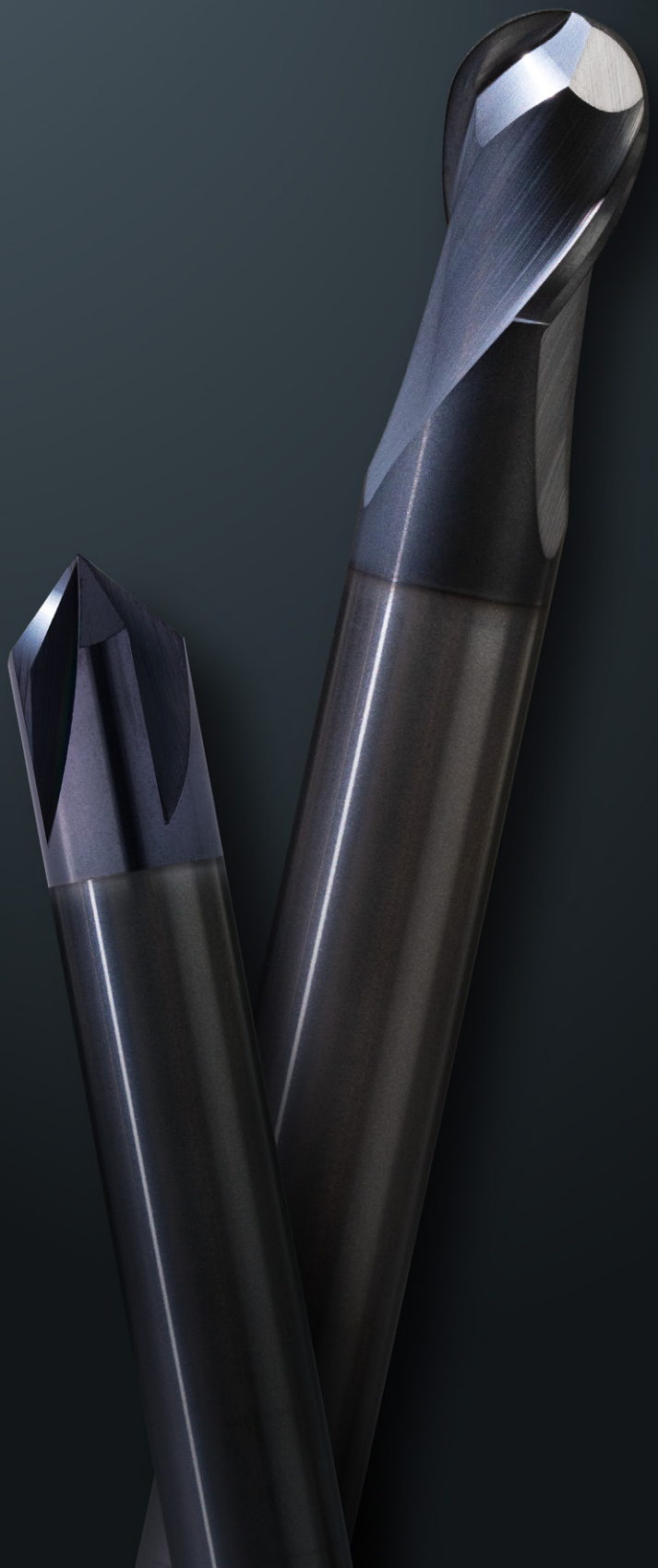
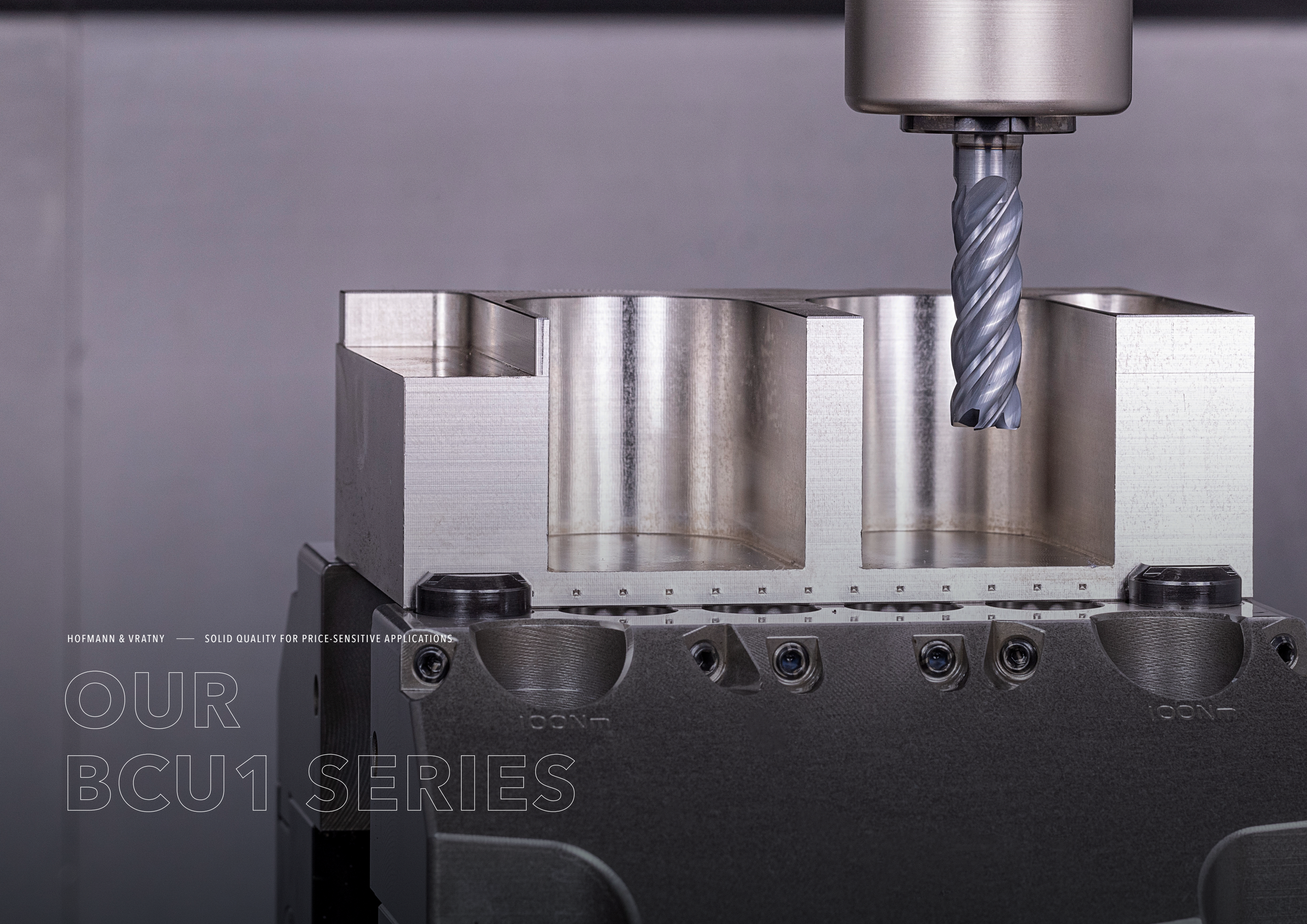
Basic

2023

BCU1 SERIES



HOFMANN & VRATNY — BCU1 SERIES EN



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 irrepressible drive to shape the future of the industry together. To us, that means shaping tomorrow.

Andreas Vratny

Zdenek Vratny

Marius Heinemann-Grüder

OUR
BCU1 Series

MADE IN BAVARIA

PROVEN QUALITY

47
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-M01-0103 | 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

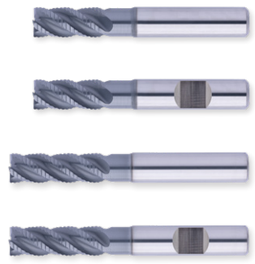
BCU1-M02 SLOTMAKER

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-M06 FORMMAKER

BCU1-M06-0123 | BCU1 Formmaker Z4 2xD BUI 60

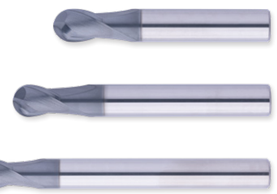
BCU1-M06-0124 | BCU1 Formmaker Z4 2xD BUI 64

BCU1-M08 ROWMAKER

BCU1-M08-0053 | BCU1 Rowmaker Z2 1xD short BUI 68

BCU1-M08-0063 | BCU1 Rowmaker Z2 1xD long BUI 70

BCU1-M08-0073 | BCU1 Rowmaker Z2 1xD overlong BUI 72



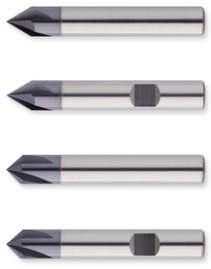
BCU1-M09 CHAMFMAKER

BCU1-M09-0103 | BCU1 Chamfmaker Z3-4 60° BUI 74

BCU1-M09-0104 | BCU1 Chamfmaker Z4 60° BUI 76

BCU1-M09-0153 | BCU1 Chamfmaker Z3-4 90° BUI 78

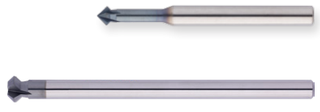
BCU1-M09-0154 | BCU1 Chamfmaker Z4 90° BUI 80

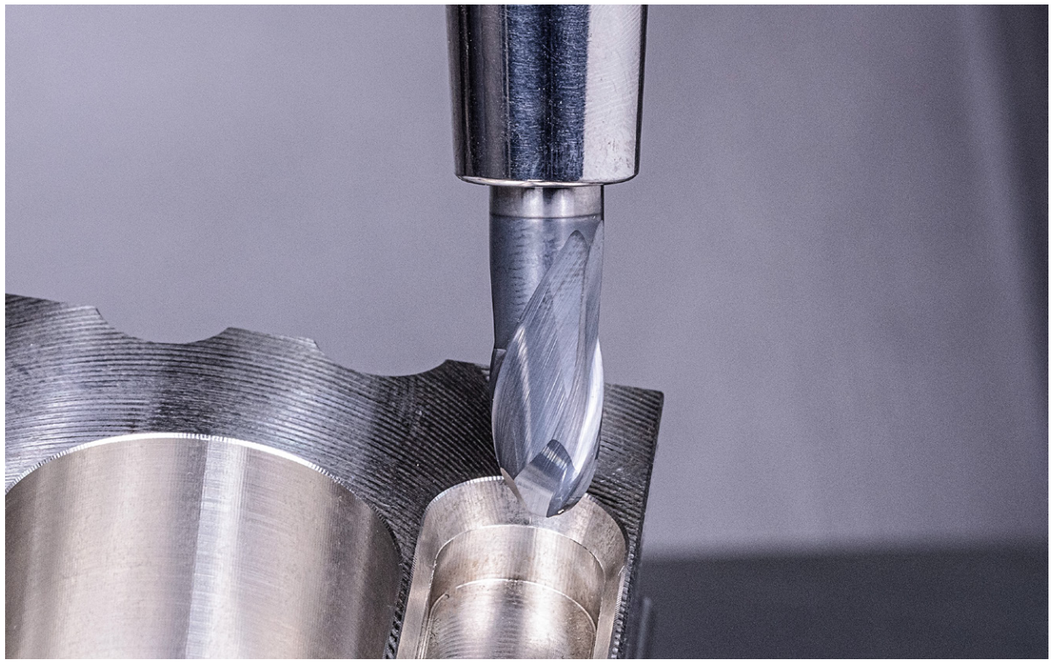


BCU1-M10 FB-CHAMFMAKER

BCU1-M10-0023 | BCU1 FB-Chamfmaker Z4 90° BUI 82

BCU1-M10-0123 | BCU1 FB-Chamfmaker Z4 90° BUI 84





BCU1-M11 ROUNDMAKER

BCU1-M11-0023 | BCU1 Roundmaker Z4 BUI 86

BCU1-M12 FB-ROUNDMAKER

BCU1-M12-0023 | BCU1 FB-Roundmaker Z4 BUI 88

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HOFMANN & VRATNY | BCU1 SERIES

OUR BCU1 SERIES

Solid quality for price-sensitive applications

OUR BCU1 SERIES PERFORMS WELL IN ALL AREAS OF APPLICATION.

