018	0.025	0.028	0.032	0.035	0.04	0.05	0.045	0.06	0.05	0.07
M STAINLESS STEEL		Vc (m/min)												
1.1 ferritic/martensitic	<850	90		0.015		0.025		0.032		0.048		0.055		0.065
2.1 austenitic	<650	85		0.012		0.022		0.03		0.045		0.05		0.06
N NON-FERROUS		Vc (m/min)												
1.1-1.3 ALUMINIUM alloyed/casted	<600	380	0.025	0.04	0.04	0.045	0.045	0.065	0.065	0.085	0.085	0.11	0.11	0.13
3.1-3.3 COPPER alloyed	<600	180	0.02	0.03	0.03	0.035	0.035	0.055	0.055	0.075	0.075	0.1	0.1	0.12
T TITANIUM		Vc (m/min)												
2.1-2.2 pure/alloyed	<1000	45		0.012		0.022		0.03		0.045		0.05		0.06
S SUPER ALLOYS		Vc (m/min)												
1.1-1.3 HRSA	<1450	20		0.01		0.018		0.025		0.04		0.045		0.055

Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

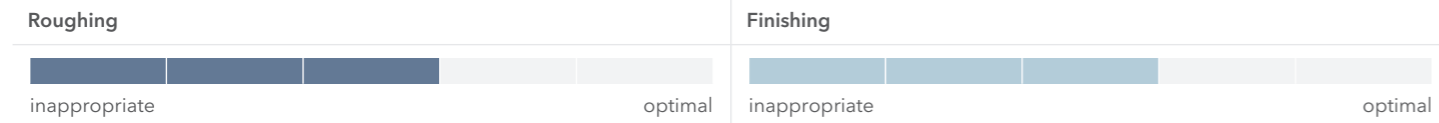
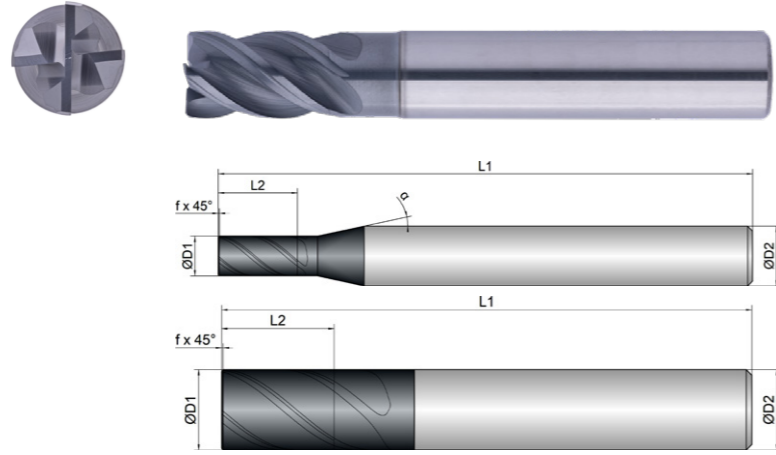
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz
P STEEL		Vc (m/min)				
1.1-1.3 unalloyed	<850	190	0.065	0.085	0.085	0.1
2.1-2.2 low-alloyed	<950	180	0.055	0.075	0.075	0.09
3.1-3.2 high-alloyed	<1100	160	0.05	0.07	0.07	0.08
K CASTINGS		Vc (m/min)				
1.1-1.2 Grey cast iron	<1000	200	0.055	0.075	0.075	0.09
M STAINLESS STEEL		Vc (m/min)				
1.1 ferritic/martensitic	<850	90		0.07		0.08
2.1 austenitic	<650	85		0.06		0.07
N NON-FERROUS		Vc (m/min)				
1.1-1.3 ALUMINIUM alloyed/casted	<600	380	0.12	0.14	0.13	0.15
3.1-3.3 COPPER alloyed	<600	180	0.11	0.13	0.12	0.14
T TITANIUM		Vc (m/min)				
2.1-2.2 pure/alloyed	<1000	45		0.06		0.07
S SUPER ALLOYS		Vc (m/min)				
1.1-1.3 HRSA	<1450	20		0.055		0.065

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA	≠	

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



BCU1-M01-0203	D1	L2	L1	D2	z	45°		α
	mm ø	mm	mm	mm ø	#			
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



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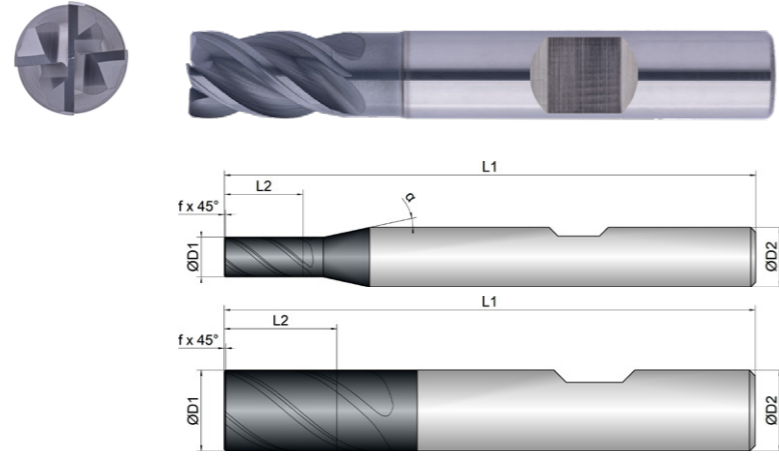
Material	Strength (N/mm ²)	Feed (mm/Z)	Ø3		Ø4		Ø5		Ø6		Ø8		Ø10	
			fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)												
1.1-1.3 unalloyed	<850	200	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
2.1-2.2 low-alloyed	<950	190	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05	0.045	0.06
3.1-3.2 high-alloyed	<1100	170	0.01	0.012	0.01	0.012	0.02	0.025	0.028	0.032	0.038	0.048	0.042	0.055
K CASTINGS		Vc (m/min)												
1.1-1.2 Grey cast iron	<1000	210	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05	0.045	0.06
M STAINLESS STEEL		Vc (m/min)												
1.1 ferritic/martensitic	<850	95		0.015		0.018		0.025		0.032		0.048		0.055
2.1 austenitic	<650	90		0.012		0.015		0.022		0.03		0.045		0.05
N NON-FERROUS		Vc (m/min)												
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.015	0.02	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1
3.1-3.3 COPPER alloyed	<600	200	0.012	0.015	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09
T TITANIUM		Vc (m/min)												
2.1-2.2 pure/alloyed	<1000	50		0.012		0.015		0.022		0.028		0.04		0.05
S SUPER ALLOYS		Vc (m/min)												
1.1-1.3 HRSA	<1450	25		0.01		0.012		0.018		0.022		0.035		0.045

Material	Strength (N/mm ²)	Feed (mm/Z)	Ø12		Ø16		Ø20	
			fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)						
1.1-1.3 unalloyed	<850	200	0.055	0.075	0.065	0.085	0.08	0.1
2.1-2.2 low-alloyed	<950	190	0.05	0.07	0.055	0.075	0.07	0.09
3.1-3.2 high-alloyed	<1100	170	0.045	0.065	0.05	0.07	0.065	0.08
K CASTINGS		Vc (m/min)						
1.1-1.2 Grey cast iron	<1000	210	0.05	0.07	0.055	0.075	0.07	0.09
M STAINLESS STEEL		Vc (m/min)						
1.1 ferritic/martensitic	<850	95		0.06		0.065		0.08
2.1 austenitic	<650	90		0.055		0.06		0.07
N NON-FERROUS		Vc (m/min)						
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.1	0.12	0.11	0.13	0.12	0.14
3.1-3.3 COPPER alloyed	<600	200	0.09	0.11	0.1	0.12	0.11	0.13
T TITANIUM		Vc (m/min)						
2.1-2.2 pure/alloyed	<1000	50		0.055		0.06		0.07
S SUPER ALLOYS		Vc (m/min)						
1.1-1.3 HRSA	<1450	25		0.05		0.055		0.065

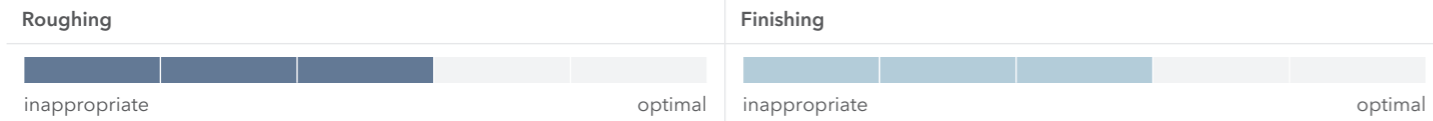
NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		



- 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 ø	mm	mm	mm ø	#			
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



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Material	Strength (N/mm ²)	Feed (mm/Z)	Ø3		Ø4		Ø5		Ø6		Ø8		Ø10	
			fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL	Vc (m/min)													
1.1-1.3 unalloyed	<850	200	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055	0.05	0.065
2.1-2.2 low-alloyed	<950	190	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05	0.045	0.06
3.1-3.2 high-alloyed	<1100	170	0.01	0.012	0.01	0.012	0.02	0.025	0.028	0.032	0.038	0.048	0.042	0.055
K CASTINGS	Vc (m/min)													
1.1-1.2 Grey cast iron	<1000	210	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05	0.045	0.06
M STAINLESS STEEL	Vc (m/min)													
1.1 ferritic/martensitic	<850	95		0.015		0.018		0.025		0.032		0.048		0.055
2.1 austenitic	<650	90		0.012		0.015		0.022		0.03		0.045		0.05
N NON-FERROUS	Vc (m/min)													
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.015	0.02	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1
3.1-3.3 COPPER alloyed	<600	200	0.012	0.015	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09
T TITANIUM	Vc (m/min)													
2.1-2.2 pure/alloyed	<1000	50		0.012		0.015		0.022		0.028		0.04		0.05
S SUPER ALLOYS	Vc (m/min)													
1.1-1.3 HRSA	<1450	25		0.01		0.012		0.018		0.022		0.035		0.045

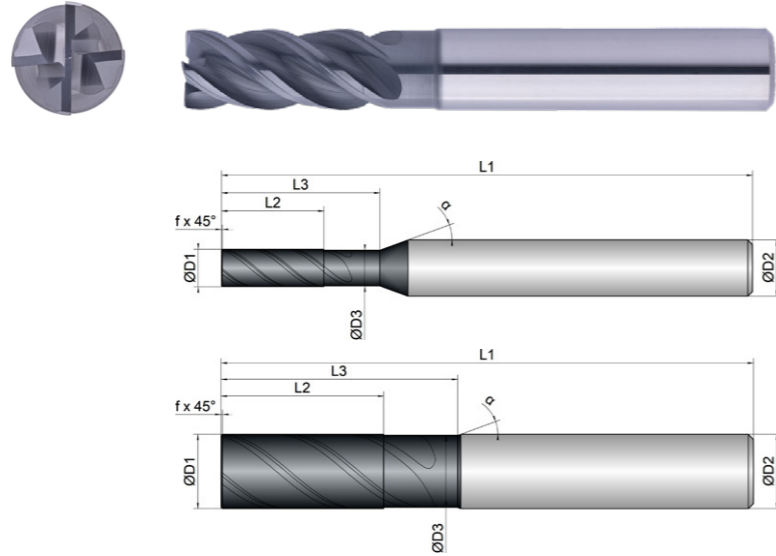
Material	Strength (N/mm ²)	Feed (mm/Z)	Ø12		Ø16		Ø20	
			fz	fz	fz	fz	fz	fz
P STEEL	Vc (m/min)							
1.1-1.3 unalloyed	<850	200	0.055	0.075	0.065	0.085	0.08	0.1
2.1-2.2 low-alloyed	<950	190	0.05	0.07	0.055	0.075	0.07	0.09
3.1-3.2 high-alloyed	<1100	170	0.045	0.065	0.05	0.07	0.065	0.08
K CASTINGS	Vc (m/min)							
1.1-1.2 Grey cast iron	<1000	210	0.05	0.07	0.055	0.075	0.07	0.09
M STAINLESS STEEL	Vc (m/min)							
1.1 ferritic/martensitic	<850	95		0.06		0.065		0.08
2.1 austenitic	<650	90		0.055		0.06		0.07
N NON-FERROUS	Vc (m/min)							
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.1	0.12	0.11	0.13	0.12	0.14
3.1-3.3 COPPER alloyed	<600	200	0.09	0.11	0.1	0.12	0.11	0.13
T TITANIUM	Vc (m/min)							
2.1-2.2 pure/alloyed	<1000	50		0.055		0.06		0.07
S SUPER ALLOYS	Vc (m/min)							
1.1-1.3 HRSA	<1450	25		0.05		0.055		0.065

