EXU1 SERIES

2026

HOFMANN & VRATNY — OUR EXPERTS FOR UNIVERSAL USE

OUR EXU1 SERIES

THE RIGHT TOOL. AT ALL TIMES.

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

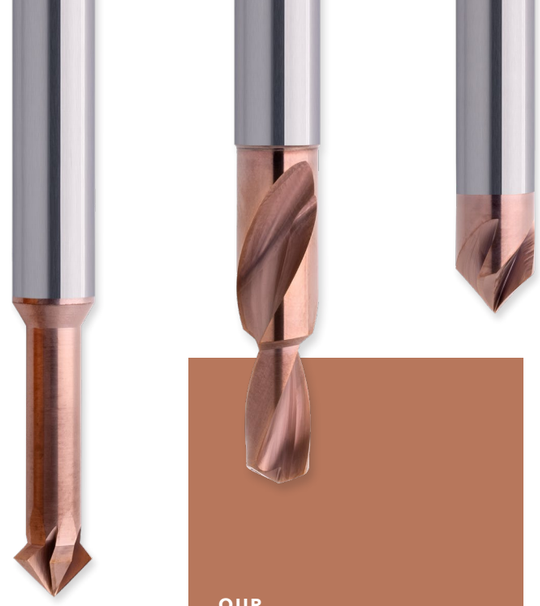
Every day, our strong team works on our collective goal of producing the best tools in the world. Companies from the medical industry, semi-conductor industry, machine and plant construction, aviation, aerospace engineering, and last but not least, the automotive industry have been using our milling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

The success of our company is built on innovation, a culture of cooperation, open interaction with high respect and many years of successful and trustful collaboration with our business partners. You can always count on us, our tools 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
EXU1 SERIES

50
YEARS OF EXPERIENCE

2 million
TOOLS PRODUCED EVERY YEAR

MILLING CUTTERS

DRILLS

MADE IN BAVARIA

MADE IN CZECHIA

PROVEN QUALITY

PROVEN QUALITY

- Manufacturer of solid carbide cutting tools for a wide range of materials
- Founded in 1976
- 2 locations in Bavaria and 1 location in Czechia
  - Headquarters and milling cutter production in Aßling near Munich
  - Regrinding centre in Nuremberg
  - Location with drill production in Ivančice near Brno

BEHIND THE SCENES

PRODUCTION ENVIRONMENT:
ALWAYS UP TO DATE

In a production area of 3,751 m², we produce around 2 million tools per year. In order to guarantee the precise manufacture of our tools, our clean production halls are kept at a constant temperature of 24 °C.

PLANT FOR MACRO TOOLS

- Manufacturing of diameters from 8 - 32 mm
- Use of 5 & 6-axis CNC grinding machines with 12-position grinding wheel changer enable us to manufacture complex tool geometries
- Radius tolerance of less than 5 µm
- Laser micrometer with measuring ranges up to 50 mm covers a wide product range

PLANT FOR MICRO TOOLS

- Manufacturing of diameters from 0.1 - 6 mm
- Use of 5 & 6-axis CNC grinding machines especially with linear and hydrostatic technology
- Tolerances are 3 µm for concentricity and radii and 5 µm for diameter
- CNC measuring machines for recording and measuring the smallest geometries up to 0.1 mm diameter

PLANT FOR SC DRILLS

- Production for standard and special drills
- Use of 5 & 6-axis grinding machines with steady rest
- Measuring technology for particularly long tools

DEPARTMENT FOR SPECIAL TOOLS

- Production of a wide range of semi-standard and special tools
- The delivery times for special milling cutters are as follows:
  - 3 weeks uncoated
  - 4 weeks coated
  - 6 weeks diamond-coated

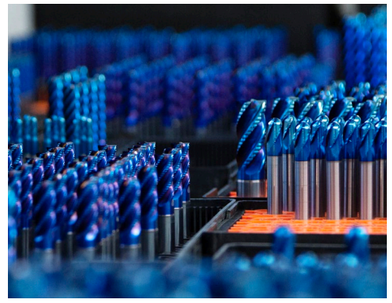
REGRINDING CENTRE

- Original reconditioning of Hofmann & Vratny tools
- Regrinding of third-party tools
- The delivery times for reground tools are as follows:
  - without coating: 21 calendar days
  - with coating: 28 calendar days

RESEARCH & DEVELOPMENT:
THE ORIGIN OF OUR INNOVATIONS

In our R&D department, we develop various milling cutter geometries and work together with our partners on innovative coatings and high-performance substrates. Furthermore, on a total of four CNC milling machines, our milling cutters and those from our competitors are tested here every day in order to develop our tools in the best possible way for state-of-the-art production processes.