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

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

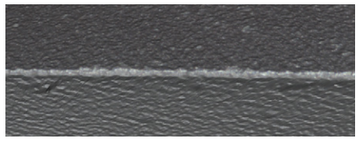
- Versatile application thanks to tried-and-tested geometries
- Stable universal coating for machining, even suitable for the most demanding materials in roughing and finishing
- Special fine grain substrate for reduced cracking and improved resistance to cutting edge breakouts

A SPECIAL EDGE PREPARATION PROCESS ENSURES:

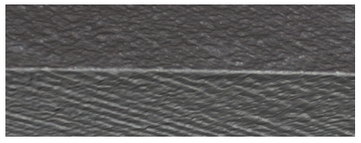
- Entirely homogeneous cutting edges
- Even distribution of cutting forces
- Improved surface quality of the component
- Controlled and even wear

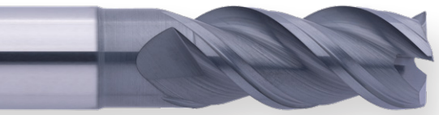
EXPERIENCE OUR BCU1 SERIES IN ACTION

BEFORE EDGE PREPARATION



AFTER EDGE PREPARATION

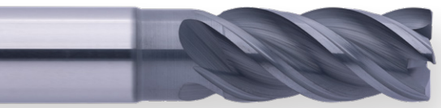




BASIC U1 PERFORMMAKER (M01) Z3

▶ IN ACTION ▶ IN ACTION

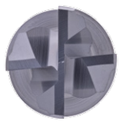
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating



BASIC U1 PERFORMMAKER (M01) Z4

▶ IN ACTION ▶ IN ACTION

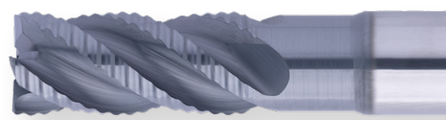
- Adapted clearance angle for reliable machining
- Unequal tooth pitch for smooth running
- Large chip chambers for good chip disposal
- Available in 1.5xD, 2xD and 3xD
- Available as HA and HB
- With BUI coating

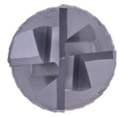


BASIC U1 SLOTMAKER (M02) Z4

▶ IN ACTION ▶ IN ACTION

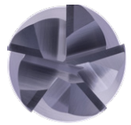
- Optimised chip chambers for a large chip volume, for example with full slot milling
- Adapted roughing teeth for small chips
- Available in 2xD and 3xD
- Available as HA and HB
- With BUI coating

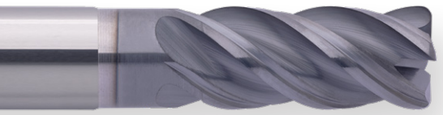




BASIC U1 CHIPMAKER (M03) Z5

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



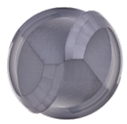


BASIC U1 FORMMAKER
(M06) Z4

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

BASIC U1 ROWMAKER
(M08) Z2

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

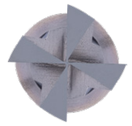


BASIC U1 CHAMFMAKER
(M09) Z3-4

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

BASIC U1 FB CHAMFMAKER
(M10) Z4

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

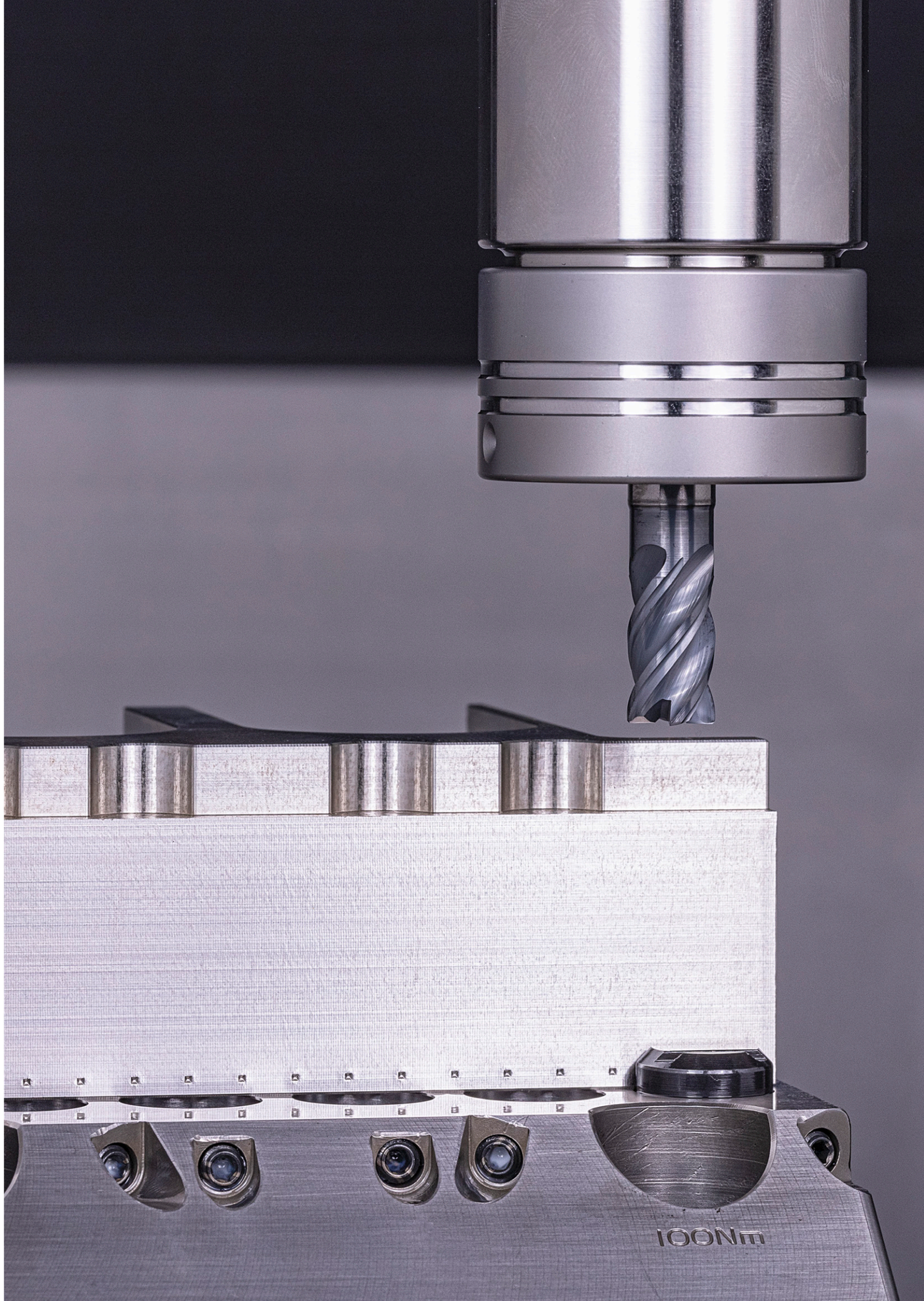


BASIC U1 ROUNDMAKER (M11) Z4

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

BASIC U1 FB ROUNDMAKER (M12) Z4

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

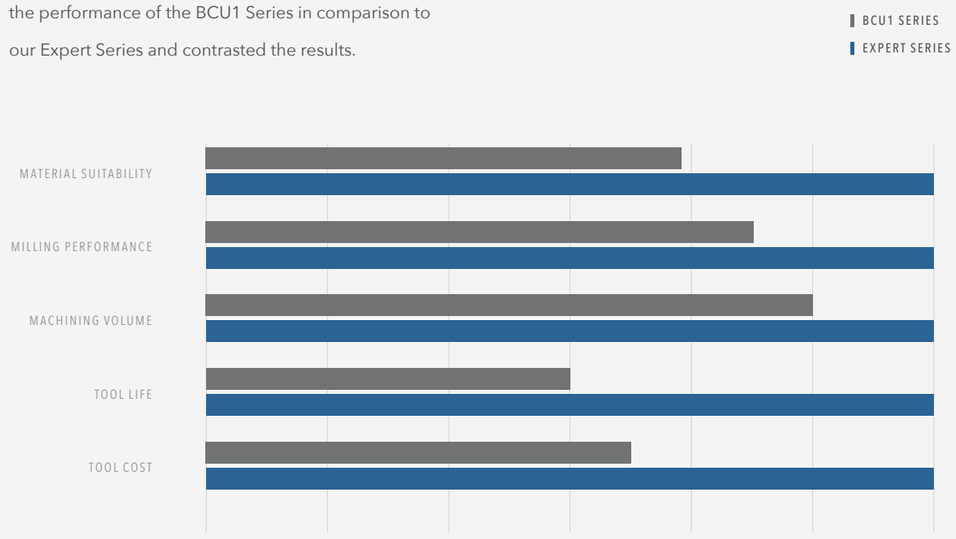


APPLICATION EXAMPLES

THE BCU1 SERIES IN COMPARISON TO OUR EXPERT SERIES

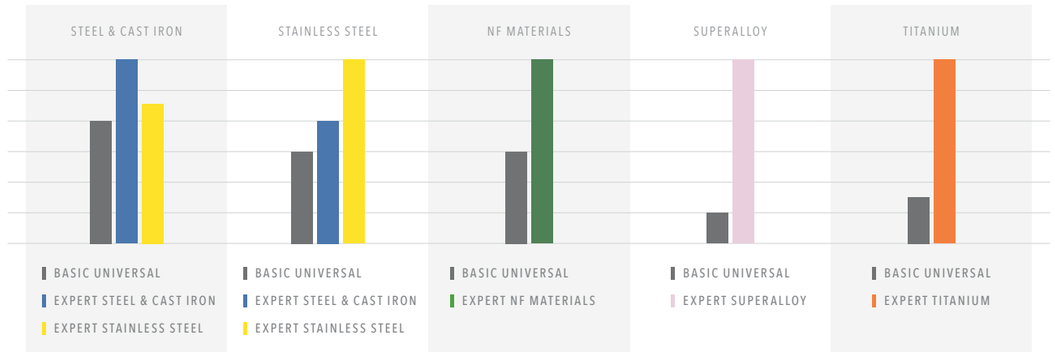
The BCU1 series stands out due to its excellent price/performance ratio and the wide range of possible uses for the tools. The milling cutters in this range can be used on different materials with solid results. Our Expert Series, on the other hand, are specially tailored to one particular area of application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

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

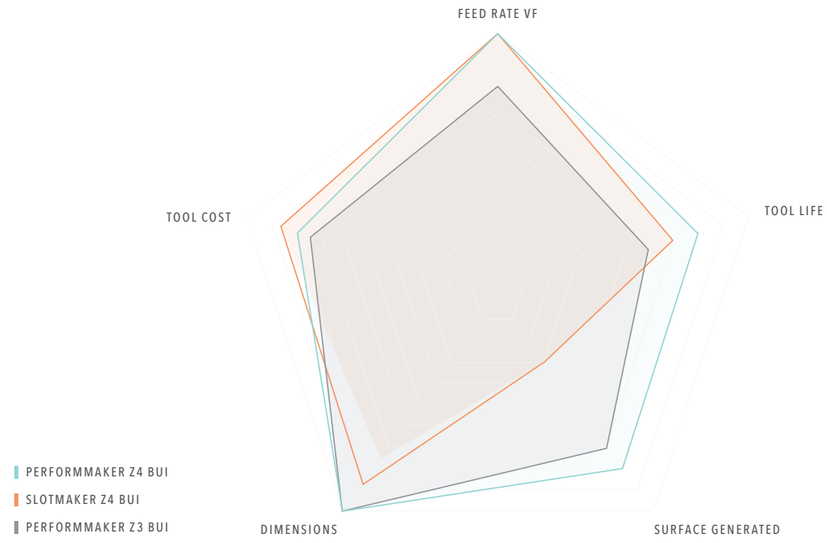


HOFMANN & VRATNY | BCU1 SERIES

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.