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA		

- 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
	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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Dimension	Ø2		Ø3		Ø4		Ø5		Ø6		Ø8	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL															
Vc (m/min)															
1.1-1.3	unalloyed	<850	200	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055
2.1-2.2	low-alloyed	<950	190	0.01	0.012	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05
3.1-3.2	high-alloyed	<1100	170	0.008	0.01	0.01	0.012	0.01	0.012	0.02	0.025	0.028	0.032	0.038	0.048
K CASTINGS															
Vc (m/min)															
1.1-1.2	Grey cast iron	<1000	210	0.01	0.012	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05
M STAINLESS STEEL															
Vc (m/min)															
1.1	ferritic/martensitic	<850	95		0.012		0.015		0.018		0.025		0.032		0.048
2.1	austenitic	<650	90		0.01		0.012		0.015		0.022		0.03		0.045
N NON-FERROUS															
Vc (m/min)															
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.015	0.018	0.015	0.02	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08
3.1-3.3	COPPER alloyed	<600	200	0.012	0.012	0.012	0.015	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07
T TITANIUM															
Vc (m/min)															
2.1-2.2	pure/alloyed	<1000	50		0.01		0.012		0.015		0.022		0.028		0.04
S SUPER ALLOYS															
Vc (m/min)															
1.1-1.3	HRSA	<1450	25		0.008		0.01		0.012		0.018		0.022		0.035

Dimension	Ø10		Ø12		Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

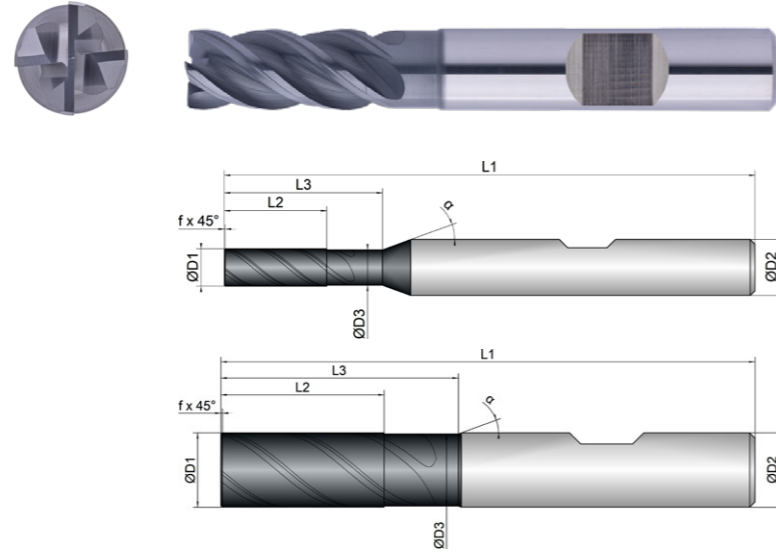
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL											
Vc (m/min)											
1.1-1.3	unalloyed	<850	200	0.05	0.065	0.055	0.075	0.065	0.085	0.08	0.1
2.1-2.2	low-alloyed	<950	190	0.045	0.06	0.05	0.07	0.055	0.075	0.07	0.09
3.1-3.2	high-alloyed	<1100	170	0.042	0.055	0.045	0.065	0.05	0.07	0.065	0.08
K CASTINGS											
Vc (m/min)											
1.1-1.2	Grey cast iron	<1000	210	0.045	0.06	0.05	0.07	0.055	0.075	0.07	0.09
M STAINLESS STEEL											
Vc (m/min)											
1.1	ferritic/martensitic	<850	95		0.055		0.06		0.065		0.08
2.1	austenitic	<650	90		0.05		0.055		0.06		0.07
N NON-FERROUS											
Vc (m/min)											
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.08	0.1	0.1	0.12	0.11	0.13	0.12	0.14
3.1-3.3	COPPER alloyed	<600	200	0.07	0.09	0.09	0.11	0.1	0.12	0.11	0.13
T TITANIUM											
Vc (m/min)											
2.1-2.2	pure/alloyed	<1000	50		0.05		0.055		0.06		0.07
S SUPER ALLOYS											
Vc (m/min)											
1.1-1.3	HRSA	<1450	25		0.045		0.05		0.055		0.065

NOTIZ | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		

- 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	45°	α
	mm \varnothing	mm \varnothing	mm	mm	mm	mm \varnothing	#	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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Dimension	Ø2		Ø3		Ø4		Ø5		Ø6		Ø8	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)												
1.1-1.3 unalloyed	<850	200	0.012	0.015	0.015	0.02	0.015	0.02	0.025	0.03	0.035	0.04	0.045	0.055
2.1-2.2 low-alloyed	<950	190	0.01	0.012	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05
3.1-3.2 high-alloyed	<1100	170	0.008	0.01	0.01	0.012	0.01	0.012	0.02	0.025	0.028	0.032	0.038	0.048
K CASTINGS		Vc (m/min)												
1.1-1.2 Grey cast iron	<1000	210	0.01	0.012	0.012	0.015	0.012	0.015	0.022	0.028	0.03	0.035	0.04	0.05
M STAINLESS STEEL		Vc (m/min)												
1.1 ferritic/martensitic	<850	95		0.012		0.015		0.018		0.025		0.032		0.048
2.1 austenitic	<650	90		0.01		0.012		0.015		0.022		0.03		0.045
N NON-FERROUS		Vc (m/min)												
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.015	0.018	0.015	0.02	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08
3.1-3.3 COPPER alloyed	<600	200	0.012	0.012	0.012	0.015	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07
T TITANIUM		Vc (m/min)												
2.1-2.2 pure/alloyed	<1000	50		0.01		0.012		0.015		0.022		0.028		0.04
S SUPER ALLOYS		Vc (m/min)												
1.1-1.3 HRSA	<1450	25		0.008		0.01		0.012		0.018		0.022		0.035

Dimension	Ø10		Ø12		Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD

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	200	0.05	0.065	0.055	0.075	0.065	0.085	0.08	0.1
2.1-2.2 low-alloyed	<950	190	0.045	0.06	0.05	0.07	0.055	0.075	0.07	0.09
3.1-3.2 high-alloyed	<1100	170	0.042	0.055	0.045	0.065	0.05	0.07	0.065	0.08
K CASTINGS		Vc (m/min)								
1.1-1.2 Grey cast iron	<1000	210	0.045	0.06	0.05	0.07	0.055	0.075	0.07	0.09
M STAINLESS STEEL		Vc (m/min)								
1.1 ferritic/martensitic	<850	95		0.055		0.06		0.065		0.08
2.1 austenitic	<650	90		0.05		0.055		0.06		0.07
N NON-FERROUS		Vc (m/min)								
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.08	0.1	0.1	0.12	0.11	0.13	0.12	0.14
3.1-3.3 COPPER alloyed	<600	200	0.07	0.09	0.09	0.11	0.1	0.12	0.11	0.13
T TITANIUM		Vc (m/min)								
2.1-2.2 pure/alloyed	<1000	50		0.05		0.055		0.06		0.07
S SUPER ALLOYS		Vc (m/min)								
1.1-1.3 HRSA	<1450	25		0.045		0.05		0.055		0.065

NOTIZ | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

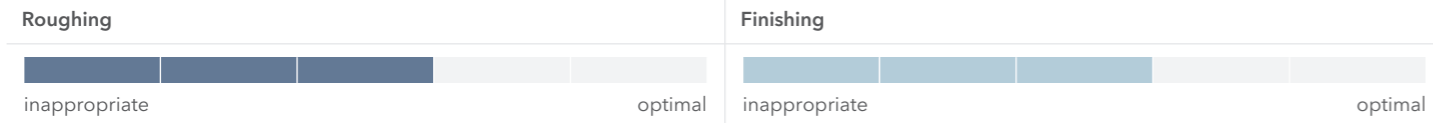
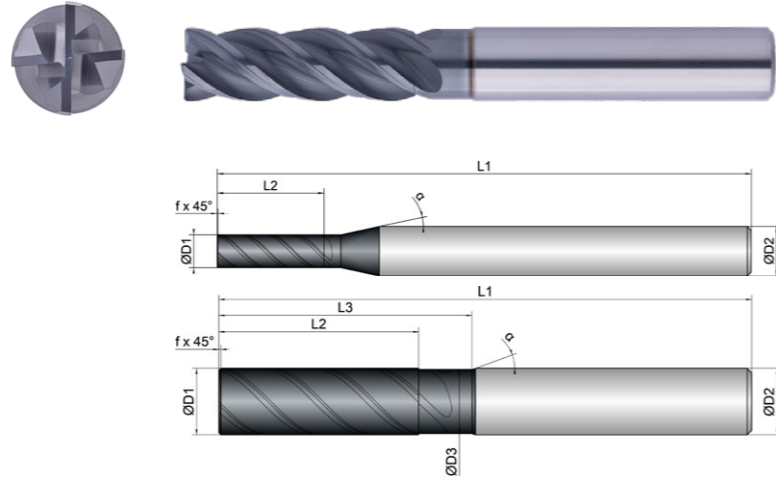
Strategy	HPC	UNI	
Application			
Features	HA	≠	



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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

- 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/mm²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P STEEL	Vc (m/min)													
1.1-1.3 unalloyed	<850	190	0.012	0.018	0.022	0.028	0.032	0.038	0.042	0.052	0.048	0.06	0.052	0.07
2.1-2.2 low-alloyed	<950	180	0.01	0.015	0.02	0.025	0.03	0.035	0.04	0.048	0.042	0.055	0.048	0.065
3.1-3.2 high-alloyed	<1100	160	0.008	0.012	0.018	0.022	0.028	0.032	0.038	0.045	0.038	0.052	0.042	0.06
K CASTINGS	Vc (m/min)													
1.1-1.2 Grey cast iron	<1000	200	0.01	0.015	0.02	0.025	0.03	0.035	0.04	0.048	0.042	0.055	0.048	0.065
M STAINLESS STEEL	Vc (m/min)													
1.1 ferritic/martensitic	<850	90		0.015		0.022		0.032		0.045		0.052		0.06
2.1 austenitic	<650	85		0.012		0.02		0.028		0.042		0.05		0.055
N NON-FERROUS	Vc (m/min)													
1.1-2.3 ALUMINIUM alloyed/casted	<600	380	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3 COPPER alloyed	<600	180	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM	Vc (m/min)													
2.1-2.2 pure/alloyed	<1000	45		0.012		0.02		0.028		0.042		0.048		0.055
S SUPER ALLOYS	Vc (m/min)													
1.1-1.3 HRSA	<1450	20		0.01		0.015		0.023		0.038		0.042		0.05

Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

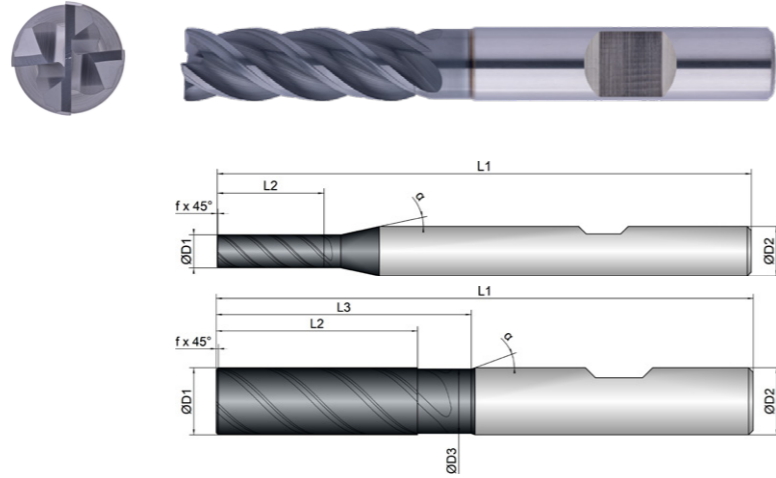
Material	Strength (N/mm²)	Feed (mm/Z)	fz	fz	fz	fz
P STEEL	Vc (m/min)					
1.1-1.3 unalloyed	<850	190	0.06	0.08	0.075	0.09
2.1-2.2 low-alloyed	<950	180	0.05	0.07	0.065	0.08
3.1-3.2 high-alloyed	<1100	160	0.045	0.065	0.06	0.075
K CASTINGS	Vc (m/min)					
1.1-1.2 Grey cast iron	<1000	200	0.05	0.07	0.065	0.08
M STAINLESS STEEL	Vc (m/min)					
1.1 ferritic/martensitic	<850	90		0.065		0.075
2.1 austenitic	<650	85		0.06		0.065
N NON-FERROUS	Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/casted	<600	380	0.11	0.13	0.12	0.14
3.1-3.3 COPPER alloyed	<600	180	0.1	0.12	0.11	0.13
T TITANIUM	Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	45		0.055		0.065
S SUPER ALLOYS	Vc (m/min)					
1.1-1.3 HRSA	<1450	20		0.05		0.06