WAREHOUSE & LOGISTICS:
SHIPPING TOGETHER



Through our global partner and trading network, we supply the manufacturing industries worldwide and work hand in hand to develop tools that meet customer requirements and market demands. In our warehouse and logistics department, our tools go through a multi-stage process to ensure that they reach the customer in perfect condition. With a stock availability of over 98.5 %, we guarantee same-day dispatch for orders received by 3 pm.

PEOPLE ARE THE CENTRE OF ALL OUR ACTIVITIES

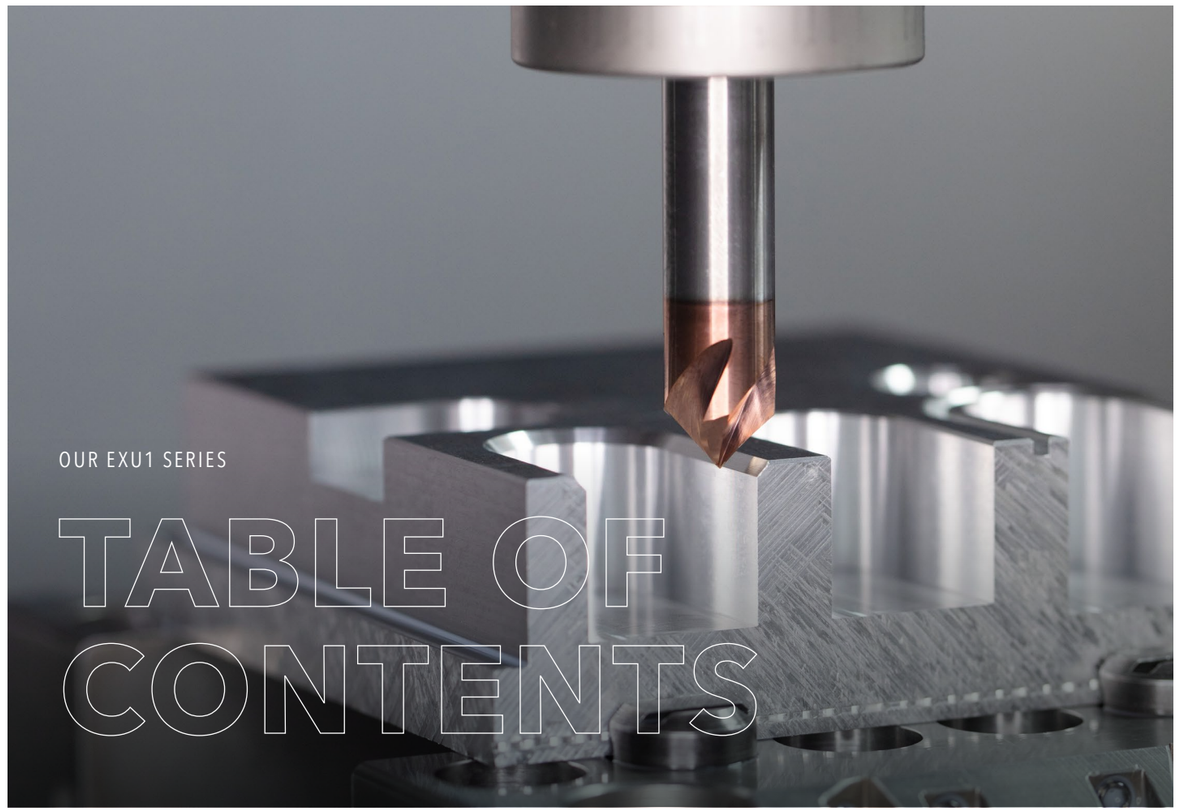
Every day, our team makes a significant contribution to the success of our company, which is why it is important to us that our employees feel comfortable and enjoy their work alongside with their day-to-day tasks. To contribute to the well-being of our employees, we offer:

- a daily free hot lunch in our canteen
- free hot and cold drinks
- many social benefits

WOULD YOU LIKE TO GET YOUR OWN IMPRESSION OF US?

Then come and visit us with our partner.