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.



HOFMANN & VRATNY | BCU1 SERIES

BETA UNI IRON

BUI

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

BC U 1 - M 01 - 0293

PRODUCT LINE

- **BC** Basic
- **EX** Expert

TOOL TYPE

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

TOOL VERSION

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

MAIN APPLICATION

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

VERSION

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

OTHER DISTINGUISHING FEATURES

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

PRODUCT IDENT

e.g. 0023

DIMENSION

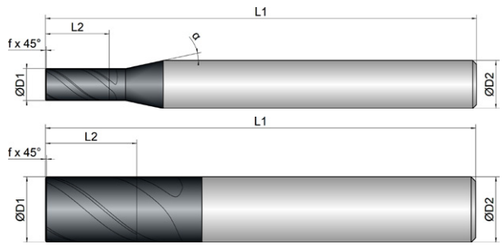
- **3x10** Cutting diameter x length of undercut
- **12/0,5** Cutting diameter / corner radius
- **10** Diameter

Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M01-0103	D1 mm ⌀	L2 mm	L1 mm	D2 mm ⌀	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

BCU1-M01-0103 | BCU1 PERFORMMAKER Z3 1,5XD BUI

Download Catalog Pages (PDF)

	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

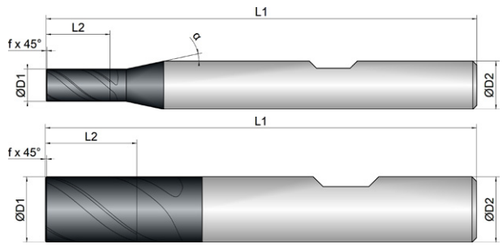
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.02	3	3	0.025	0.9	L2max	0.018	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.02	4	4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

Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M01-0104	D1 mm ⌀	L2 mm	L1 mm	D2 mm ⌀	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

BCU1-M01-0104 | BCU1 PERFORMMAKER Z3 1,5XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

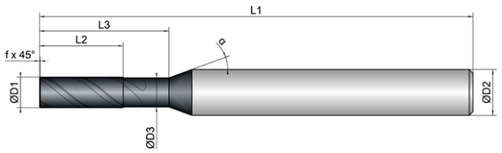
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.02	3	3	0.025	0.9	L2max	0.018	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.02	4	4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

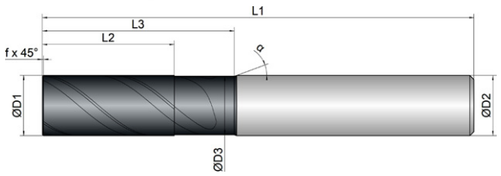
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC UNI
Application	
Features	HA ≠ 2xD 45°

Basic

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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0113 | BCU1 PERFORMMAKER Z3 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

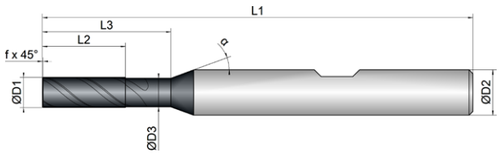
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
2	5	0.5°	0.015	2	2	0.02	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275
3	8	0.5°	0.02	3	3	0.025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

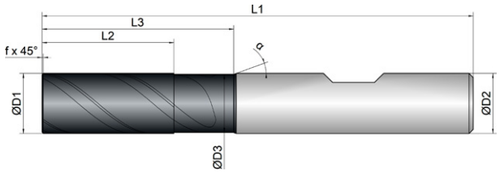
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC UNI
Application	
Features	HB ≠ 2xD 45°

Basic

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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0114 | BCU1 PERFORMMAKER Z3 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

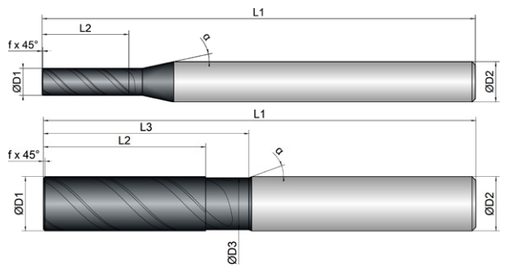
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
2	5	0.5°	0.015	2	2	0.02	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275
3	8	0.5°	0.02	3	3	0.025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

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC, UNI
Application	
Features	HA, ≠, 3xD, 45°

Basic

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0123 | BCU1 PERFORMMAKER Z3 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	190	190	210	305	1	1
2.1-2.2	low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2	high alloyed	<1100	160	160	180	188	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	220	232	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1	austenitic	<650		75	80	122	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	380	380	400	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		45	50	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		20	25	42	0.7	0.3

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

Material P 1.1-1.3

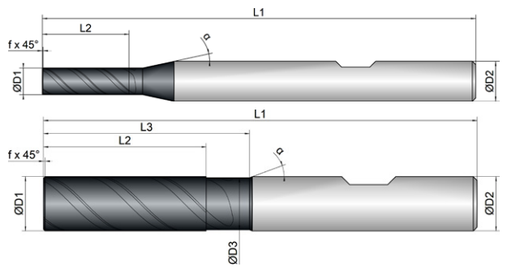
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.015	4	4	0.02	1.2	L2max	0.018	0.2	L2max	0.05	0.88	L2max	0.0414
5	16	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.06	1.04	L2max	0.0487
6	18	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.08	1.28	L2max	0.0655
8	24	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.1	1.52	L2max	0.0785
10	30	1.5°	0.05	10	10	0.065	3	L2max	0.035	0.2	L2max	0.12	1.84	L2max	0.093
12	36	2°	0.055	12	12	0.075	3.6	L2max	0.04	0.2	L2max	0.14	2.08	L2max	0.106
16	48	2.5°	0.065	16	16	0.085	4.8	L2max	0.045	0.2	L2max	0.15	2.64	L2max	0.1114
20	60	3°	0.085	20	20	0.1	6	L2max	0.05	0.2	L2max	0.18	2.88	L2max	0.1264

Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC UNI
Application	
Features	HB ≠ 3xD 45°

Basic

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0124 | BCU1 PERFORMMAKER Z3 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	190	190	210	305	1	1
2.1-2.2	low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2	high alloyed	<1100	160	160	180	188	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	220	232	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1	austenitic	<650		75	80	122	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	380	380	400	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		45	50	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		20	25	42	0.7	0.3

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

Material P 1.1-1.3

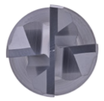
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.015	4	4	0.02	1.2	L2max	0.018	0.2	L2max	0.05	0.88	L2max	0.0414
5	16	0.5°	0.025	5	5	0.03	1.5	L2max	0.02	0.2	L2max	0.06	1.04	L2max	0.0487
6	18	0.8°	0.035	6	6	0.04	1.8	L2max	0.025	0.2	L2max	0.08	1.28	L2max	0.0655
8	24	1°	0.045	8	8	0.055	2.4	L2max	0.03	0.2	L2max	0.1	1.52	L2max	0.0785
10	30	1.5°	0.05	10	10	0.065	3	L2max	0.035	0.2	L2max	0.12	1.84	L2max	0.093
12	36	2°	0.055	12	12	0.075	3.6	L2max	0.04	0.2	L2max	0.14	2.08	L2max	0.106
16	48	2.5°	0.065	16	16	0.085	4.8	L2max	0.045	0.2	L2max	0.15	2.64	L2max	0.1114
20	60	3°	0.085	20	20	0.1	6	L2max	0.05	0.2	L2max	0.18	2.88	L2max	0.1264

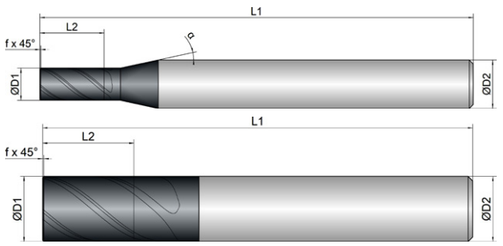
Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0203 | BCU1 PERFORMMAKER Z4 1,5XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

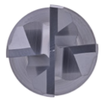
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.015	4	4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

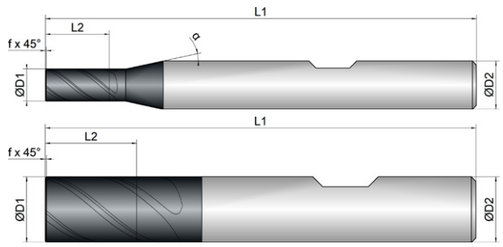
Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M01-0204 | BCU1 PERFORMMAKER Z4 1,5XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

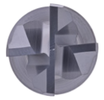
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
3	6	0.5°	0.015	3	3	0.02	0.9	L2max	0.013	0.2	L2max	0.045	0.8	L2max	0.0398
4	8	0.5°	0.015	4	4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

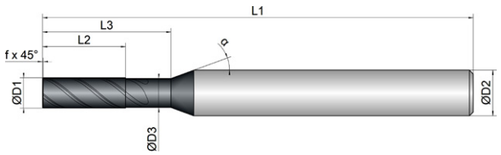
Cooling	
Tolerance	e8
Coating	BetaUni Iron

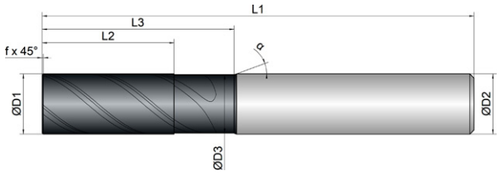
Strategy	HPC UNI
Application	
Features	HA ≠ 2xD 45°

Basic

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







Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M01-0213	D1 mm ⌀	D3 mm ⌀	L2 mm	L3 mm	L1 mm	D2 mm ⌀	z #	45° mm	°	α °
2	2.0	1.8	5.0	10.0	57.0	6.0	4	0.10	40	20
3	3.0	2.8	8.0	13.0	57.0	6.0	4	0.10	40	20
4	4.0	3.8	11.0	17.0	57.0	6.0	4	0.10	40	20
5	5.0	4.8	13.0	20.0	57.0	6.0	4	0.20	40	20
6	6.0	5.8	13.0	20.0	57.0	6.0	4	0.20	40	20
8	8.0	7.7	19.0	25.0	63.0	8.0	4	0.20	40	20
10	10.0	9.7	22.0	32.0	72.0	10.0	4	0.20	40	20
12	12.0	11.6	26.0	38.0	83.0	12.0	4	0.20	40	20
16	16.0	15.5	32.0	44.0	92.0	16.0	4	0.30	40	20
20	20.0	19.5	41.0	54.0	104.0	20.0	4	0.30	40	20

BCU1-M01-0213 | BCU1 PERFORMMAKER Z4 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

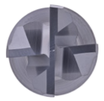
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
2	5	0.5°	0.012	2	2	0.015	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275
3	8	0.5°	0.015	3	3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