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB		

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



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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL		Vc (m/min)													
1.1-1.3	unalloyed	<850	190	0.012	0.018	0.022	0.028	0.032	0.038	0.042	0.052	0.048	0.06	0.052	0.07
2.1-2.2	low-alloyed	<950	180	0.01	0.015	0.02	0.025	0.03	0.035	0.04	0.048	0.042	0.055	0.048	0.065
3.1-3.2	high-alloyed	<1100	160	0.008	0.012	0.018	0.022	0.028	0.032	0.038	0.045	0.038	0.052	0.042	0.06
K CASTINGS		Vc (m/min)													
1.1-1.2	Grey cast iron	<1000	200	0.01	0.015	0.02	0.025	0.03	0.035	0.04	0.048	0.042	0.055	0.048	0.065
M STAINLESS STEEL		Vc (m/min)													
1.1	ferritic/martensitic	<850	90		0.015		0.022		0.032		0.045		0.052		0.06
2.1	austenitic	<650	85		0.012		0.02		0.028		0.042		0.05		0.055
N NON-FERROUS		Vc (m/min)													
1.1-2.3	ALUMINIUM alloyed/casted	<600	380	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3	COPPER alloyed	<600	180	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM		Vc (m/min)													
2.1-2.2	pure/alloyed	<1000	45		0.012		0.02		0.028		0.042		0.048		0.055
S SUPER ALLOYS		Vc (m/min)													
1.1-1.3	HRSA	<1450	20		0.01		0.015		0.023		0.038		0.042		0.05

Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

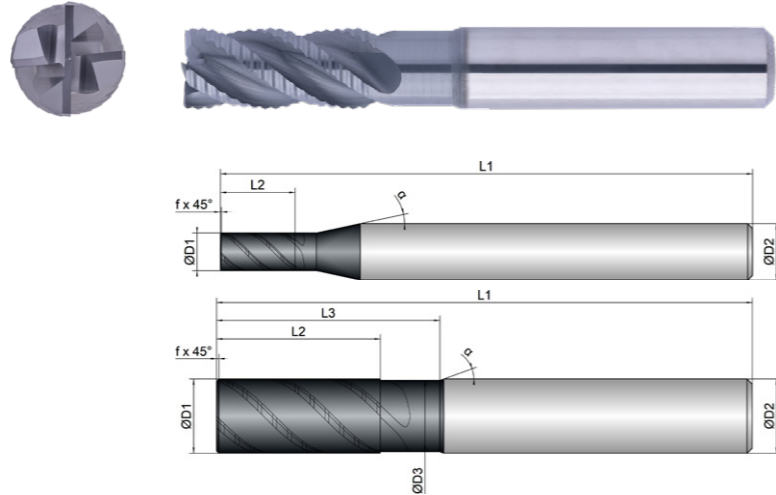
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	
P STEEL		Vc (m/min)					
1.1-1.3	unalloyed	<850	190	0.06	0.08	0.075	0.09
2.1-2.2	low-alloyed	<950	180	0.05	0.07	0.065	0.08
3.1-3.2	high-alloyed	<1100	160	0.045	0.065	0.06	0.075
K CASTINGS		Vc (m/min)					
1.1-1.2	Grey cast iron	<1000	200	0.05	0.07	0.065	0.08
M STAINLESS STEEL		Vc (m/min)					
1.1	ferritic/martensitic	<850	90		0.065		0.075
2.1	austenitic	<650	85		0.06		0.065
N NON-FERROUS		Vc (m/min)					
1.1-2.3	ALUMINIUM alloyed/casted	<600	380	0.11	0.13	0.12	0.14
3.1-3.3	COPPER alloyed	<600	180	0.1	0.12	0.11	0.13
T TITANIUM		Vc (m/min)					
2.1-2.2	pure/alloyed	<1000	45		0.055		0.065
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3	HRSA	<1450	20		0.05		0.06

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application		Basic	
Features	HA	≠	2xD

- 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	12
5	5.0	0.0	9.0	0.0	57.0	6.0	4	0.20	12
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	31.0	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



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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12			
	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD		
Infeed in mm	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD	ap=1xD		
Application														
Material	Strength (N/mm²)													
P STEEL	Vc (m/min)													
1.1-1.3 unalloyed	<850	185	0.015	0.02	0.02	0.03	0.03	0.04	0.04	0.055	0.06	0.08	0.065	0.09
2.1-2.2 low-alloyed	<950	175	0.012	0.018	0.018	0.028	0.028	0.037	0.037	0.052	0.055	0.075	0.06	0.085
3.1-3.2 high-alloyed	<1100	165	0.01	0.015	0.015	0.025	0.025	0.034	0.034	0.048	0.05	0.07	0.055	0.08
K CASTINGS	Vc (m/min)													
1.1-1.2 Grey cast iron	<1000	200	0.012	0.018	0.018	0.028	0.028	0.037	0.037	0.052	0.055	0.075	0.06	0.085
M STAINLESS STEEL	Vc (m/min)													
1.1 ferritic/martensitic	<850	90	0.006	0.01	0.01	0.015	0.018	0.025	0.025	0.035	0.03	0.05	0.04	0.06
2.1 austenitic	<650	85	0.005	0.008	0.008	0.012	0.015	0.022	0.022	0.031	0.028	0.045	0.035	0.055
N NON-FERROUS	Vc (m/min)													
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3 COPPER alloyed	<600	200	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM	Vc (m/min)													
2.1-2.2 pure/alloyed	<1000	40	0.01	0.015	0.025	0.035	0.045	0.055						
S SUPER ALLOYS	Vc (m/min)													
1.1-1.3 HRSA	<1450													

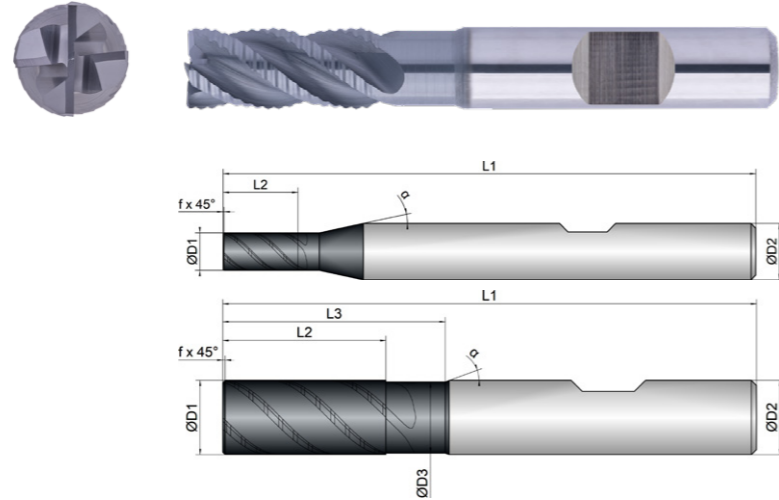
Dimension	Ø16		Ø20			
	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD		
Infeed in mm	ap=1xD	ap=1xD	ap=1xD	ap=1xD		
Application						
Material	Strength (N/mm²)					
P STEEL	Vc (m/min)					
1.1-1.3 unalloyed	<850	185	0.07	0.095	0.08	0.12
2.1-2.2 low-alloyed	<950	175	0.065	0.09	0.075	0.11
3.1-3.2 high-alloyed	<1100	165	0.06	0.085	0.07	0.1
K CASTINGS	Vc (m/min)					
1.1-1.2 Grey cast iron	<1000	200	0.065	0.09	0.075	0.11
M STAINLESS STEEL	Vc (m/min)					
1.1 ferritic/martensitic	<850	90	0.05	0.07	0.06	0.08
2.1 austenitic	<650	85	0.045	0.065	0.055	0.07
N NON-FERROUS	Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.11	0.13	0.12	0.14
3.1-3.3 COPPER alloyed	<600	200	0.1	0.12	0.11	0.13
T TITANIUM	Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	40	0.065	0.07		
S SUPER ALLOYS	Vc (m/min)					
1.1-1.3 HRSA	<1450					

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB	\neq	2xD

- 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	D3	L2	L3	L1	D2	z	α	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	45
8	8.0	7.6	19.0	25.0	63.0	8.0	4	0.20	45
10	10.0	9.6	22.0	30.0	72.0	10.0	4	0.32	45
12	12.0	11.4	26.0	36.0	83.0	12.0	4	0.32	45
16	16.0	15.4	31.0	42.0	92.0	16.0	4	0.32	45
20	20.0	19.4	41.0	52.0	104.0	20.0	4	0.50	45



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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL															
Vc (m/min)															
1.1-1.3	unalloyed	<850	185	0.015	0.02	0.02	0.03	0.03	0.04	0.04	0.055	0.06	0.08	0.065	0.09
2.1-2.2	low-alloyed	<950	175	0.012	0.018	0.018	0.028	0.028	0.037	0.037	0.052	0.055	0.075	0.06	0.085
3.1-3.2	high-alloyed	<1100	165	0.01	0.015	0.015	0.025	0.025	0.034	0.034	0.048	0.05	0.07	0.055	0.08
K CASTINGS															
Vc (m/min)															
1.1-1.2	Grey cast iron	<1000	200	0.012	0.018	0.018	0.028	0.028	0.037	0.037	0.052	0.055	0.075	0.06	0.085
M STAINLESS STEEL															
Vc (m/min)															
1.1	ferritic/martensitic	<850	90	0.006	0.01	0.01	0.015	0.018	0.025	0.025	0.035	0.03	0.05	0.04	0.06
2.1	austenitic	<650	85	0.005	0.008	0.008	0.012	0.015	0.022	0.022	0.031	0.028	0.045	0.035	0.055
N NON-FERROUS															
Vc (m/min)															
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3	COPPER alloyed	<600	200	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM															
Vc (m/min)															
2.1-2.2	pure/alloyed	<1000	40		0.01		0.015		0.025		0.035		0.045		0.055
S SUPER ALLOYS															
Vc (m/min)															
1.1-1.3	HRSA	<1450													

Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

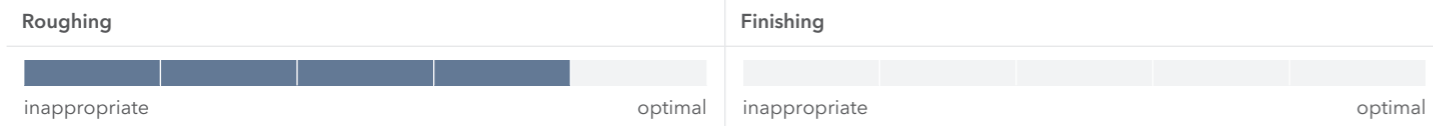
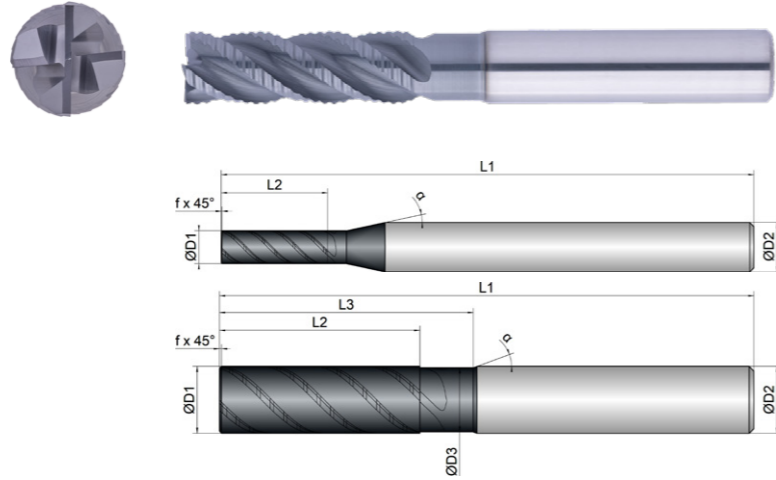
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	
P STEEL							
Vc (m/min)							
1.1-1.3	unalloyed	<850	185	0.07	0.095	0.08	0.12
2.1-2.2	low-alloyed	<950	175	0.065	0.09	0.075	0.11
3.1-3.2	high-alloyed	<1100	165	0.06	0.085	0.07	0.1
K CASTINGS							
Vc (m/min)							
1.1-1.2	Grey cast iron	<1000	200	0.065	0.09	0.075	0.11
M STAINLESS STEEL							
Vc (m/min)							
1.1	ferritic/martensitic	<850	90	0.05	0.07	0.06	0.08
2.1	austenitic	<650	85	0.045	0.065	0.055	0.07
N NON-FERROUS							
Vc (m/min)							
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.11	0.13	0.12	0.14
3.1-3.3	COPPER alloyed	<600	200	0.1	0.12	0.11	0.13
T TITANIUM							
Vc (m/min)							
2.1-2.2	pure/alloyed	<1000	40		0.065		0.07
S SUPER ALLOYS							
Vc (m/min)							
1.1-1.3	HRSA	<1450					

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HA	≠	3xD

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



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



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Dimension	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application												

Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz	
P STEEL		Vc (m/min)													
1.1-1.3	unalloyed	<850	175	0.012	0.015	0.015	0.022	0.022	0.032	0.032	0.048	0.05	0.07	0.055	0.08
2.1-2.2	low-alloyed	<950	165	0.01	0.012	0.012	0.02	0.02	0.03	0.03	0.043	0.045	0.065	0.05	0.075
3.1-3.2	high-alloyed	<1100	155	0.008	0.01	0.01	0.018	0.018	0.025	0.025	0.04	0.042	0.06	0.045	0.07
K CASTINGS		Vc (m/min)													
1.1-1.2	Grey cast iron	<1000	180	0.01	0.012	0.012	0.02	0.02	0.03	0.03	0.043	0.045	0.065	0.05	0.075
M STAINLESS STEEL		Vc (m/min)													
1.1	ferritic/martensitic	<850	85	0.006	0.01	0.01	0.015	0.018	0.025	0.025	0.035	0.03	0.05	0.04	0.06
2.1	austenitic	<650	80	0.005	0.008	0.008	0.012	0.015	0.022	0.022	0.031	0.028	0.045	0.035	0.055
N NON-FERROUS		Vc (m/min)													
1.1-2.3	ALUMINIUM alloyed/casted	<600	360	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3	COPPER alloyed	<600	180	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM		Vc (m/min)													
2.1-2.2	pure/alloyed	<1000	35		0.01		0.015		0.025		0.035		0.045		0.055
S SUPER ALLOYS		Vc (m/min)													
1.1-1.3	HRSA	<1450													

Dimension	Ø16		Ø20	
Infeed in mm	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD
Application				

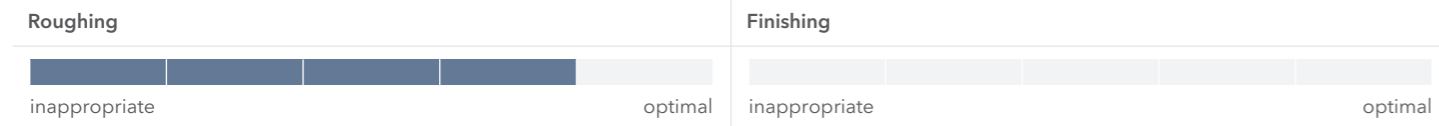
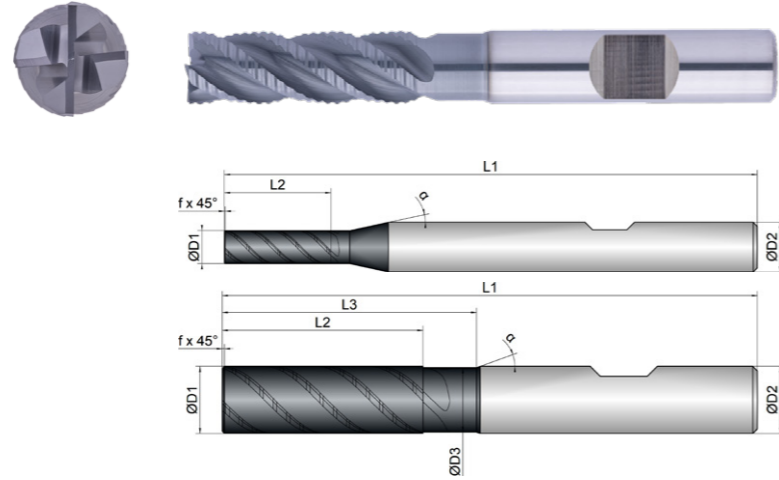
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	
P STEEL		Vc (m/min)					
1.1-1.3	unalloyed	<850	175	0.06	0.085	0.07	0.1
2.1-2.2	low-alloyed	<950	165	0.055	0.08	0.065	0.09
3.1-3.2	high-alloyed	<1100	155	0.05	0.075	0.06	0.08
K CASTINGS		Vc (m/min)					
1.1-1.2	Grey cast iron	<1000	180	0.055	0.08	0.065	0.09
M STAINLESS STEEL		Vc (m/min)					
1.1	ferritic/martensitic	<850	85	0.05	0.07	0.06	0.08
2.1	austenitic	<650	80	0.045	0.065	0.055	0.07
N NON-FERROUS		Vc (m/min)					
1.1-2.3	ALUMINIUM alloyed/casted	<600	360	0.11	0.13	0.12	0.14
3.1-3.3	COPPER alloyed	<600	180	0.1	0.12	0.11	0.13
T TITANIUM		Vc (m/min)					
2.1-2.2	pure/alloyed	<1000	35		0.065		0.07
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3	HRSA	<1450					

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC	UNI	
Application			
Features	HB	\neq	3xD

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



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



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Material	Strength (N/mm ²)	Feed (mm/Z)	Ø4		Ø5		Ø6		Ø8		Ø10		Ø12		
			ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	
P STEEL			Vc (m/min)												
1.1-1.3	unalloyed	<850	175	0.012	0.015	0.015	0.022	0.022	0.032	0.032	0.048	0.05	0.07	0.055	0.08
2.1-2.2	low-alloyed	<950	165	0.01	0.012	0.012	0.02	0.02	0.03	0.03	0.043	0.045	0.065	0.05	0.075
3.1-3.2	high-alloyed	<1100	155	0.008	0.01	0.01	0.018	0.018	0.025	0.025	0.04	0.042	0.06	0.045	0.07
K CASTINGS			Vc (m/min)												
1.1-1.2	Grey cast iron	<1000	180	0.01	0.012	0.012	0.02	0.02	0.03	0.03	0.043	0.045	0.065	0.05	0.075
M STAINLESS STEEL			Vc (m/min)												
1.1	ferritic/martensitic	<850	85	0.006	0.01	0.01	0.015	0.018	0.025	0.025	0.035	0.03	0.05	0.04	0.06
2.1	austenitic	<650	80	0.005	0.008	0.008	0.012	0.015	0.022	0.022	0.031	0.028	0.045	0.035	0.055
N NON-FERROUS			Vc (m/min)												
1.1-2.3	ALUMINIUM alloyed/casted	<600	360	0.02	0.035	0.035	0.04	0.04	0.06	0.06	0.08	0.08	0.1	0.1	0.12
3.1-3.3	COPPER alloyed	<600	180	0.015	0.025	0.025	0.03	0.03	0.05	0.05	0.07	0.07	0.09	0.09	0.11
T TITANIUM			Vc (m/min)												
2.1-2.2	pure/alloyed	<1000	35	0.01	0.015	0.025	0.035	0.045	0.055	0.065	0.075	0.085	0.095	0.105	0.115
S SUPER ALLOYS			Vc (m/min)												
1.1-1.3	HRSA	<1450	35	0.01	0.015	0.025	0.035	0.045	0.055	0.065	0.075	0.085	0.095	0.105	0.115

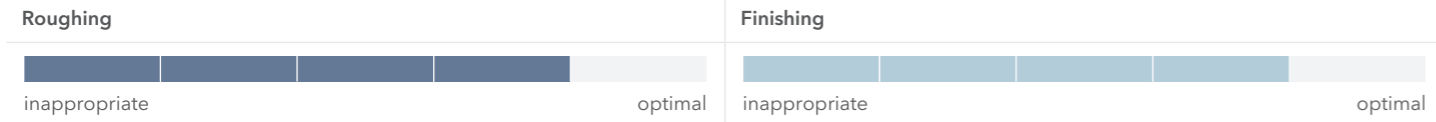
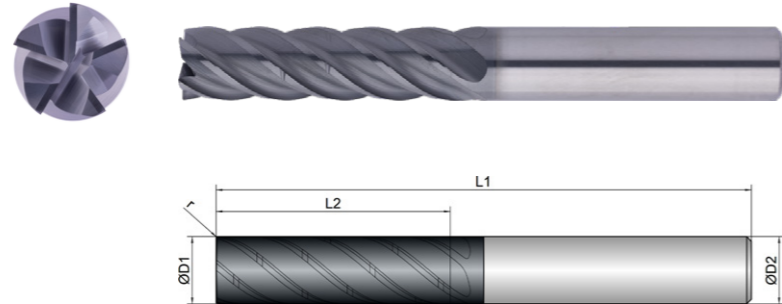
Material	Strength (N/mm ²)	Feed (mm/Z)	Ø16		Ø20		
			ae=1xD	ae=0.3xD	ae=1xD	ae=0.3xD	
P STEEL			Vc (m/min)				
1.1-1.3	unalloyed	<850	175	0.06	0.085	0.07	0.1
2.1-2.2	low-alloyed	<950	165	0.055	0.08	0.065	0.09
3.1-3.2	high-alloyed	<1100	155	0.05	0.075	0.06	0.08
K CASTINGS			Vc (m/min)				
1.1-1.2	Grey cast iron	<1000	180	0.055	0.08	0.065	0.09
M STAINLESS STEEL			Vc (m/min)				
1.1	ferritic/martensitic	<850	85	0.05	0.07	0.06	0.08
2.1	austenitic	<650	80	0.045	0.065	0.055	0.07
N NON-FERROUS			Vc (m/min)				
1.1-2.3	ALUMINIUM alloyed/casted	<600	360	0.11	0.13	0.12	0.14
3.1-3.3	COPPER alloyed	<600	180	0.1	0.12	0.11	0.13
T TITANIUM			Vc (m/min)				
2.1-2.2	pure/alloyed	<1000	35	0.065	0.07	0.075	0.08
S SUPER ALLOYS			Vc (m/min)				
1.1-1.3	HRSA	<1450	35	0.065	0.07	0.075	0.08

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	
Application		
Features	HA \neq	

- 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



BCU1-M03-0123	D1	L2	L1	D2	z	r	
	 mm ∅	 mm	 mm	 mm ∅	 #	 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



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Dimension	∅6	∅8	∅10	∅12	∅16
Infeed in mm	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max
Application					

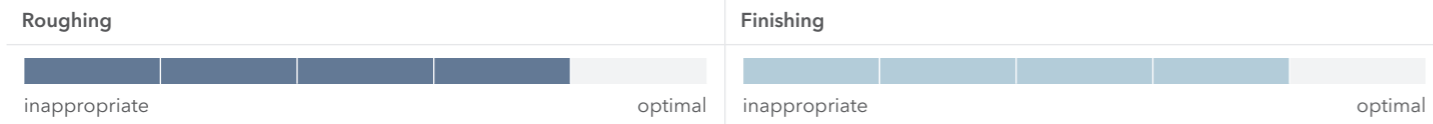
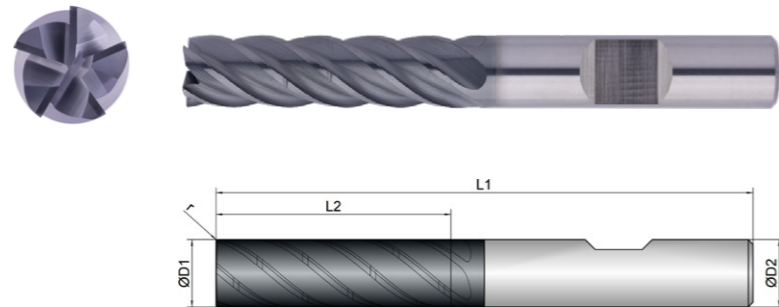
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3	unalloyed	<850	240	0.05	0.07	0.08	0.09
2.1-2.2	low-alloyed	<950	200	0.045	0.065	0.075	0.085
3.1-3.2	high-alloyed	<1100	180	0.04	0.06	0.07	0.08
K CASTINGS		Vc (m/min)					
1.1-1.2	Grey cast iron	<1000	220	0.045	0.065	0.075	0.085
M STAINLESS STEEL		Vc (m/min)					
1.1	ferritic/martensitic	<850	170	0.045	0.06	0.07	0.09
2.1	austenitic	<650	160	0.04	0.045	0.05	0.07
N NON-FERROUS		Vc (m/min)					
1.1-2.3	ALUMINIUM alloyed/casted	<600	400	0.04	0.05	0.06	0.07
3.1-3.3	COPPER alloyed	<600	160	0.035	0.045	0.05	0.06
T TITANIUM		Vc (m/min)					
2.1-2.2	pure/alloyed	<1000	80	0.035	0.045	0.05	0.06
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3	HRSA	<1450					

NOTE | The values marked in turquoise are side applications! We recommend the use of HB shank and side lock arbor. (EXPK1-M03-0124). Values for ETC-milling; please reduce Vc and fz by 20% using side milling.