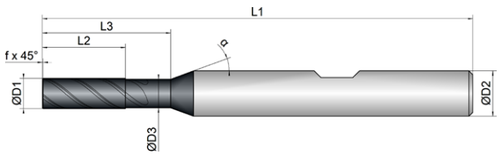
Cooling	
Tolerance	e8
Coating	BetaUni Iron

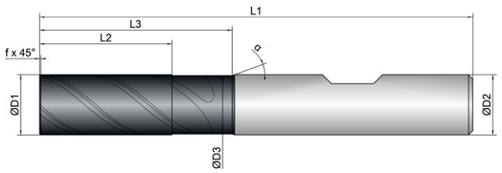
Strategy	HPC, UNI
Application	
Features	HB, ≠, 2xD, 45°

Basic

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







Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M01-0214	D1 mm ø	D3 mm ø	L2 mm	L3 mm	L1 mm	D2 mm ø	z #	45° mm	°	α °
2	2.0	1.8	5.0	10.0	57.0	6.0	4	0.10	40	20
3	3.0	2.8	8.0	13.0	57.0	6.0	4	0.10	40	20
4	4.0	3.8	11.0	17.0	57.0	6.0	4	0.10	40	20
5	5.0	4.8	13.0	20.0	57.0	6.0	4	0.20	40	20
6	6.0	5.8	13.0	20.0	57.0	6.0	4	0.20	40	20
8	8.0	7.7	19.0	25.0	63.0	8.0	4	0.20	40	20
10	10.0	9.7	22.0	32.0	72.0	10.0	4	0.20	40	20
12	12.0	11.6	26.0	38.0	83.0	12.0	4	0.20	40	20
16	16.0	15.5	32.0	44.0	92.0	16.0	4	0.30	40	20
20	20.0	19.5	41.0	54.0	104.0	20.0	4	0.30	40	20

BCU1-M01-0214 | BCU1 PERFORMMAKER Z4 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

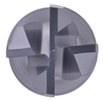
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
2	5	0.5°	0.012	2	2	0.015	0.6	L2max	0.011	0.2	L2max	0.03	0.6	L2max	0.0275
3	8	0.5°	0.015	3	3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

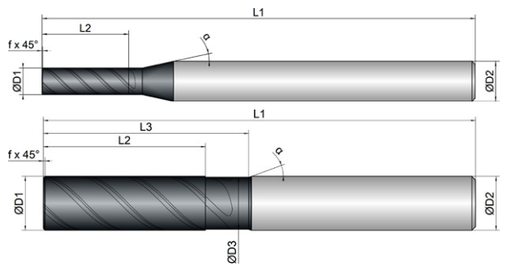
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC, UNI
Application	
Features	HA, ≠, 3xD, 45°

Basic

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





Roughing	Finishing
inappropriate – optimal	inappropriate – optimal

BCU1-M01-0223	D1 mm ⌀	D3 mm ⌀	L2 mm	L3 mm	L1 mm	D2 mm ⌀	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

BCU1-M01-0223 | BCU1 PERFORMMAKER Z4 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	190	190	210	305	1	1
2.1-2.2	low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2	high alloyed	<1100	160	160	180	188	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	220	232	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1	austenitic	<650		75	80	122	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	380	380	400	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		45	50	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		20	25	42	0.7	0.3

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

Material P 1.1-1.3

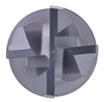
D1	L2	Immersion Angle	Full Slot			Side Milling			Finishing			ETC			
Ø	mm	α°	fz (mm/Z)	ae = 1xD (mm)	ap = 1xD (mm)	fz (mm/Z)	ae = 0.3xD (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	fz (mm/Z)	ae (mm)	ap (mm)	hmax (mm)
4	13	0.5°	0.012	4	4	0.018	1.2	L2max	0.015	0.2	L2max	0.04	0.48	L2max	0.026
5	16	0.5°	0.022	5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

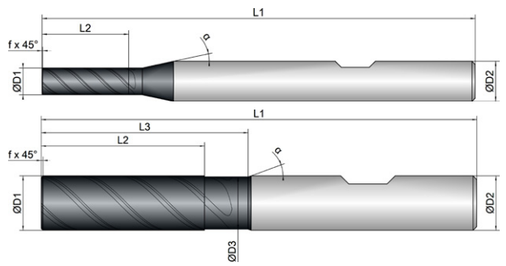
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HPC, UNI
Application	
Features	HB, ≠, 3xD, 45°

Basic

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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M01-0224	D1 mm ⌀	D3 mm ⌀	L2 mm	L3 mm	L1 mm	D2 mm ⌀	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

BCU1-M01-0224 | BCU1 PERFORMMAKER Z4 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing	ETC	Materialgroup Factor fz / α	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	190	190	210	305	1	1
2.1-2.2	low alloyed	<950	180	180	200	222	0.9	0.8
3.1-3.2	high alloyed	<1100	160	160	180	188	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	220	232	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		85	90	142	0.9	0.7
2.1	austenitic	<650		75	80	122	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	380	380	400	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		45	50	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		20	25	42	0.7	0.3

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

Material P 1.1-1.3

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

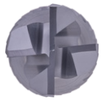
Cooling	
Tolerance	e8
Coating	BetaUni Iron

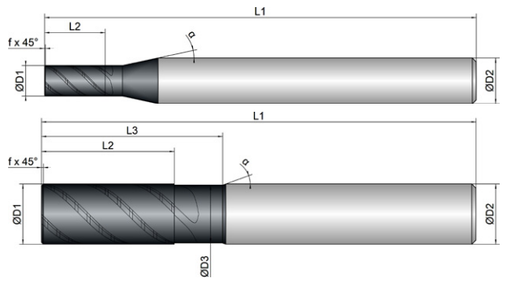
Strategy	HPC UNI
Application	
Features	HA ≠ 2xD 45°

Basic

- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips

- For roughing under HPC conditions





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M02-0103 | BCU1 SLOTMAKER Z4 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	185	185	295	1	1
2.1-2.2	low alloyed	<950	175	175	212	0.9	0.8
3.1-3.2	high alloyed	<1100	165	165	182	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	224	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	85	85	132	0.9	0.7
2.1	austenitic	<650	75	75	114	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	480	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		40	62	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450					

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

Material P 1.1-1.3

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

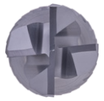
Cooling	
Tolerance	e8
Coating	BetaUni Iron

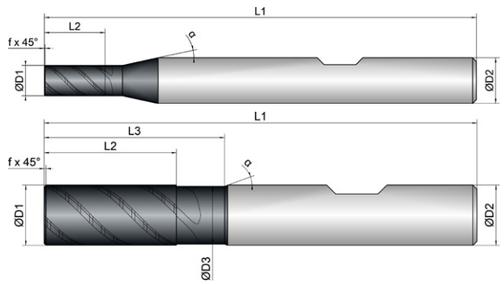
Strategy	HPC, UNI
Application	
Features	HB, ≠, 2xD, 45°

Basic

- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips

- For roughing under HPC conditions





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M02-0104 | BCU1 SLOTMAKER Z4 2XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	185	185	295	1	1
2.1-2.2	low alloyed	<950	175	175	212	0.9	0.8
3.1-3.2	high alloyed	<1100	165	165	182	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	200	200	224	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	85	85	132	0.9	0.7
2.1	austenitic	<650	75	75	114	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	480	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	242	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		40	62	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450					

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

Material P 1.1-1.3

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

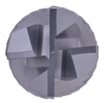
Cooling	
Tolerance	e8
Coating	BetaUni Iron

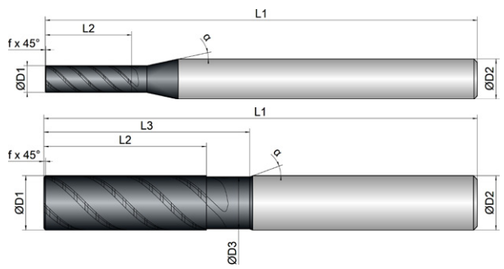
Strategy	HPC, UNI
Application	
Features	HA, ≠, 3xD, 45°

Basic

- Optimized chip chambers for a large chip volume
- Adapted roughing teeth for small chips

- For roughing under HPC conditions





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M02-0113 | BCU1 SLOTMAKER Z4 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	175	175	285	1	1
2.1-2.2	low alloyed	<950	165	165	202	0.9	0.8
3.1-3.2	high alloyed	<1100	155	155	176	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	180	180	214	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	80	80	122	0.9	0.7
2.1	austenitic	<650	70	70	104	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	360	360	460	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	222	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		35	52	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450					

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

Material P 1.1-1.3

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

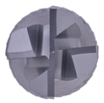
Cooling	
Tolerance	e8
Coating	BetaUni Iron

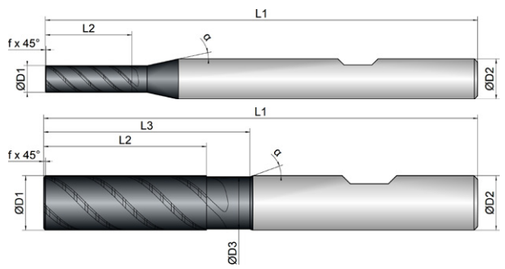
Strategy	HPC UNI
Application	
Features	HB ≠ 3xD 45°

Basic

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

BCU1-M02-0114 | BCU1 SLOTMAKER Z4 3XD BUI

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	Material	Strength (N/mm²)	Full Slot	Side Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	175	175	285	1	1
2.1-2.2	low alloyed	<950	165	165	202	0.9	0.8
3.1-3.2	high alloyed	<1100	155	155	176	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	180	180	214	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	80	80	122	0.9	0.7
2.1	austenitic	<650	70	70	104	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	360	360	460	1.6	2
3.1-3.3	COPPER | alloyed	<600	180	180	222	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		35	52	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450					

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

Material P 1.1-1.3

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

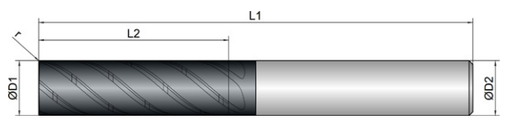
Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M03-0123 | BCU1 CHIPMAKER Z5 3.5XD BUI

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	Material	Strength (N/mm²)	ETC	Finishing	Materialgroup Factor fz	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	274	230	1	1
2.1-2.2	low alloyed	<950	226	170	0.9	0.8
3.1-3.2	high alloyed	<1100	198	140	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	234	190	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	158	90	0.9	0.7
2.1	austenitic	<650	134	80	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	460	460	1.6	2
3.1-3.3	COPPER | alloyed	<600	198	222	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000	80	50	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450				

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

Material P 1.1-1.3

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

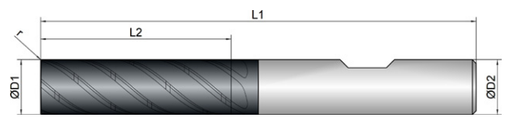
Cooling	
Tolerance	e8
Coating	BetaUni Iron

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

Basic

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

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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M03-0124 | BCU1 CHIPMAKER Z5 3.5XD BUI

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	Material	Strength (N/mm²)	ETC	Finishing	Materialgroup Factor fz	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	274	230	1	1
2.1-2.2	low alloyed	<950	226	170	0.9	0.8
3.1-3.2	high alloyed	<1100	198	140	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	234	190	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850	158	90	0.9	0.7
2.1	austenitic	<650	134	80	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	460	460	1.6	2
3.1-3.3	COPPER | alloyed	<600	198	222	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000	80	50	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450				

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

Material P 1.1-1.3

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

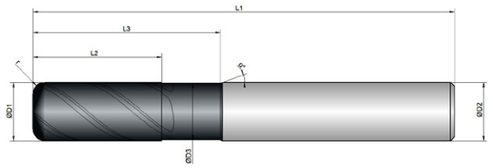
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HSC HPC UNI
Application	
Features	HA ≠ 2xD R

Basic

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

- With big corner radius for 3D contours



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M06-0123 | BCU1 FORMMAKER Z4 2XD BUI

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

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing / Multipass Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

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

BCU1-M06-0123 | BCU1 FORMMAKER Z4 2XD BUI

Material P 1.1-1.3

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

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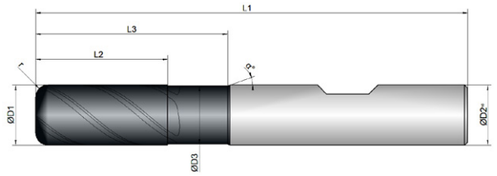
Cooling	
Tolerance	e8
Coating	BetaUni Iron

Strategy	HSC HPC UNI
Application	
Features	HB ≠ 2xD R

Basic

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

- With big corner radius for 3D contours



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M06-0124	D1 mm ø	D3 mm ø	L2 mm	L3 mm	L1 mm	D2 mm ø	z #	r mm		α °
6/0,5	6.0	5.8	13.0	20.0	57.0	6.0	4	0.50	40	20
6/1	6.0	5.8	13.0	20.0	57.0	6.0	4	1.00	40	20
6/1,5	6.0	5.8	13.0	20.0	57.0	6.0	4	1.50	40	20
8/0,5	8.0	7.7	19.0	25.0	63.0	8.0	4	0.50	40	20
8/1	8.0	7.7	19.0	25.0	63.0	8.0	4	1.00	40	20
8/2	8.0	7.7	19.0	25.0	63.0	8.0	4	2.00	40	20
8/3	8.0	7.7	19.0	25.0	63.0	8.0	4	3.00	40	20
10/0,5	10.0	9.7	22.0	32.0	72.0	10.0	4	0.50	40	20
10/1	10.0	9.7	22.0	32.0	72.0	10.0	4	1.00	40	20
10/2	10.0	9.7	22.0	32.0	72.0	10.0	4	2.00	40	20
10/3	10.0	9.7	22.0	32.0	72.0	10.0	4	3.00	40	20

BCU1-M06-0124 | BCU1 FORMMAKER Z4 2XD BUI

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

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	Material	Strength (N/mm²)	Full Slot	Side Milling	Finishing / Multipass Milling	ETC	Materialgroup Factor fz / a	Materialgroup Factor ae ETC
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	unalloyed	<850	200	200	220	315	1	1
2.1-2.2	low alloyed	<950	190	190	210	232	0.9	0.8
3.1-3.2	high alloyed	<1100	170	170	190	198	0.8	0.7
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.2	grey cast iron	<1000	210	210	230	242	0.9	0.8
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1	ferritic/martensitic	<850		90	95	152	0.9	0.7
2.1	austenitic	<650		80	85	132	0.8	0.5
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-2.3	ALUMINIUM | alloyed/casted	<600	400	400	420	500	1.6	2
3.1-3.3	COPPER | alloyed	<600	200	200	220	262	1.5	1.6
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
2.1-2.2	pure/alloyed	<1000		50	53	75	0.8	0.5
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	**Vc = m/min**		
1.1-1.3	HRSA	<1450		25	28	42	0.7	0.3

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

Material P 1.1-1.3

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

BCU1-M06-0124 | BCU1 FORMMAKER Z4 2XD BUI

Material P 1.1-1.3

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

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Cooling	
Tolerance	f8
Coating	BetaUni Iron

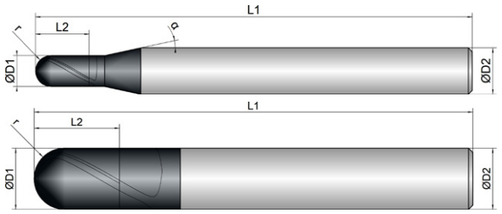
Strategy	HSC, UNI
Application	
Features	HA, 1xD, R

Basic

- 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



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M08-0053	D1 mm ⌀	L2 mm	L1 mm	D2 mm ⌀	z #	r mm		α °
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

BCU1-M08-0053 | BCU1 ROWMAKER Z2 1XD SHORT BUI

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	Material	Strength (N/mm²)	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	unalloyed	<850	260	280	290	1
2.1-2.2	low alloyed	<950	210	230	240	0.9
3.1-3.2	high alloyed	<1100	200	220	230	0.8
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.2	grey cast iron	<1000	270	290	300	0.9
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1	ferritic/martensitic	<850	90	95	100	1
2.1	austenitic	<650	75	80	85	0.9
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-2.3	ALUMINIUM | alloyed/casted	<600	470	490	500	1.6
3.1-3.3	COPPER | alloyed	<600	190	210	220	1.5
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
2.1-2.2	pure/alloyed	<1000	40	45	50	0.8
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	HRSA	<1450	30	35	40	0.7

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

Material P 1.1-1.3

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

Cooling	
Tolerance	f8
Coating	BetaUni Iron

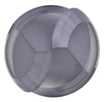
Strategy	HSC, UNI
Application	
Features	HA, 1xD, R

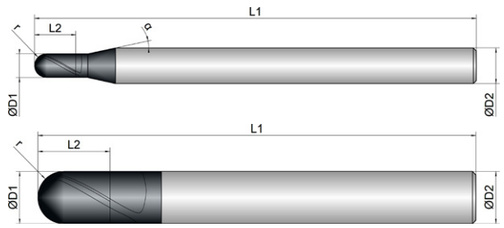
Basic

- 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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M08-0063	D1 mm ø	L2 mm	L1 mm	D2 mm ø	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

BCU1-M08-0063 | BCU1 ROWMAKER Z2 1XD LONG BUI

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	Material	Strength (N/mm²)	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	unalloyed	<850	240	260	270	1
2.1-2.2	low alloyed	<950	190	210	220	0.9
3.1-3.2	high alloyed	<1100	180	200	210	0.8
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.2	grey cast iron	<1000	250	270	280	0.9
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1	ferritic/martensitic	<850	80	85	90	1
2.1	austenitic	<650	65	70	75	0.9
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-2.3	ALUMINIUM | alloyed/casted	<600	440	460	470	1.6
3.1-3.3	COPPER | alloyed	<600	170	190	200	1.5
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
2.1-2.2	pure/alloyed	<1000	40	42	45	0.8
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	HRSA	<1450	30	33	35	0.7

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

Material P 1.1-1.3

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

Cooling	
Tolerance	f8
Coating	BetaUni Iron

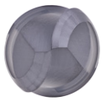
Strategy	HSC, UNI
Application	
Features	HA, 1xD, R

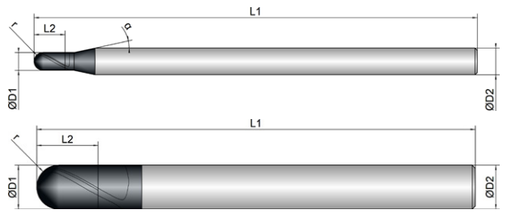
Basic

- 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





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

BCU1-M08-0073 | BCU1 ROWMAKER Z2 1XD OVERLONG BUI

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	Material	Strength (N/mm²)	Roughing	Semi Finishing	Finishing	Materialgroup Factor fz
P	STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	unalloyed	<850	210	230	240	1
2.1-2.2	low alloyed	<950	170	190	200	0.9
3.1-3.2	high alloyed	<1100	165	185	195	0.8
K	CASTINGS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.2	grey cast iron	<1000	230	250	260	0.9
M	STAINLESS STEEL		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1	ferritic/martensitic	<850	75	80	85	1
2.1	austenitic	<650	60	65	70	0.9
N	NON-FERROUS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-2.3	ALUMINIUM | alloyed/casted	<600	410	430	440	1.6
3.1-3.3	COPPER | alloyed	<600	150	170	180	1.5
T	TITANIUM		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
2.1-2.2	pure/alloyed	<1000	30	35	40	0.8
S	SUPER ALLOYS		**Vc = m/min**	**Vc = m/min**	**Vc = m/min**	
1.1-1.3	HRSA	<1450	25	28	30	0.7

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

Material P 1.1-1.3

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

Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA

Basic

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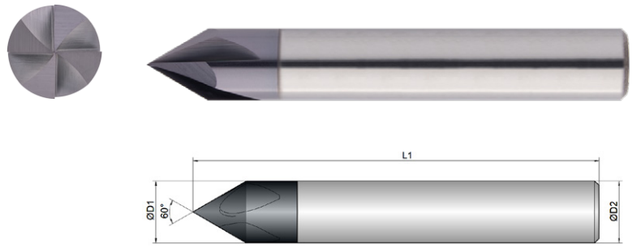
For universal chamfering of work pieces



Roughing	Finishing
inappropriate — optimal	inappropriate — optimal

	D1	L1	D2	z	α
BCU1-M09-0103	mm ⌀	mm	mm ⌀	#	°
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	

BCU1-M09-0103 | BCU1 CHAMFMAKER Z3-4 60° BUI

			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)	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

Basic

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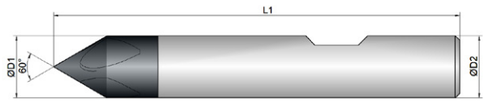
For universal chamfering of work pieces



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

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

			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/mm²)**	**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!

STILL CAN'T FIND A SUITABLE MILLING CUTTER?

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Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA

Basic

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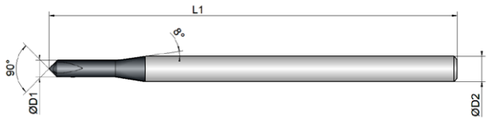
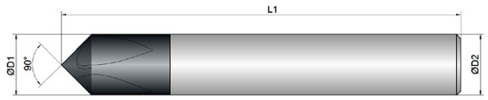
For universal chamfering of work pieces





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M09-0153	D1 mm ⌀	L1 mm	D2 mm ⌀	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	

BCU1-M09-0153 | BCU1 CHAMFMAKER Z3-4 90° BUI

			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)**	**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!

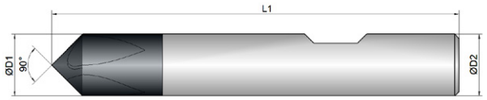
Cooling	
Tolerance	a9
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HB

Basic

Download Catalog Pages (PDF)

For universal chamfering of work pieces



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M09-0154	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

	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/mm²)	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!

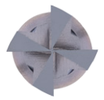
Cooling	
Tolerance	-
Coating	BetaUni Iron

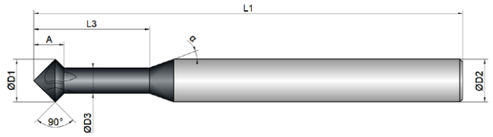
Strategy	UNI
Application	
Features	HA

Basic

Download Catalog Pages (PDF)

- For universal chamfering of work pieces
- Forwards and backwards cutting





Roughing

inappropriate — optimal

Finishing

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	1.5	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	30
10	10.0	5.9	4.0	23.0	72.0	10.0	4	30
12	12.0	5.9	6.0	23.0	73.0	12.0	4	30

BCU1-M10-0023 | BCU1 FB-CHAMFMAKER Z4 90° BUI

	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/mm²)	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!