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	ETC	
Application		
Features	HB \neq	

- 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



BCU1-M03-0124	D1	L2	L1	D2	z	r	
	 mm ∅	 mm	 mm	 mm ∅	 #	 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



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Dimension	∅6	∅8	∅10	∅12	∅16
Infeed in mm	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max	ae= 0.07xD ap= L2 max
Application					

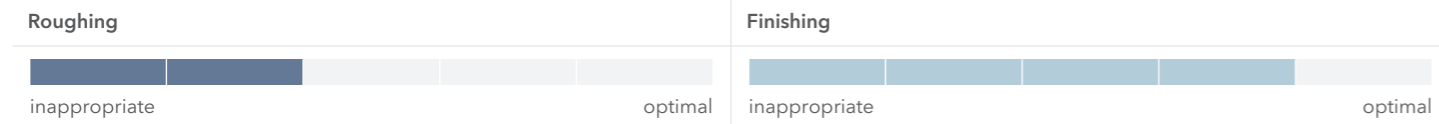
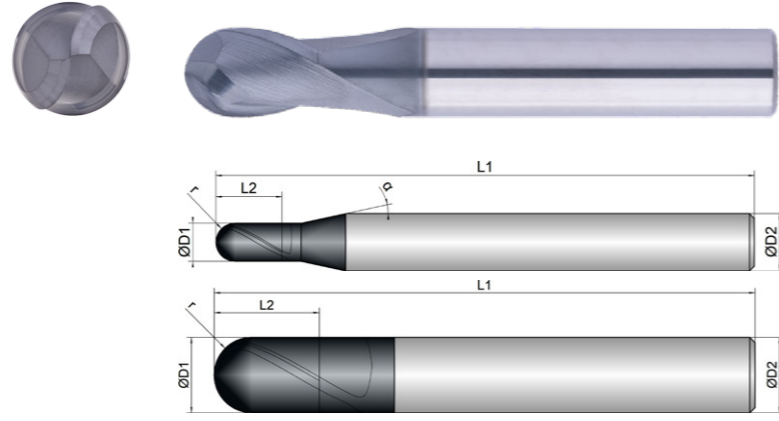
Material	Strength (N/mm ²)	Feed (mm/Z)	Strength				
			fz	fz	fz	fz	fz
P STEEL		Vc (m/min)					
1.1-1.3 unalloyed	<850	240	0.05	0.07	0.08	0.09	0.11
2.1-2.2 low-alloyed	<950	200	0.045	0.065	0.075	0.085	0.1
3.1-3.2 high-alloyed	<1100	180	0.04	0.06	0.07	0.08	0.09
K CASTINGS		Vc (m/min)					
1.1-1.2 Grey cast iron	<1000	220	0.045	0.065	0.075	0.085	0.1
M STAINLESS STEEL		Vc (m/min)					
1.1 ferritic/martensitic	<850	170	0.045	0.06	0.07	0.09	0.11
2.1 austenitic	<650	160	0.04	0.045	0.05	0.07	0.09
N NON-FERROUS		Vc (m/min)					
1.1-2.3 ALUMINIUM alloyed/casted	<600	400	0.04	0.05	0.06	0.07	0.11
3.1-3.3 COPPER alloyed	<600	160	0.035	0.045	0.05	0.06	0.08
T TITANIUM		Vc (m/min)					
2.1-2.2 pure/alloyed	<1000	80	0.035	0.045	0.05	0.06	0.08
S SUPER ALLOYS		Vc (m/min)					
1.1-1.3 HRSA	<1450						

NOTE | The values marked in turquoise are side applications! Values for ETC-milling; please reduce Vc and fz by 20% using side milling.

Cooling	
Tolerance	f8
Coating	BetaUni Iron

Strategy	HSC	UNI	
Application			
Features	HA		

- 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



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Dimension	∅0.5	∅1	∅1.5	∅2	∅2.5	∅3	∅4	∅5	∅6	∅8
Infeed in mm	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD
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	290	0.01	0.02	0.03	0.04	0.045	0.05	0.06	0.07	0.085	0.12
2.1-2.2	low-alloyed	<950	240	0.008	0.015	0.025	0.035	0.04	0.045	0.055	0.065	0.08	0.11
3.1-3.2	high-alloyed	<1100	230	0.006	0.012	0.022	0.03	0.035	0.04	0.05	0.06	0.075	0.09
K CASTINGS Vc (m/min)													
1.1-1.2	Grey cast iron	<1000	300	0.008	0.015	0.025	0.035	0.045	0.05	0.055	0.065	0.08	0.11
M STAINLESS STEEL Vc (m/min)													
1.1	ferritic/martensitic	<850	100	0.01	0.015	0.02	0.025	0.03	0.035	0.045	0.05	0.06	0.075
2.1	austenitic	<650	85	0.008	0.012	0.015	0.02	0.025	0.03	0.04	0.045	0.055	0.07
N NON-FERROUS Vc (m/min)													
1.1-2.3	ALUMINIUM alloyed/casted	<600	500	0.01	0.015	0.018	0.02	0.022	0.025	0.03	0.05	0.06	0.07
3.1-3.3	COPPER alloyed	<600	220	0.006	0.008	0.012	0.015	0.018	0.02	0.024	0.04	0.05	0.06
T TITANIUM Vc (m/min)													
2.1-2.2	pure/alloyed	<1000	50	0.008	0.012	0.012	0.015	0.015	0.018	0.022	0.025	0.03	0.04
S SUPER ALLOYS Vc (m/min)													
1.1-1.3	HRSA	<1450	30	0.006	0.01	0.01	0.012	0.012	0.015	0.018	0.02	0.025	0.035

Dimension	∅10	∅12
Infeed in mm	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD
Application		

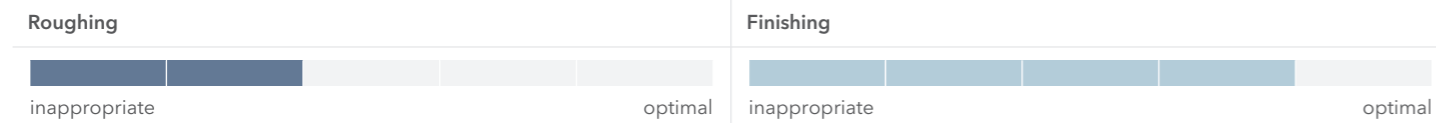
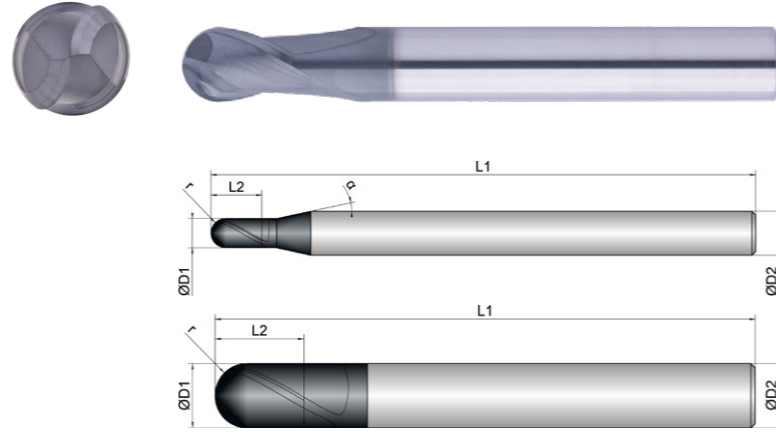
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	
P STEEL Vc (m/min)					
1.1-1.3	unalloyed	<850	290	0.13	0.14
2.1-2.2	low-alloyed	<950	240	0.12	0.13
3.1-3.2	high-alloyed	<1100	230	0.1	0.11
K CASTINGS Vc (m/min)					
1.1-1.2	Grey cast iron	<1000	300	0.12	0.13
M STAINLESS STEEL Vc (m/min)					
1.1	ferritic/martensitic	<850	100	0.09	0.1
2.1	austenitic	<650	85	0.08	0.09
N NON-FERROUS Vc (m/min)					
1.1-2.3	ALUMINIUM alloyed/casted	<600	500	0.08	0.09
3.1-3.3	COPPER alloyed	<600	220	0.065	0.075
T TITANIUM Vc (m/min)					
2.1-2.2	pure/alloyed	<1000	50	0.055	0.065
S SUPER ALLOYS Vc (m/min)					
1.1-1.3	HRSA	<1450	30	0.045	0.055

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	f8
Coating	BetaUni Iron

Strategy	HSC	UNI	
Application			
Features	HA		

- 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 mm 	L2 mm 	L1 mm 	D2 mm 	z # 	r mm 		α °
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



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Dimension	Ø0.5	Ø1	Ø1.5	Ø2	Ø2.5	Ø3	Ø4	Ø5	Ø6	Ø8
Infeed in mm	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD
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	270	0.01	0.02	0.03	0.04	0.045	0.05	0.06	0.07	0.085	0.12
2.1-2.2	low-alloyed	<950	220	0.008	0.015	0.025	0.035	0.04	0.045	0.055	0.065	0.08	0.11
3.1-3.2	high-alloyed	<1100	210	0.006	0.012	0.022	0.03	0.035	0.04	0.05	0.06	0.075	0.09
K CASTINGS		Vc (m/min)											
1.1-1.2	Grey cast iron	<1000	280	0.008	0.015	0.025	0.035	0.045	0.05	0.055	0.065	0.08	0.11
M STAINLESS STEEL		Vc (m/min)											
1.1	ferritic/martensitic	<850	90	0.01	0.015	0.02	0.025	0.03	0.035	0.045	0.05	0.06	0.075
2.1	austenitic	<650	75	0.008	0.012	0.015	0.02	0.025	0.03	0.04	0.045	0.055	0.07
N NON-FERROUS		Vc (m/min)											
1.1-2.3	ALUMINIUM alloyed/casted	<600	470	0.01	0.015	0.018	0.02	0.022	0.025	0.03	0.05	0.06	0.07
3.1-3.3	COPPER alloyed	<600	200	0.008	0.01	0.012	0.015	0.018	0.02	0.026	0.04	0.05	0.06
T TITANIUM		Vc (m/min)											
2.1-2.2	pure/alloyed	<1000	45	0.008	0.012	0.012	0.015	0.015	0.018	0.022	0.025	0.03	0.04
S SUPER ALLOYS		Vc (m/min)											
1.1-1.3	HRSA	<1450	25	0.006	0.01	0.01	0.012	0.012	0.015	0.018	0.02	0.025	0.035