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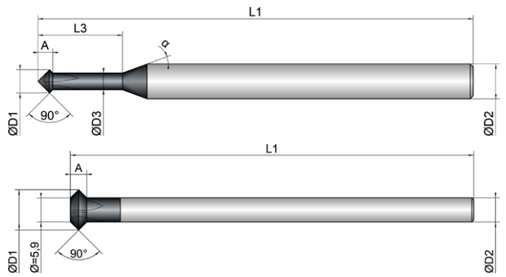
Cooling	
Tolerance	rs
Coating	BetaUni Iron

Strategy	UNI
Application	
Features	HA

Basic

Download Catalog Pages (PDF)

- For universal chamfering of work pieces
- Variant made of blank form for deep cavities
- Forwards and backwards cutting



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M10-0123	D1 mm ⌀	D3 mm ⌀	A mm	L3 mm	L1 mm	D2 mm ⌀	z #	α °
3	3.0	2.2	2.0	10.0	75.0	4.0	4	20
3,8	3.8	2.9	2.7	13.0	75.0	4.0	4	20
4	4.0	2.9	2.7	13.0	75.0	4.0	4	20
4,8	4.8	3.9	3.0	15.0	75.0	5.0	4	20
5	5.0	3.9	3.0	15.0	75.0	5.0	4	20
5,8	5.8	3.9	4.0	15.0	100.0	6.0	4	20
6	6.0	3.9	4.0	15.0	100.0	6.0	4	20
7,8	7.8	5.65	2.0	5.9	100.0	6.0	4	0
8	8.0	5.65	2.0	5.9	100.0	6.0	4	0
9,8	9.8	5.65	4.0	5.9	100.0	6.0	4	0
10	10.0	5.65	4.0	5.9	100.0	6.0	4	0
11,8	11.8	5.65	6.0	5.9	100.0	6.0	4	0
12	12.0	5.65	6.0	5.9	100.0	6.0	4	0

BCU1-M10-0123 | BCU1 FB-CHAMFMAKER Z4 90° BUI

			Dimension	Ø3	Ø3.8	Ø4	Ø4.8	Ø5	Ø5.8	Ø6	Ø7.8	Ø8	Ø9.8
			Infeed in mm	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD	ae= 0.1xD ap= 0.1xD
			Application										
	Material	Strength (N/mm²)	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/mm²)	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

Basic

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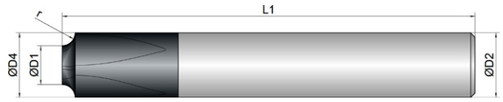
For the universal manufacturing of radii to components



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M11-0023	D1 mm ø	D4 mm ø	L1 mm	D2 mm ø	z #	r mm
3/0,5	3.0	4	50.0	4.0	4	0.50
3,2/0,4	3.2	4	50.0	4.0	4	0.40
3,4/0,3	3.4	4	50.0	4.0	4	0.30
3,6/0,2	3.6	4	50.0	4.0	4	0.20
4/1	4.0	6	50.0	6.0	4	1.00
4,4/0,8	4.4	6	50.0	6.0	4	0.80
4,8/0,6	4.8	6	50.0	6.0	4	0.60
5/1,5	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

BCU1-M11-0023 | BCU1 ROUNDMAKER Z4 BUI

	Material	Strength (N/mm²)	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
			Infeed in mm	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax
			Application										
	Material	Strength (N/mm²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P	STEEL		Vc (m/min)										
1.1-1.3	unalloyed	<850	170	0.024	0.024	0.024	0.024	0.028	0.028	0.028	0.03	0.034	0.038
2.1-2.2	low-alloyed	<950	150	0.02	0.02	0.02	0.02	0.024	0.024	0.024	0.026	0.03	0.034
3.1-3.2	high-alloyed	<1100	100	0.016	0.016	0.016	0.016	0.02	0.02	0.02	0.022	0.026	0.03
K	CASTINGS		Vc (m/min)										
1.1-1.2	grey cast iron	<1000	125	0.016	0.016	0.016	0.016	0.02	0.02	0.02	0.022	0.026	0.03
M	STAINLESS STEEL		Vc (m/min)										
1.1	ferritic/martensitic	<850	85	0.012	0.012	0.012	0.012	0.016	0.016	0.016	0.018	0.022	0.026
2.1	austenitic	<650	75	0.01	0.01	0.01	0.01	0.014	0.014	0.014	0.016	0.02	0.024
N	NON-FERROUS		Vc (m/min)										
1.1-2.3	ALUMINIUM | alloyed/casted	<600	500	0.029	0.029	0.029	0.029	0.033	0.033	0.033	0.035	0.039	0.043
3.1-3.3	COPPER | alloyed	<600	180	0.02	0.02	0.02	0.02	0.024	0.024	0.024	0.026	0.03	0.034
T	TITANIUM		Vc (m/min)										
2.1-2.2	pure/alloyed	<1000	40	0.012	0.012	0.012	0.012	0.016	0.016	0.016	0.018	0.022	0.026
S	SUPER ALLOYS		Vc (m/min)										
1.1-1.3	HRSA	<1450	25	0.01	0.01	0.01	0.01	0.014	0.014	0.014	0.016	0.02	0.024

	Material	Strength (N/mm²)	Dimension	Ø6 R3	Ø9 R3.5	Ø8 R4	Ø7 R4.5	Ø10 R5	Ø8 R6	Ø9 R8	Ø5 R10
			Infeed in mm	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax
			Application								
	Material	Strength (N/mm²)	Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz
P	STEEL		Vc (m/min)								
1.1-1.3	unalloyed	<850	170	0.038	0.04	0.04	0.04	0.041	0.041	0.045	0.045
2.1-2.2	low-alloyed	<950	150	0.034	0.036	0.036	0.036	0.037	0.037	0.04	0.04
3.1-3.2	high-alloyed	<1100	100	0.03	0.032	0.032	0.032	0.033	0.033	0.035	0.035
K	CASTINGS		Vc (m/min)								
1.1-1.2	grey cast iron	<1000	125	0.03	0.032	0.032	0.032	0.033	0.033	0.035	0.035
M	STAINLESS STEEL		Vc (m/min)								
1.1	ferritic/martensitic	<850	85	0.026	0.028	0.028	0.028	0.029	0.029	0.03	0.03
2.1	austenitic	<650	75	0.024	0.026	0.026	0.026	0.027	0.027	0.028	0.028
N	NON-FERROUS		Vc (m/min)								
1.1-2.3	ALUMINIUM | alloyed/casted	<600	500	0.043	0.045	0.045	0.045	0.046	0.046	0.05	0.05
3.1-3.3	COPPER | alloyed	<600	180	0.034	0.036	0.036	0.036	0.037	0.037	0.04	0.04
T	TITANIUM		Vc (m/min)								
2.1-2.2	pure/alloyed	<1000	40	0.026	0.028	0.028	0.028	0.029	0.029	0.03	0.03
S	SUPER ALLOYS		Vc (m/min)								
1.1-1.3	HRSA	<1450	25	0.024	0.026	0.026	0.026	0.027	0.027	0.028	0.028

NOTE | The values marked in turquoise are side applications!

Please use the arithmetic average from D2 and D1 to calculate cutting datas.
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

Basic

Download Catalog Pages (PDF)

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

Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

BCU1-M12-0023	D1 mm ⌀	D4 mm ⌀	A mm	L1 mm	D2 mm ⌀	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

BCU1-M12-0023 | BCU1 FB-ROUNDMAKER Z4 BUI

	Material	Strength (N/mm²)	Dimension	Ø5.6 R0.2	Ø7.6 R0.2	Ø5.4 R0.3	Ø7.4 R0.3	Ø5.2 R0.4	Ø7.2 R0.4	Ø5 R0.5	Ø7 R0.5	Ø8.4 R0.8	Ø8 R1
			Infeed in mm	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax
			Application										
			Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
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/mm²)	Dimension	Ø7.6 R1.2	Ø7 R1.5	Ø8.4 R1.8	Ø8 R2	Ø7 R2.5
			Infeed in mm	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax	ae= rmax ap= rmax
			Application					
			Feed (mm/Z)	fz	fz	fz	fz	fz
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 datas.
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

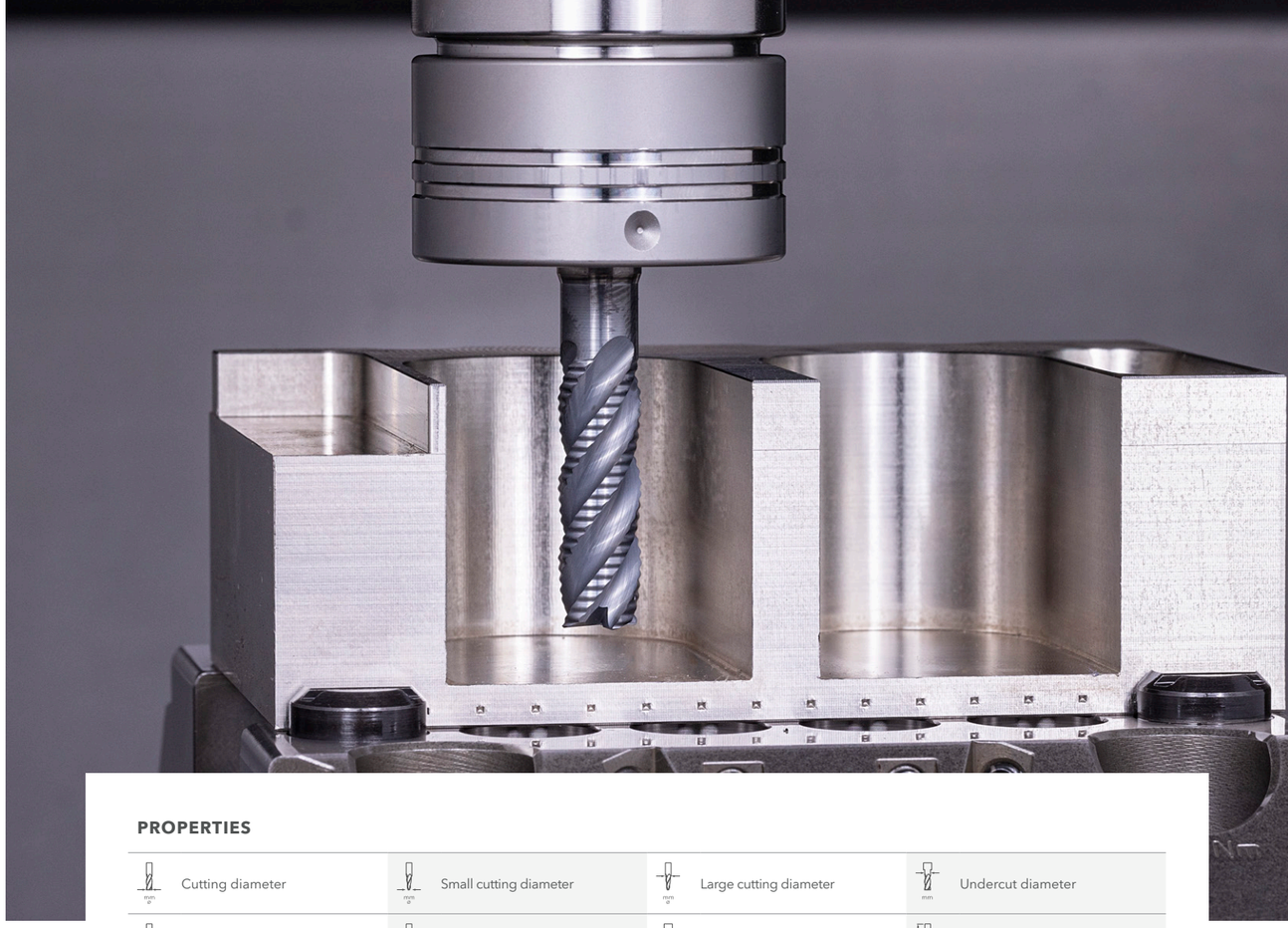
Air-cooling	Dry machining	Oil cooling	Cooling Lubricant
Minimum quantity lubrication			