Dimension	Ø10	Ø12
Infeed in mm	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD
Application		

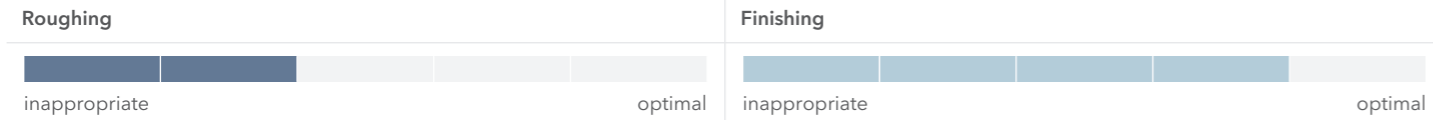
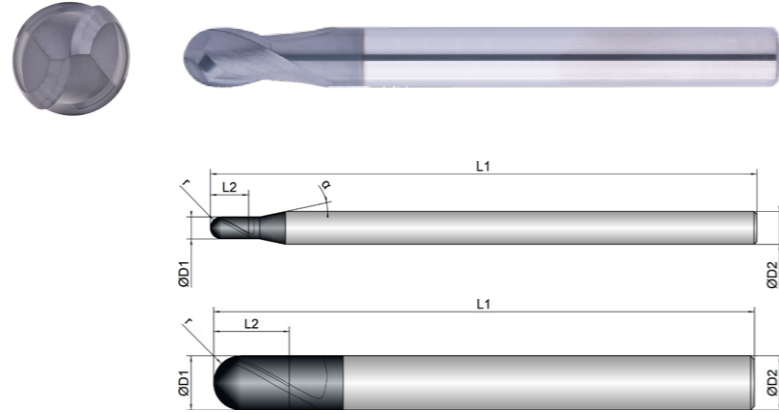
Material	Strength (N/mm ²)	Feed (mm/Z)	fz	fz	
P STEEL		Vc (m/min)			
1.1-1.3	unalloyed	<850	270	0.13	0.14
2.1-2.2	low-alloyed	<950	220	0.12	0.13
3.1-3.2	high-alloyed	<1100	210	0.1	0.11
K CASTINGS		Vc (m/min)			
1.1-1.2	Grey cast iron	<1000	280	0.12	0.13
M STAINLESS STEEL		Vc (m/min)			
1.1	ferritic/martensitic	<850	90	0.09	0.1
2.1	austenitic	<650	75	0.08	0.09
N NON-FERROUS		Vc (m/min)			
1.1-2.3	ALUMINIUM alloyed/casted	<600	470	0.08	0.09
3.1-3.3	COPPER alloyed	<600	200	0.065	0.075
T TITANIUM		Vc (m/min)			
2.1-2.2	pure/alloyed	<1000	45	0.055	0.065
S SUPER ALLOYS		Vc (m/min)			
1.1-1.3	HRSA	<1450	25	0.045	0.055

NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	f8
Coating	BetaUni Iron

Strategy	HSC	UNI	
Application			
Features	HA		

- 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 mm ø	L2 mm	L1 mm	D2 mm ø	z #	r mm		α
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



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Dimension	Ø1	Ø1.5	Ø2	Ø2.5	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10
Infeed in mm	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD	ae=0.05xD ap=0.05xD
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	240	0.015	0.025	0.035	0.04	0.045	0.055	0.065	0.75	0.11	0.12
2.1-2.2 low-alloyed	<950	200	0.012	0.02	0.03	0.035	0.04	0.05	0.06	0.07	0.1	0.11
3.1-3.2 high-alloyed	<1100	195	0.01	0.015	0.025	0.03	0.035	0.045	0.055	0.065	0.08	0.09
K CASTINGS		Vc (m/min)										
1.1-1.2 Grey cast iron	<1000	260	0.012	0.02	0.03	0.035	0.04	0.05	0.06	0.07	0.1	0.11
M STAINLESS STEEL		Vc (m/min)										
1.1 ferritic/martensitic	<850	80	0.012	0.015	0.02	0.025	0.03	0.04	0.045	0.055	0.065	0.08
2.1 austenitic	<650	68	0.01	0.012	0.015	0.02	0.025	0.035	0.04	0.05	0.06	0.07
N NON-FERROUS		Vc (m/min)										
1.1-2.3 ALUMINIUM alloyed/casted	<600	440	0.012	0.015	0.018	0.02	0.025	0.03	0.045	0.055	0.065	0.075
3.1-3.3 COPPER alloyed	<600	180	0.008	0.01	0.012	0.015	0.018	0.022	0.035	0.045	0.055	0.06
T TITANIUM		Vc (m/min)										
2.1-2.2 pure/alloyed	<1000	40	0.01	0.01	0.012	0.012	0.015	0.02	0.022	0.025	0.035	0.05
S SUPER ALLOYS		Vc (m/min)										
1.1-1.3 HRSA	<1450	20	0.008	0.008	0.01	0.01	0.012	0.015	0.018	0.022	0.03	0.045

Dimension	Ø12
Infeed in mm	ae=0.05xD ap=0.05xD
Application	

Material	Strength (N/mm ²)	Feed (mm/Z)	fz
P STEEL		Vc (m/min)	
1.1-1.3 unalloyed	<850	240	0.13
2.1-2.2 low-alloyed	<950	200	0.12
3.1-3.2 high-alloyed	<1100	195	0.1
K CASTINGS		Vc (m/min)	
1.1-1.2 Grey cast iron	<1000	260	0.12
M STAINLESS STEEL		Vc (m/min)	
1.1 ferritic/martensitic	<850	80	0.09
2.1 austenitic	<650	68	0.08
N NON-FERROUS		Vc (m/min)	
1.1-2.3 ALUMINIUM alloyed/casted	<600	440	0.085
3.1-3.3 COPPER alloyed	<600	180	0.07
T TITANIUM		Vc (m/min)	
2.1-2.2 pure/alloyed	<1000	40	0.06
S SUPER ALLOYS		Vc (m/min)	
1.1-1.3 HRSA	<1450	20	0.05

NOTE | The values marked in turquoise are side applications!

Cooling

Tolerance a9

Coating BetaUni Iron

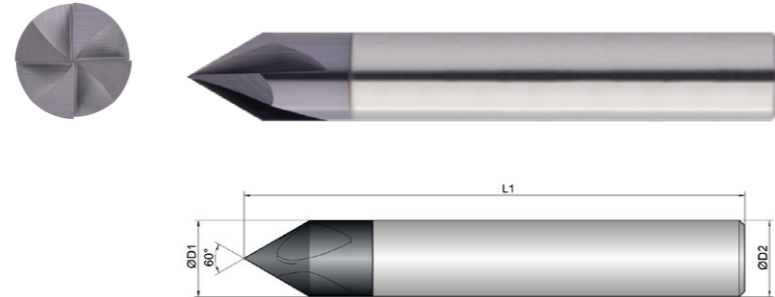
Strategy **UNI**

Application

Features **HA**

Basic

■ For universal chamfering of work pieces



Roughing **Finishing**

inappropriate optimal inappropriate optimal

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	



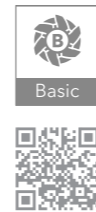
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Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16		
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max		
Application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

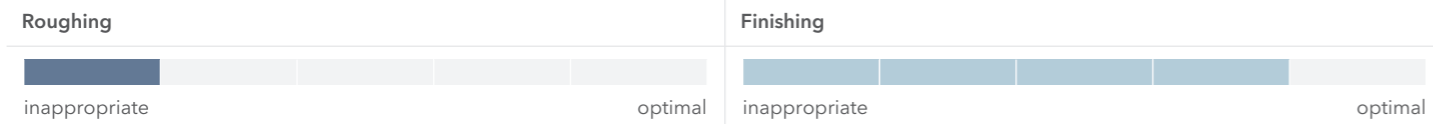
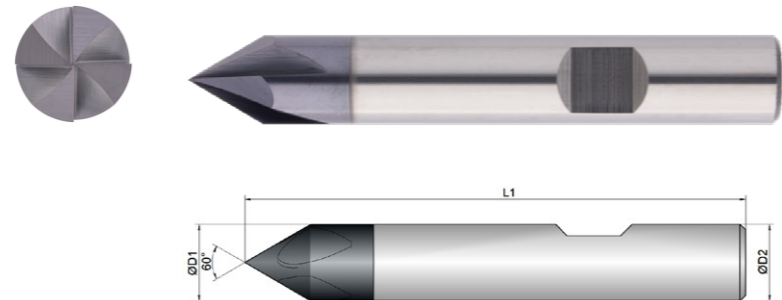
NOTE | The values marked in turquoise are side applications!

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



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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/casted <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

NOTIZ | The values marked in turquoise are side applications!

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 a9

Coating BetaUni Iron

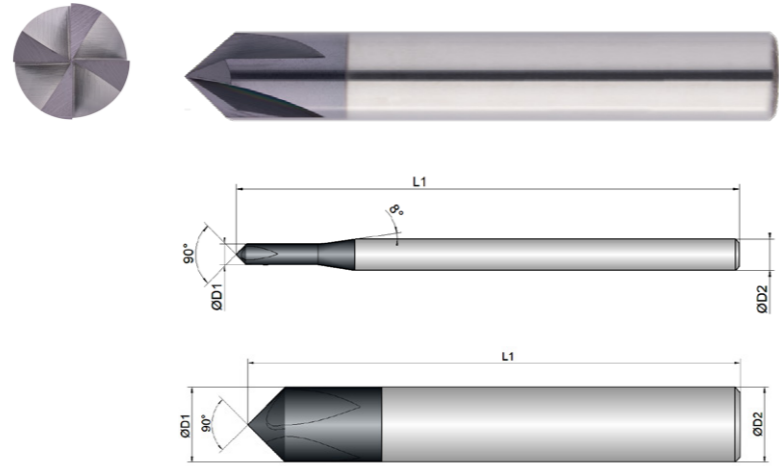
Strategy **UNI**

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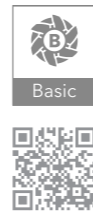
Dimension	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
Infeed in mm	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max	ae= 0.1xD ap= L2 max
Application									

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/casted	<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

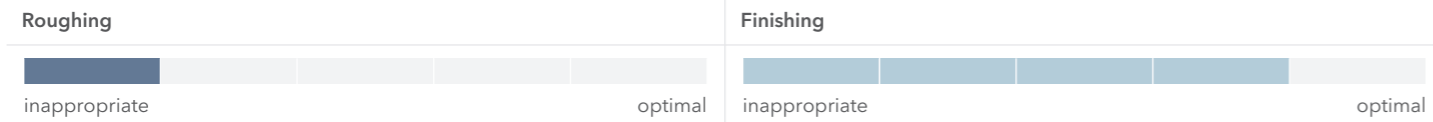
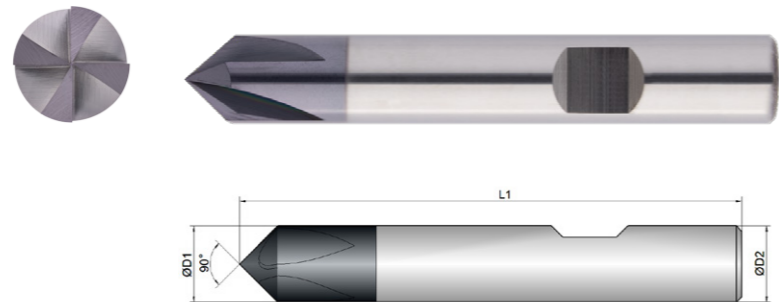
NOTE | The values marked in turquoise are side applications!

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/casted <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

NOTE | The values marked in turquoise are side applications!