FEATURES

2xD 2xD	3xD 3xD	4xD 4xD	5xD 5xD
Center cutting	Non-center cutting	HA Without Weldon	HB 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)	R Corner radius	45° Corner bevel	90° Sharp edged

STRATEGY

ETC Extended Trochoidal Cutting	HPC High Performance Cutting	HSC High Speed Cutting	MTC Multi Task Cutting
UNI 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	C30			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						

HOFMANN & VRATNY | BCU1 SERIES

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				S6
1.2382	GX155CrVMo121								
1.2542	45WCrV7	45 WCrV 8		BS 1	45 WCrV 8 KU	2710	45 WCrSi 8		S1
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	49MnVS3			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 WCV 5		X 30 WCrV 5 3 KU			SKD 4	
1.2606	X37CrMoW51		Z 35 CWDV 5	BH 12	X 35 CrMoW 05 KU		F.537	SKD 62	H 12

P 3.2 STEEL | high alloyed <1100 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.2083	X42Cr13	X 42 Cr 13	Z 40 C 14		X 41 Cr 13 KU	2314		SUS 420 J2	420
1.2316	X36CrMo17	X 36 CrMo 17	X38CrMo 16 1		X 38 CrMo 16 1 KU		X 38 CrMo 16		D-4
1.2343	X38CrMoVH1	X 38 CrMoV 5 1	Z 38 CDV 5	BH 11	X 37 CrMoV 5 1 KU		X 37 CrMoV 5	SKD 6	H 11
1.2344	X40CrMoV51	X 40 CrMoV 5 1	Z 40 CDV 5	BH 13	X 40 CrMoV 5 1 1 KU	2242	X 40 CrMoV 5	SKD 61	H 13
1.2436	X210CrW12	X 210 CrW 12	Z 210 CW1 2		X 215 CrW 12 1 KU	2312	X 210 CrW 12	SKD 2	
1.2581	X30WCrV93	X 30 WCrV 9 3	Z 30 WCV 9	BH 21	X 30 WCrV 9 3 KU		X 30 WCrV 9	SKD 5	H 21
1.2601	X165CrMoV12	X 165 CrMoV 12			X 165 CrMoW 12 KU	2310	X 160 CrMoV 12		
1.2767	X45NiCrMo4	40 NiCrMo 4	Y 35 NCD 16		42 NiCrMo 15 7 KU				A 9
1.2779	X6NiCrTi2615			S 66286					660
1.3302	S1214	HS 12 1 4			X 150 WV 1305 KU				A 7
1.3318	S1212	HS 02.01.12							
1.3401	X120Mn12	X 120 Mn 12	Z 120 M 12	BW 10	X G 120 Mn 12	2183	AM-X 120 Mn 12	SCMnH 1	A 128
1.3543	X102CrMo17	X 102 CrMo 17	X100CrMo17		X 105 CrMo 17		X 100 CrMo 17		
1.3549	X89CrMoV81								
1.3551	80MoCrV4216		80 DCV 40	T 11350	X 80 MoCrV 4 4		80 MoCrV 40-16		M 50
1.7225	42CrMo4.M4S	42 CrMo 4	42 CD 4	708 A 42	42 CrMo 4	2244		SCM 440 H	4140

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

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
0.6010	GG10	GJL-100	FGL 100	Grade 100	G 10	0110-00	FG 10	FC 100	A48-20 B
0.6012	GG150 HB	GJL-HB 170							
0.6015	GG15	GJL-150	FGL 150	Grade 150	G 15	0115-00	FG 15	FC 150	A48-25 B
0.6017	GG170 HB	GJL-HB 205							

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

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
0.6020	GG20	GJL-200	FGL 200	Grade 220	G 20	0120-00	FG 20	FC 200	A48-30 B
0.6022	GG190 HB	GJL-HB 230							
0.6025	GG25	GJL-250	FGL 250	Grade 260	G 25	0125-00	FG 25	FC 250	A48-40 B
0.6027	GG220 HB	GJL-HB 250	FGL 250						
0.6030	GG30	GJL-300	FGL 300	Grade 300	G 30	0130-00	FG 30	FC 300	A48-45 B
0.6032	GG240 HB	GJL-HB 275							
0.6035	GG35	GJL-350	FGL 350	Grade 350	G 35	0135-00	FG 35	FC 350	A48-50 B
0.6037	GG260 HB	GJL-HB 275							
0.6040	GG40	GJL-400	FGL 400	Grade 400		0140-00			A48-60 B

HOFMANN & VRATNY | BCU1 SERIES

M 1.1 STAINLESS STEEL FERRITIC/MARTENSITIC <850 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.4000	X6Cr13	X 6 Cr 13	Z 6 C 13	403 S 17	X 6 Cr 13	2301	X 6 Cr 13	SUS 403	403
1.4002	X6CrAl13	X 6 CrAl 13	Z 6 CA 13	405 S 17	X 6 CrAl 13	2302	X 6 CrAl 13	SUS 405	405
1.4005	X12CrS13	X 12 CrS 13	Z 12 CF 13	416 S 21	X 12 CrS 13	2380	X12 CrS 13	SUS 416	416
1.4006	X10Cr13	X 12 Cr 13 KD	Z 12 C 13	410 S 21	X 12 Cr 13	2302	X 12 Cr 13	SUS 410	410
1.4008	GX8CrNi13	GX 7 CrNiMo 12 1	Z 12 CN 13 M	410 C 21	GX 12 Cr 13			SCS 1	414
1.4016	X6Cr17	X 8 Cr 17	Z 8 C 17	430 S 15	X 8 Cr 17 KD	2320	X 8 Cr 17	SUS 430	430
1.4021	X20Cr13	X 20 Cr 13	Z 20 C 13	420 S 37	X 20 Cr 13	2303	X 20 Cr 13	SUS 420 J1	420
1.4024	X15Cr13	X 15 Cr 13	Z 12 C 13 M	420 S 29	X 12 Cr 13			SUS 410 J1	
1.4027	GX20Cr14		Z 20 C 13 M	420 C 29				SCS 2	
1.4028	X30Cr13	X 30 Cr 13	Z 30 Cr 13	420 S 45	X 30 Cr 13	2304	X 30 Cr 13	SUS 420 J2	420
1.4034	X45Cr13	X 45 Cr 13	Z 40 C 14	420 S 45	X 40 Cr 14		X 46 Cr 13		420
1.4057	X19CrNi172	X 19 CrNi 17 2	Z 15 CN 16.02	431 S 29	X 16 CrNi 16	2321	X 15 CrNi 16	SUS 431	431
1.4104	X12CrMoS17	X 14 CrMoS 17	Z 10 CF 17	441 S 29	X 10 CrS 17	2383	X 10 CrS 17	SUS 430 F	430 F
1.4105	X4CrMoS18	X 6 CRMoS 17	Z 6 CDF 18-02					SUS 430 F	430
1.4107	GX8CrNi12	GX 8 CrNi 12	GX 8 CrNi 12		GX 8 CrNi 12				
1.4109	X65CrMo14	X 70 CrMo 15	Z 70 CD 14					SUS 440 A	440 A
1.4110	X55CrMo14		Z 50 CD 13						
1.4112	X90CrMoV18	X 90 CrMoV 18	Z 3 CT 1 2	409 S 1 9	X 6 Cr Ti 1 2			SUS 440 B	440 B
1.4113	X6CrMo171	X 8 CrMo 17	Z 8 CD 17.02	434 S 17	X 8 CrMO 17	2325		SUS 434	434
1.4116	X45CrMoV15	X 50 CrMoV 15	Z 50 CD 15		X50 CrMoV 15		X 46 CrMo 16		
1.4122	X35CrMo17	X 39 CrMo 17 1	X39CrMo17-1		X 35 CrMo 17				
1.4125	X105CrMo17	X 105 CrMo 17	Z 100 CD 17		X 105 CrMo 17			SUS 440 C	440 C
1.4136	GX70CrMo292		Z 60 CD 29.2 M						
1.4313	X5CrNi134	X 3 CrNiMo 13 4	Z 4 CDN 13.4	425 C 11	X 3 CrNiMo 13 4	2385		SCS 5	CA 6-NM
1.4317	GX4CrNi134	GX 4 CrNi 13 4	GX 4 CrNi 13 4		GX 4 CrNi 13 4				
1.4351	X3CrNi134	X 3 CrNi 14 04 KE							
1.4405	GX5CrNiMo165	GX 4 CrNiMo 16 5 1	GX 4 CrNiMo 16 5 1		GX 4 CrNiMo 16 5 1				
1.4510	X6CrTi17	X 8 CrTi 17	Z 8 CT 17		X 6 CrTi 17		X 8 CrTi 17	SUS 430 LX	430 Ti
1.4511	X6CrNb17	X 3 CrNb 17	Z 8 CNb 17		X 6 CrNb 17			SUS 430 LX	430 Nb
1.4512	X6CrTi12	X 5 CrTi 12	Z 6 CT 12	409 S 19	X 6 CrTi12			SUH 409	409
1.4523	X8CrMoTi17	X 2 CrMoTiS 18 2	X 2 CrMoTiS 18 2						
1.4704	X45SiCr4	45SiCr16-11							HNV 2
1.4718	X45CrSi93	X 45 CrSi 8	Z 45 CS 9	401 S 45	X 45 CrSi 8		F.3220	SUH 1	HNV 3
1.4722	X10CrSi13						X 10 CrSi 13		
1.4724	X10CrAl13	X 10 CrAl 13	Z 10 C 13	BH 12	X 10 CrAl 12		X 10 CrAl 13	SUS 405	H-12
1.4725	X8CrAl144	CrAl 14 4	K 91670						
1.4747	X80CrNiSi20	X 80 CrNiSi 20	Z 80 CSN 20.02	433 S 65	X 80 CrSiNi 20		X 80 CrSiNi20-02	SUH 4	HNV 6
1.4762	X10CrAl24	X 10 CrAl 24	Z 10 CAS 24		X 16 Cr 26	2322	X 10 CrAl 24	SUH 442	446
1.4767	X8CrAl205	CrAl 20 5							

M 2.1 STAINLESS STEEL | austenitic <650 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.4300	X12CrNi188			302					
1.4301	X5CrNi1810	X 6 CrNi 18 10 KD	Z 6 CN 18.09	304 S 15	X 5 CrNi 18 10	2332	X 5 CrNi 18 11	SUS 304	304 H
1.4302	X5CrNi199	X 6 CrNi 20 10 KE		308 S 96					
1.4303	X5CrNi1812	X 8 CrNi 18 12 KD	Z 8 CN 17.07	305 S 19	X 8 CrNi 19 10		X 8 CrNi 18 12	SUS 305	308
1.4305	X10CrNiS189	X 8 CrNiS 19 9	Z 8 CNF 18.09	303 S 31	X 8 CrNiS 18 9	2346	F.310.C	SUS 303	303
1.4307	X2CrNi189	X 2 CrNi 18 9	CLC 18.9.L	304 S 11	X 2 CrNi 18 9			SUS 304 L	304 L
1.4308	GX6CrNi189	X 2 CrNi 18 7	Z 6 CN 18.10 M	304 C 15	GX 5 CrNi 19 10	2333		SCS 13	CF-8
1.4310	X12CrNi177	X 12 CrNi 17 7	Z 12 CN 17.07	301 S 21	X 12 CrNi 17 07		X 12 CrNi 17 07	SUS 301	301
1.4311	X2CrNiN1810	X 2 CrNiN 18 10	Z 8 CN 18.12	304 S 62	X 8 CrNi 19 10	2371	X 8 CrNi 18 12	SUS 304 LN	304 LN
1.4312	GX10CrNi188		Z 10 CN 18.9 M	302 C 25				SCS 12	
1.4318	X 2 CrNiN 18 7	X 2 CrNiN 18 7	18-7L		18-7L				
1.4401	X5CrNiMo17122	X 6 CrNiMo 17 12 2 KD	Z 6 CND 17.11	316 S 16	X 5 CrNiMo 17 12	2347	X 5 CrNiMo 17 12	SUS 316	316
1.4404	X2CrNiMo17132	GX 3 CrNiMo 17 12 2 KD	Z 3 CND 19.10 M	316 S 12	GX 2 CrNiMo 19 11	2348	X 2 CrNiMo	SUS 316 L	316 L
1.4406	X2CrNiMoN17122	X 3 CrNiMoN 17 12 2	Z 2 CND 17.12 Az	316 S 61	X 2 CrNiMoN 17 12			SUS 316 LN	316 LN
1.4408	GX6CrNiMo1810	GX 5 CrNiMo 19 11 2	GX 5 CrNiMo 19 11 2	316 C 16	GX 5 CrNiMo 19 11 2	2343	X 7 CrNiMo 20 10	SCS 14	CF-8M
1.4435	X2CrNiMo18143	X 2 CrNiMo 18 16	Z 2 CDN 17.13	316 S 11	X 2 CrNiMo 17 13	2353		SVS 16	316 L
1.4436	X5CrNiMo17133	X 6 CrniMo 18 13 3 KD	Z 6 CND 17.12	316 S 16	X 5 CrNiMo 17 13	2343	X 6 CrNiMo 17 12 03	SUS 316	316
1.4438	X2CrNiMo18164	X 3 CrNiMo 18 16 4	Z 2 CND 19.15	317 S 12	X 2 CrNiMo 18 15	2367		SUS 317 L	317 L
1.4442	X2CrNiMo18154		X 3 CrNiMoN 18 14						

N 1.1 ALUMINIUM | alloyed <500 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
3.1255	AlCu 4 SiMg	AW-2014	A-U4SG	H 15	P-AlCu 4.4 SiMnMg		L-3130	A2014	AA2014
3.1305	AlCu 2.5 Mg	AW-2117	A-U2G	L 86	P-AlCu 2.5 MgSi		L-3180	A2117	AA2117
3.1324	AlCu 4 MgSi	AW-2017 A							
3.1325	AlCuMg1	AW-2017 A	A-U4G	H 14	P-AlCu 4.5 MgMn	GA631	L-3120	A2017	AA2017 A
3.1355	AlCuMg2	AW-2024	A-U4G1	L 97 / L 98	P-AlCu 4.5 MgMn	5	L-3140	A2024	AA2024
3.2315	AlMgSi 1	AW-6082	A-SGM0,7	H 30	P-AlMgSi	4212	L-3453		AA6082
3.3206	AlMgSi 0.5	AW-6060	A-GS	H 9	P-AlMgSi	4140	L-3442		AA6060
3.3208	Al99.9 MgSi	AW-6401							
3.3210	AlMgSi 0.7	AW-6005 A							
3.3211	AlMg 1 SiCu	AW-6061	A-GSUC	H 20	P-AlMg 1 SiCu		L-3420	A6061	AA6061
3.3315	AlMg1	AW-5005 A	A-G0,6	N 41	P-AlMg 0.9	4106	L-3350	A5005	AA5005 A
3.3316	AlMg 1.5	AW-5050	A-G1,5	3L 44	P-AlMg 1.5		L-3380		AA5050 B
3.3317	Al99.85 Mg 1	AW-5305							
3.3318	Al99.9 Mg 1	AW-5505							
3.3326	AlMg 1.8	AW-5051 A							
3.3345	AlMg 4.5	AW-5082	A-G4,5		P-AlMg 4.4			A5082	AA5082
3.3523	AlMg 2.5	AW-5052	A-G2,5C	L 80 / L 81	P-AlMg 2.5	4120	L-3360	A5052	AA5052
3.3525	AlMg 2 Mn 0.3	AW-5251	A-G2M	N4	P-AlMg 2 Mn		L-3361		AA5251
3.3527	AlMg 2 Mn 0.8	AW-5049	A-G2,5MC					A5049	AA5049
3.3535	AlMg 3	AW-5754	A-G3M		P-AlMg 3.5	4130	L-3390		AA5754
3.3537	AlMg 2.7 Mn	AW-5454	A-G2,5MC		P-AlMg 2.7 Mn	4130	L-3391		AA5454
3.3541	G-AlMg 3	AC-51100							
3.3545	AlMg 4 Mn	AW-5086	A-G4MC		P-AlMg 4.4		L-3382		AA5086
3.3547	AlMg 4 Mn	AW-5086	A-G4MC	N8	P-AlMg 4.5	4140	L-3321	A5083	AA5083

N 1.2 ALUMINIUM | alloyed <600 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
3.0615	AlMgSiPb	AW-6012	A-SGPb		P-AlSiMgMn		L-3452		AA6012
3.1645	AlCu 4 PbMgMn	AW-2007				4355	L-3121	A2007	AA2007
3.1655	AlCu 6 BiPb	AW-2011	A-U5PbBi	FC 1	P-AlCu 5.5 PbBi	4338	L-3192	A2011	AA2011
3.4335	AlZn 4.5 Mg 1	AW-7020	A-Z5G	H 17		4425	L-3741		AA7020
3.4345	AlZnMgCu 0.5	AW-7022	A-Z4GU						AA7022
3.4365	AlZnMgCu 1.5	AW-7075	A-Z5GU	2L 95	P-AlZn 5.8 MgCu		L-3710	A7075	AA7075

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

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
3.2151	G-AlSi 6 Cu 4	AC-45000	A-S5UZ	LM 4				AC4B	A 319.0
3.2161	G-AlSi 8 Cu 3	AC-46200	A-S9U3A-Y4	LM 24	5075			AC4D	A 328.0
3.2371	G-AlSi 7 Mg 0,3	AC-42100						AC4CH	A 356.0
3.2373	G-AlSi 9 Mg	AC-43300							
3.2381	G-AlSi 10 Mg	AC-43100							
3.2383	G-AlSi 10 Mg(Cu)	AC-43400	A-S10G	LM 9	3049	4253		ADC3	A 360.2
3.2581	G-AlSi 12	AC-47100	A-S13	LM 6	4514	4261		AC3A	A 413.2
3.2583	G-AlSi 12 Cu	AC-44300	A-S12-Y4	LM 20	5079	4260		ADC1	A 413.1

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

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
2.0240	CuZn 15	CW-502L	CuZn 15	CZ 102				C 2300	C 23000
2.0265	CuZn 30	CW-505L	CuZn 30	CZ 102				C 2600	C 26000
2.0321	CuZn 37	CW-508L	CuZn 37	CZ 180	C 2720				C 27200
2.0492	G-CuZn 15 Si 4	CC-761S-GS							B-198
2.0592	G-CuZn 35 Al 1	CC-765S	U-Z 36 N 3	HTB 1					C 86500
2.0966	CuAl 10 Ni 5 Fe 4	CW-307G	U-A 10 N	CA 104					C 63000
2.1006	SG-CuSn								
2.1050	G-CuSn 10	CC-480K-GS		CT 1					C 90700
2.1052	G-CuSn 12	CC-483K-GS	UE 12 P	Pb 2					C 91700
2.1060	G-CuSn 12 Ni 2	CC-484K-GS							C 91700
2.1176	G-CuPb 10 Sn	CC-495K-GS	UE 10 Pb 10	LB 2					C 93700
2.1182	G-CuPb 15 Sn	CC-496K-GS	U-Pb 15 E 8	LB 1					C 93800
2.1188	G-CuPb 20 Sn	CC-497K-GS	U-Pb 20	LB 5					C 94100
2.1266	CuCd 1								
2.1292	G-CuCrF 35	CC-140C		CC1-FF					C 81500
2.1293	CuCrZr	CW-106C	U-Cr 0.8 Zr	CC 102					C 81500

S 2.1 TITANIUM | commercially pure <600 N/mm²

Material-number	Tradename	Germany | DIN	Europe | EN	France | AFNOR	GB | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
3.7025		Ti 99,8	Titan Grade 1	AIR:9182T35	2 TA 1					R 50250
3.7035		Ti 99,7	Titan Grade 2	AIR:9182T40	2 TA 2-1					R 50400
3.7055		Ti-99,6	Titan Grade 3	AIR:9182T50	TA 3					R 50550
3.7065		Ti-99,5	Titan Grade 4	AIR:9182T60	2 TA 6-9					R 50700

S 2.2 TITANIUM | alloyed <1000 N/mm²

Material-number	Tradename	Germany | DIN	Europe | EN	France | AFNOR	GB | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
3.7105		TiNi 0,8 Mo 0,3	Titan Grade 12							
3.7115		TiAl 5 Sn 2,5	Titan Grade 6	T-A 5 E						Ti 5 Al-2,5 Sn
3.7195		TiAl 3 V 2,5	Titan Grade 9							
3.7225		Ti 1 Pd	Titan Grade 11		TP 1					R 52250
3.7235		Ti 2 Pd	Titan Grade 7							T 52400
3.7164		TiAl 6 V 4-LN	Titan Grade 5							R 56400
3.7165		TiAl 6 V4	Titan Grade 5	T-A 6 V	TA 10-13					

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

Material-number	Tradename	Germany | DIN	Europe | EN	France | AFNOR	GB | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.3910	Magnifer® 36	Ni36	D 1							
1.3926	Magnifer® 50	RNi12								
1.4361	X1CrNiSi1815	X 1 CrNiSi 18-15-4	X 1 CrNiSi 18 15 4							
1.4562	Nicrofer® 3127	X1NiCrMoCu32287	X 1 NiCrMoCu 32 28 7							
1.4562	Alloy 31	X1NiCrMoCu32287	X 1 NiCrMoCu 32 28 7							
1.4563	Sanicro® 28	X1NiCrMoCuN31274	X 1 NiCrMoCuN 31-27-4	X 1 NiCrMoCuN 31 27 4		X 1 NiCMoCuN 31 27 4	2584			
1.4862	INCOLOY® Alloy DS	X12NiCr3618		Z 12 NCS 37.18	NA 17					
1.4980	INCOLOY® Alloy 286	X6NiCrTiMoVB21152	X 6 NiCrTiMoVB 21 15 2	Z 6 NCTDV 25.15 B	286 S 31					
2.4478	Alloy 52 (Nilo® 52)	FeNi 52	Titan Grade 4	AIR:9182T60	2 TA 6-9					N 14052

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

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

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

Material-number	Tradename	Germany | DIN	Europe | EN	France | AFNOR	GB | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
2.4681	ULTIMET® alloy	CoCr26Ni9MoSW								
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)	$V_c = \frac{D * \pi * n}{1000}$
Calculate rotational speed (rpm)	$n = \frac{V_c * 1000}{D * \pi}$
Calculate feed rate (mm/min)	$V_f = n * z * f_z$
Calculate feed per tooth (mm/number of teeth)	$f_z = \frac{V_f}{n * z}$
Calculate chip removal rate (cm³/min)	$Q = \frac{a_p * a_e * V_f}{1000}$
Calculate average chip thickness (mm)	$h_m = f_z * \frac{\sqrt{a_e}}{D}$

Explanation of terms

Vc	Cutting speed	in m/min
n	Rotational speed	in rpm
Vf	Feed rate	in mm/min
Fz	Feed per tooth	in mm/number of teeth
z	Number of teeth (cutting)	
ap	Depth of cut	in mm
ae	Width of cut	in mm
hm	Average chip thickness	in mm
Q	Chip removal rate	in cm³/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 ft. 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 fling 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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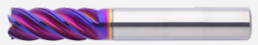

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