Cooling

Tolerance -

Coating BetaUni Iron

Strategy **UNI**

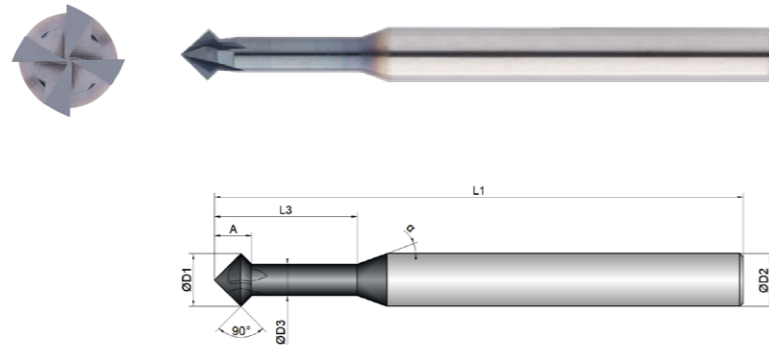
Application

Features **HA**

Basic

■ For universal chamfering of work pieces

■ Forwards and backwards cutting



Roughing **Finishing**

inappropriate optimal inappropriate optimal

BCU1-M10-0023	D1 mm Ø	D3 mm Ø	A mm	L3 mm	L1 mm	D2 mm Ø	z #	α °
2	2.0	1.0		8.0	50.0	4.0	4	20
3	3.0	2.2	2.0	10.0	50.0	4.0	4	20
4	4.0	2.9	2.5	10.0	50.0	4.0	4	20
5	5.0	3.9	3.0	15.0	65.0	6.0	4	20
6	6.0	3.9	4.0	15.0	65.0	6.0	4	20
8	8.0	5.9	2.5	20.0	70.0	8.0	4	20
10	10.0	5.9	4.0	23.0	72.0	10.0	4	20
12	12.0	5.9	6.0	23.0	73.0	12.0	4	20



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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	0.04
2.1-2.2 low-alloyed	<950	55	0.01	0.012	0.016	0.018	0.023	0.028	0.033	0.038
3.1-3.2 high-alloyed	<1100	40	0.008	0.01	0.014	0.015	0.02	0.025	0.03	0.035
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	0.038
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	0.034
2.1 austenitic	<650	30	0.006	0.008	0.012	0.014	0.018	0.022	0.026	0.032
N NON-FERROUS		Vc (m/min)								
1.1-2.3 ALUMINIUM alloyed/casted	<600	150	0.018	0.02	0.023	0.025	0.03	0.035	0.04	0.045
3.1-3.3 COPPER alloyed	<600	80	0.01	0.012	0.014	0.015	0.02	0.025	0.03	0.035
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	0.032
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	0.03

NOTE | The values marked in turquoise are side applications!

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 rs

Coating BetaUni Iron

Strategy **UNI**

Application

Features **HA**

Basic



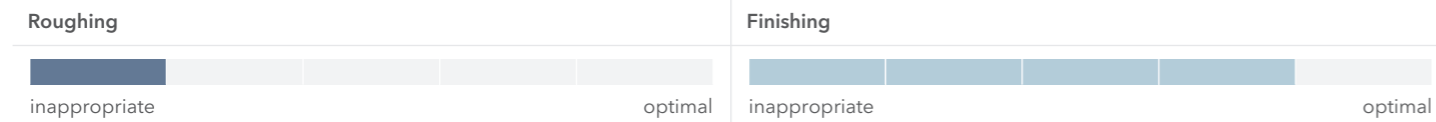
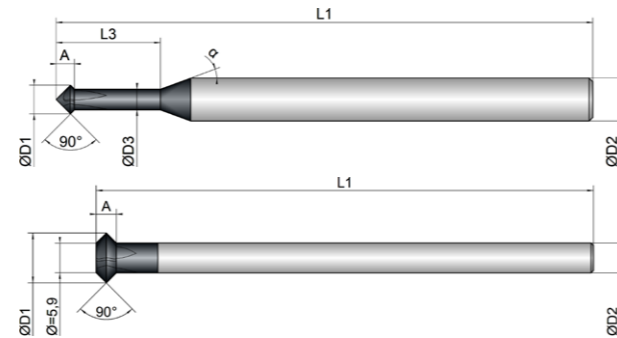
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Dimension	Ø3	Ø3.8	Ø4	Ø4.8	Ø5	Ø5.8	Ø6	Ø7.8	Ø8	Ø9.8
Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD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

For universal chamfering of work pieces

Variant made of blank form for deep cavities

Forwards and backwards cutting



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	12.0	75.0	4.0	4	90
3,8	3.8	2.9	2.7	15.7	75.0	4.0	4	90
4	4.0	2.9	2.7	15.7	75.0	4.0	4	90
4,8	4.8	3.9	3.0	18.0	75.0	5.0	4	90
5	5.0	3.9	3.0	18.0	75.0	5.0	4	90
5,8	5.8	3.9	4.0	19.0	100.0	6.0	4	90
6	6.0	3.9	4.0	19.0	100.0	6.0	4	90
7,8	7.8		2.0		100.0	6.0	4	90
8	8.0		2.0		100.0	6.0	4	90
9,8	9.8		4.0		100.0	6.0	4	90
10	10.0		4.0		100.0	6.0	4	90
11,8	11.8		6.0		100.0	6.0	4	90
12	12.0		6.0		100.0	6.0	4	90

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/casted	<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

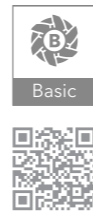
Dimension	Ø10	Ø11.8	Ø12
Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD
Application			

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/casted	<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

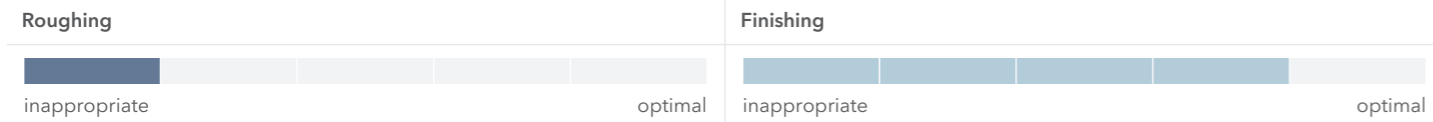
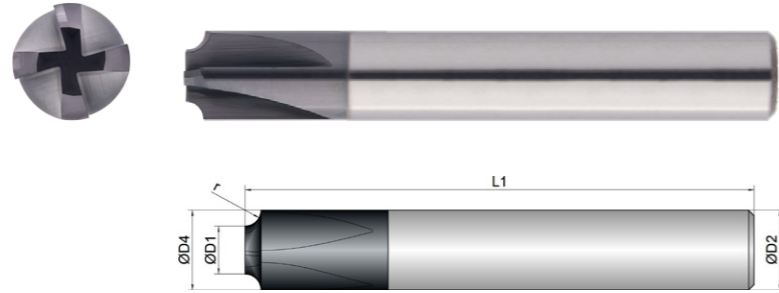
NOTE | The values marked in turquoise are side applications!

Cooling	
Tolerance	V1
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA



For the universal manufacturing of radii to components



BCU1-M11-0023	D1	D4	L1	D2	z	r
	mm Ø	mm Ø	mm	mm Ø	#	mm R
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
5/1,5	5.0	10	66.0	10.0	4	1.50
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
7/2,5	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	Ø5 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/casted	<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

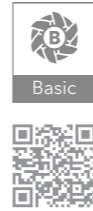
Material	Strength (N/mm ²)	Feed (mm/Z)	Dimension							
			Ø6 R3	Ø9 R3.5	Ø8 R4	Ø7 R4.5	Ø10 R5	Ø8 R6	Ø9 R8	Ø5 R10
P STEEL		Vc (m/min)	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax	ae=rmax ap=rmax
1.1-1.3 unalloyed	<850	170	fz	fz	fz	fz	fz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

NOTE | 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

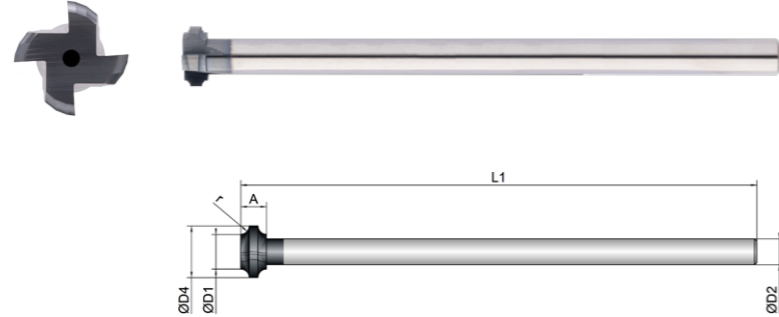
Strategy	UNI
Application	
Features	HA



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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Material	Strength (N/mm ²)	Feed (mm/Z)	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	
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	0.018	0.018
2.1-2.2	low-alloyed	<950	40	0.01	0.013	0.01	0.013	0.01	0.013	0.01	0.013	0.016	0.016
3.1-3.2	high-alloyed	<1100	35	0.008	0.011	0.008	0.011	0.008	0.011	0.008	0.011	0.014	0.014
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	0.016	0.016
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	0.014	0.014
2.1	austenitic	<650	30	0.007	0.01	0.007	0.01	0.007	0.01	0.007	0.01	0.013	0.013
N NON-FERROUS			Vc (m/min)										
1.1-2.3	ALUMINIUM alloyed/casted	<600	120	0.014	0.018	0.014	0.018	0.014	0.018	0.014	0.018	0.021	0.021
3.1-3.3	COPPER alloyed	<600	60	0.01	0.013	0.01	0.013	0.01	0.013	0.01	0.013	0.016	0.016
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	0.014	0.014
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	0.013	0.013

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

NOTE | 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

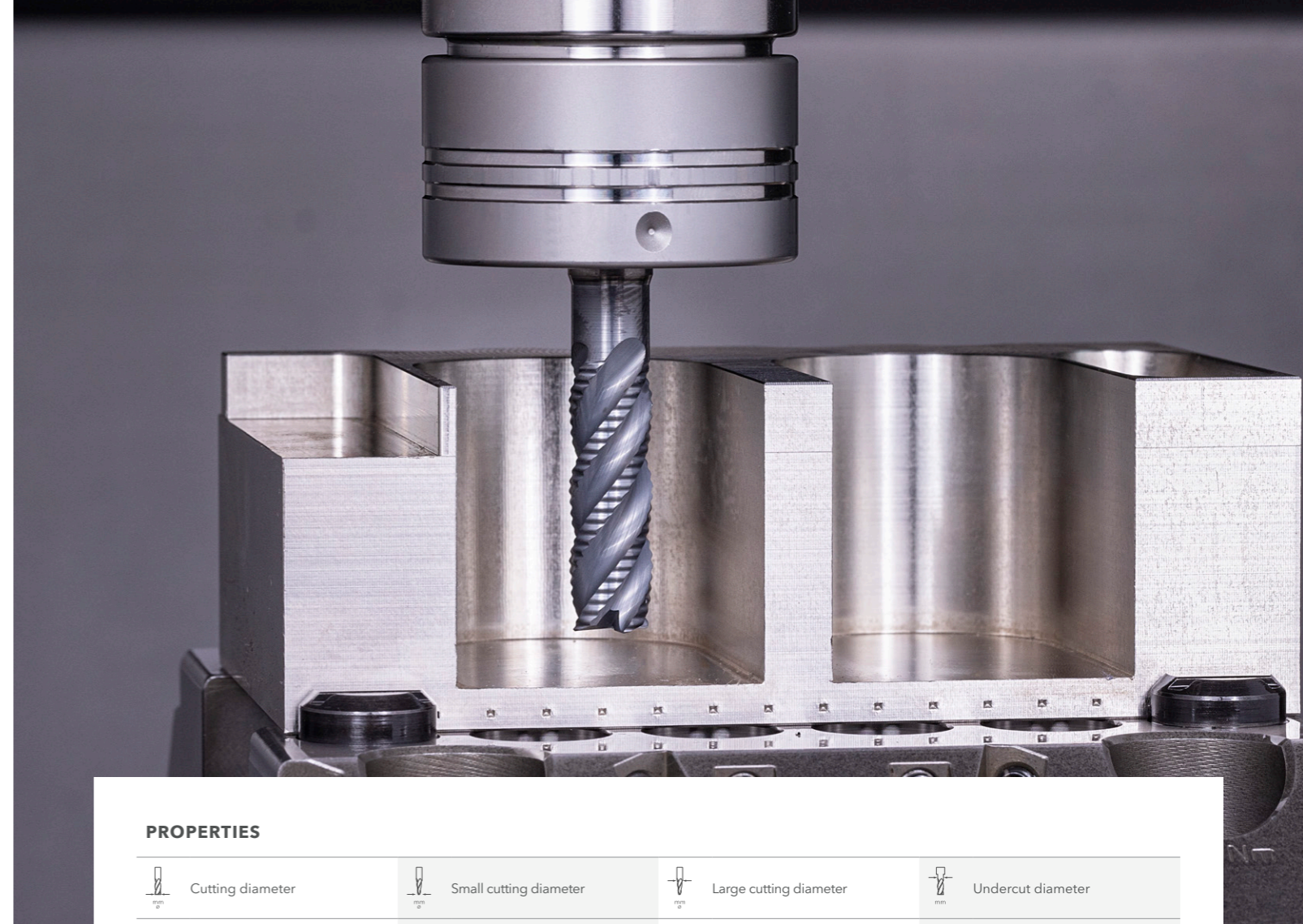
Air-cooling	Dry machining	Oil cooling	Cooling Lubricant
Minimum quantity lubrication			

FEATURES

2xD	3xD	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			

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
Length of cut	Total bevel length	Undercut length	Total length
Shank diameter	Number of teeth	Corner radius	Corner bevel
Programming radius	Maximum depth of cut	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.

P 1.1 STEEL | unalloyed <500 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.0254	St37.0	P235T1						STPG 38	
1.1120	GS20Mn5							SMnC 420	
1.1121	Ck10	2 C 10	XC 10	040 A 10	C 10	1265	C 10 k	S 10 C	1010
1.1131	GS15Mn5								
1.8961	WTSt373				Fe 360 D FF			SMA 50 A	
1.0715	9SMn28	11 SMn 28	S 250	230 M 07	CF 9 SMn 28	1912	11 SMn 28	SUM 22	1213
1.0718	9SMnPb28	11 SMnPb28	S 250 Pb		CF 9SMnPb 28	1914	11 SMnPb 28	SUM 22 L	12 L 13
1.0736	9SMn36		S300	240 M 07	CF 9 SMn 36		12 SMn 35	SUM 25	1215

P 1.2 STEEL | unalloyed <700 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.0116	ST373		E 24-3	4360-40 C	Fe 37-3	1312	A 360 C		A 570 Gr. 36
1.0144	ST443		E 28-3	4360-43 C	Fe 430 D FF	1414	AE 275-D	SM 41 B	A 573 Gr. 70
1.0401	C15		CC12	080 M 15	C 15	1350	F.111	S 15 C	1015
1.0402	C22	1 C 22	CC 22	070 M 20	C 22		C 22 k	SFVC 1	
1.0406	C25	1 C 25	CC 25	070 M 26	C 25		C 25 k	S 22 C	1025
1.0482	19Mn5		A 52 CP	224-460				SG 37	
1.0486	STE285				FE E 285 KG		AE 285 KG	SM 41 A	
1.0501	C35	1 C 35	CC 35	060 A 35	C 35	1550	F.113	S 35 C	1035
1.0503	C45	1 C 45	CC 45	080 M 46	C 45	1650	C 45 k	S 45 C	1045
1.0528	C30	1 C 30	CC 32	080 M 30	C 30			SUP 7	1030
1.0562	STE355		E 355 R/FP		Fe E 355 KG	2132	AE 355 KG	SM 50 YB	A 633 Gr. C
1.0711	9S20			220 M 07	CF 9 S 22			G 11120	1212
1.1127	36Mn6			212 M 36				SMn 443	1141
1.1133	20Mn5			120 M 19	G 22 Mn3		20 Mn 6	SMn 420	1022
1.5637	10Ni14			503	18 Ni 14 KT				A 350-LF 5
1.8962	9CrNiCuP324			WR 50 A				SPA-H	
1.0726	35S20	35 S 20	35 MF 4	212 M 36		1957	F.210G		1140
1.0760	38SMn28	38SMn28	38SMn28	38SMn28			38SMn28		
1.5423	16Mo5			1503-245-420	16 Mo 5		16 Mo 5	SBC 690	4520

P 1.3 STEEL | unalloyed <850 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.1525	C80W1	C 80 U	Y1 90		C 80 KU	1880	F.513		W 108
1.1545	C105W1	C 105 U	Y1 105	BW 1A	C 100 KU	1880	F.515		W 110
1.1620	C70W2	C 70 U							
1.1625	C80W2		Y1 80	BW 1B	C 80 KU		C 80	SKC 3	W 1
1.1645	C105W2						C 102	SK 3	
1.1663	C125W	C 120 U	Y2 120		C 120 KU		C 120	SK 2	W 112
1.1673	C135W		Y2 140		C 140 KU			SK 1	
1.1740	C60W		Y3 55					SK 7	
1.1830	C85W	C 90 U	Y3 90					SK 5	1084
1.1744	C67W		Y1 70				F.512		A-6
1.5406	17MoV84								
1.5633	24Ni8	G 9 Ni 10	22 N 8		G 9 Ni 10			SCPL 21	
1.6311	20MnMoNi45	20 MnMoNi 4 5						SQV 2 B	
1.7242	16CrMo4	18 CrMo 4	15 CD 3.5		18 CrMo 4		18 CrMo 4	SCM 418 H	
1.7350	22CrMo44								
1.7362	12CrMo195	X 12 CrMo 5	Z 10 CD 5.05	3606-625	16 CrMo 20 5			SCMV 6	
1.7709	21CrMoV57	21 CrMoV 5 7	20 CDV 5.07						

P 2.1 STEEL | low alloyed <750 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.0961	60SiCr7	60 SiCr 8	60 SC 7	250 A 61	60 SiCr 8		60 SiCr 8	SUP 7	9262
1.2162	21MnCr5	21 MnCr 5	20 NC 5					SCR 420 H	
1.2210	115CrV3	107 CrV 3 KU	100 C 3		107 CrV 3 KU		F.520.L		L2
1.2235	80CrV2						F.520.J		
1.2241	51CrV4	51 CRMnV 4			51 CrMnV 4 KU				56
1.2382	GX155CrVMo121								
1.2542	45WCrV7	45 WCrV 8		BS 1	45 WCrV 8 KU	2710	45 WCrSi 8		51
1.2552	80WCrV8						60 WCrSi 8		
1.2842	90MnCrV8	90 MnV 8	90 MV 8	BO 2	90 MnVCr 8 KU				0 2
1.7003	38Cr2	38 Cr 2 KD	38 C 2	120 M 36	38 Cr 3		38 Cr 3	SMn 438	50 B40
1.7131	16MnCr5	16 MnCr 5 KD	16 MC 5	527 M 17	16 MnCr 5	2173	16 MnCr 5	SCR 415	5115
1.7715	14MoV63	14 MoV 6-3		1503-660-440			13 MoCrV 6		

P 2.2 STEEL | low alloyed <950 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.0902	46Si7		45 S7				46 Si 7		
1.1157	40Mn4		35 M 5	150 M 36					1039
1.1167	36Mn5		40 M 5	150 M 36		2120	36 Mn 5		1335
1.1170	28Mn6	28 Mn 6	35 M 5	150 M 17	C 28 Mn		36 Mn 6	SCMn 1	1330
1.1199	49MnV53			280 M 01					
1.2002	125Cr1		Y2 120 C						
1.2003	75Cr1		35 M 5	150 M 36					
1.2004	85Cr1		Y1 100 C 2						
1.2008	140Cr3		Y2 140 C						SKS 8
1.2108	90CrSi5	P 280 GH			C 100 KU	2092			SFVC 2A
1.2127	105MnCr4				100 CrMn 4 KU				SUJ 3
1.2303	100CrMo5						F.520.F		L 7
1.2312	40CrMnMoS86		40 CMD 8						
1.2519	110WCrV5						102 WCrV 5		
1.3501	100Cr2		100 C 2						E 50100
1.3505	100Cr6	100 Cr 6	100 C 6	535 A 99	100 Cr 6	2258	100 Cr 6	SUJ 2	E52100
1.3520	100CrMn6	100 Cr Mn 6	100 CM 6				100 CrMn 6		

P 3.1 STEEL | high alloyed <800 N/mm²

Materialnumber	Germany DIN	Europe EN	France AFNOR	Great Britain BS	Italy UNI	Sweden SIS	Spain UNE	Japan JIS	USA AISI
1.2363	X100CrMoV51	X 100 CrMoV 5 1	Z 100 CDV 5	BA 2	X 100 CrMoV 5 1 KU	2260	X 100 CrMoV 5	SKD 12	A 2
1.2367	X38CrMoV53		Z 38 CDV 5 3						
1.2379	X155CrVMo121	X 153 CrMoV 12	Z 160 CDV 12	BD 2	X 155 CrVMo 12 1 KU	2310		SKD 11	D 2
1.2453	X130W5								
1.2564	X30WCrV41	30 WCrV 15 1					F.527		
1.2567	X30WCrV53	X 30 WCrV 5 3	Z 32 WCW 5		X 30 WCrV 5 3 KU			SKD 4	
1.2606	X37CrMoW51		Z 35 CWDV 5	BH 12	X 35 CrMoV 05 KU		F.537	SKD 62	H 12

P 3.2 STEEL | high alloyed <1100 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. Lists materials 1.2083 to 1.7225.

K 1.1 GREY CAST IRON <600 N/mm² (180 HB)

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Lists materials 0.6010 to 0.6017.

K 1.2 GREY CAST IRON <1000 N/mm² (300 HB)

Table with 10 columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Lists materials 0.6020 to 0.6040.

M 1.1 STAINLESS STEEL FERRITIC/MARTENSITIC <850 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. Lists materials 1.4000 to 1.4767.

M 2.1 STAINLESS STEEL | austenitic <650 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. Lists materials 1.4300 to 1.4442.

N 1.1 ALUMINIUM | alloyed <500 N/mm²

Table with columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like AlCu 4 SiMg, AlCu 2.5 Mg, AlCu 4 MgSi, AlCuMg1, AlCuMg2, AlMgSi 1, AlMgSi 0.5, Al99.9 MgSi, AlMgSi 0.7, AlMg 1 SiCu, AlMg 1, AlMg 1.5, Al99.85 Mg 1, Al99.9 Mg 1, AlMg 1.8, AlMg 4.5, AlMg 2.5, AlMg 2 Mn 0.3, AlMg 2 Mn 0.8, AlMg 3, AlMg 2.7 Mn, G-AlMg 3, AlMg 4 Mn, AlMg 4 Mn.

N 1.2 ALUMINIUM | alloyed <600 N/mm²

Table with columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like AlMgSiPb, AlCu 4 PbMgMn, AlCu 6 BiPb, AlZn 4.5 Mg 1, AlZnMgCu 0.5, AlZnMgCu 1.5.

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

Table with columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like G-AlSi 6 Cu 4, G-AlSi 8 Cu 3, G-AlSi 7 Mg 0,3, G-AlSi 9 Mg, G-AlSi 10 Mg, G-AlSi 10 Mg(Cu), G-AlSi 12, G-AlSi 12 Cu.

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

Table with columns: Materialnumber, Germany | DIN, Europe | EN, France | AFNOR, Great Britain | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like CuZn 15, CuZn 30, CuZn 37, G-CuZn 15 Si 4, G-CuZn 35 Al 1, CuAl 10 Ni 5 Fe 4, SG-CuSn, G-CuSn 10, G-CuSn 12, G-CuSn 12 Ni 2, G-CuPb 10 Sn, G-CuPb 15 Sn, G-CuPb 20 Sn, CuCd 1, G-CuCrF 35, CuCrZr.

S 2.1 TITANIUM | commercially pure <600 N/mm²

Table with columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like Ti 99,8, Ti 99,7, Ti-99,6, Ti-99,5.

S 2.2 TITANIUM | alloyed <1000 N/mm²

Table with columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like TiNi 0,8 Mo 0,3, TiAl 5 Sn 2,5, TiAl 3 V 2,5, Ti 1 Pd, Ti 2 Pd, TiAl 6 V 4-LN, TiAl 6 V4.

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

Table with columns: Material-number, Tradename, Germany | DIN, Europe | EN, France | AFNOR, GB | BS, Italy | UNI, Sweden | SIS, Spain | UNE, Japan | JIS, USA | AISI. Rows include materials like Magnifer® 36, Magnifer® 50, X1CrNiSi1815, Microfer® 3127, Alloy 31, Sanicro® 28, INCOLOY® Alloy DS, INCOLOY® Alloy 286, Alloy 52 (Nilo® 52).

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				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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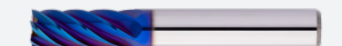
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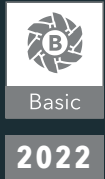


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