GET EVEN MORE INSIGHTS BEHIND THE SCENES:



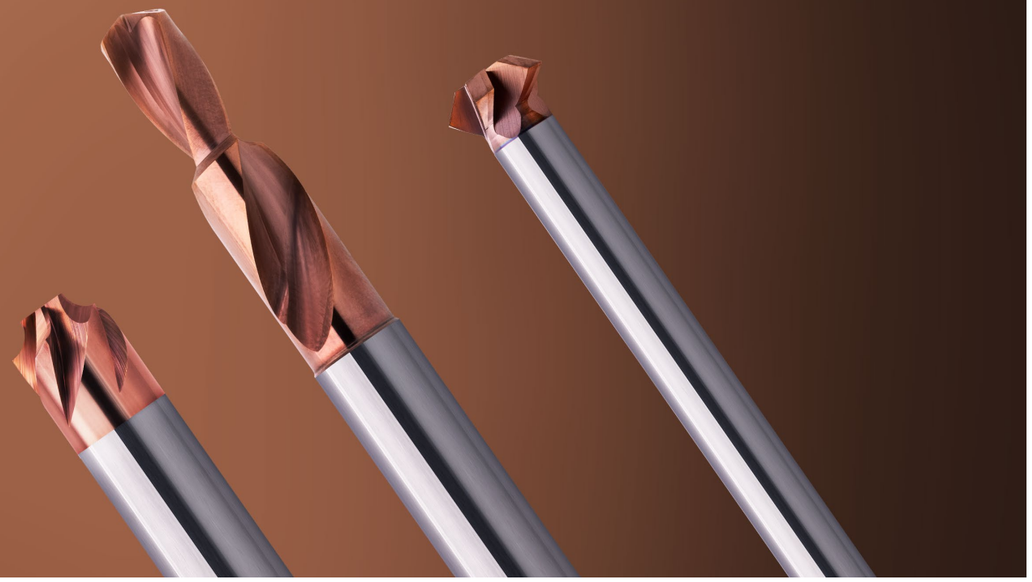
OUR EXU1 SERIES

TABLE OF CONTENTS

HOFMANN & VRATNY | EXU1 SERIES

OUR EXU1 SERIES

Our experts for universal use



THE EXU1 SERIES: THE NEW BENCHMARK FOR UNIVERSAL HIGH-END MACHINING

With the EXU1 series, we are taking universal machining to a whole new level. The series combines the flexibility of all-rounders with the uncompromising performance of expert tools.

The perfect combination of innovative geometry, a premium substrate and a state-of-the-art coating technology ensures consistent performance across a wide range of applications. The tools are used in demanding manufacturing processes and help to reduce the number of different tools required.

THE EXU1 SERIES: The new benchmark for universal high-end machining

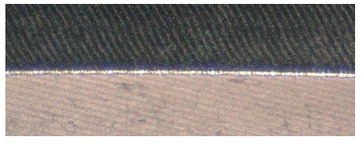
- Perfectly balanced to cover a wide range of materials with maximum performance
- This high-tech universal coating offers excellent thermal and mechanical protection in almost all materials. Thanks to its chromium-free design, it is also suitable for use in medical technology.
- An extremely durable, ultra-fine-grain substrate minimises the risk of micro-cracks and effectively protects the cutting edges against premature chipping

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

BEFORE EDGE PREPARATION

AFTER EDGE PREPARATION



EXPERT U1 CHAMFMAKER
(M09) Z3-4

- Optimised for universal use in all materials
- The spiral design ensures excellent surface finishes with efficient cutting performance
- Available in 60° and 90°
- Available as HA
- With AUR coating (chromium-free)

The tip ensures excellent accessability

EXPERT U1 FB CHAMFMAKER
(M10) Z4-5

- Optimised for universal use in all materials
- Excellent surface finishes at high cutting speeds thanks to the chip angle
- Available as HA
- With AUR coating (chromium-free)

EXPERT U1 ROUNDMAKER
(M11) Z5

- Optimised for universal use in all materials
- The spiral design ensures excellent surface finishes with efficient cutting performance
- Available as HA
- With AUR coating (chromium-free)

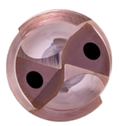
EXPERT U1 PRE COREMAKER
(D02) Z2

- Optimised for universal use in all materials
- Double-guided chip chamber for ideal chip evacuation
- Polished surfaces for minimal frictional resistance
- Angled deburring edge ensures an excellent finish on the resulting chamfer
- Available as HA
- With AUR coating (chromium-free)

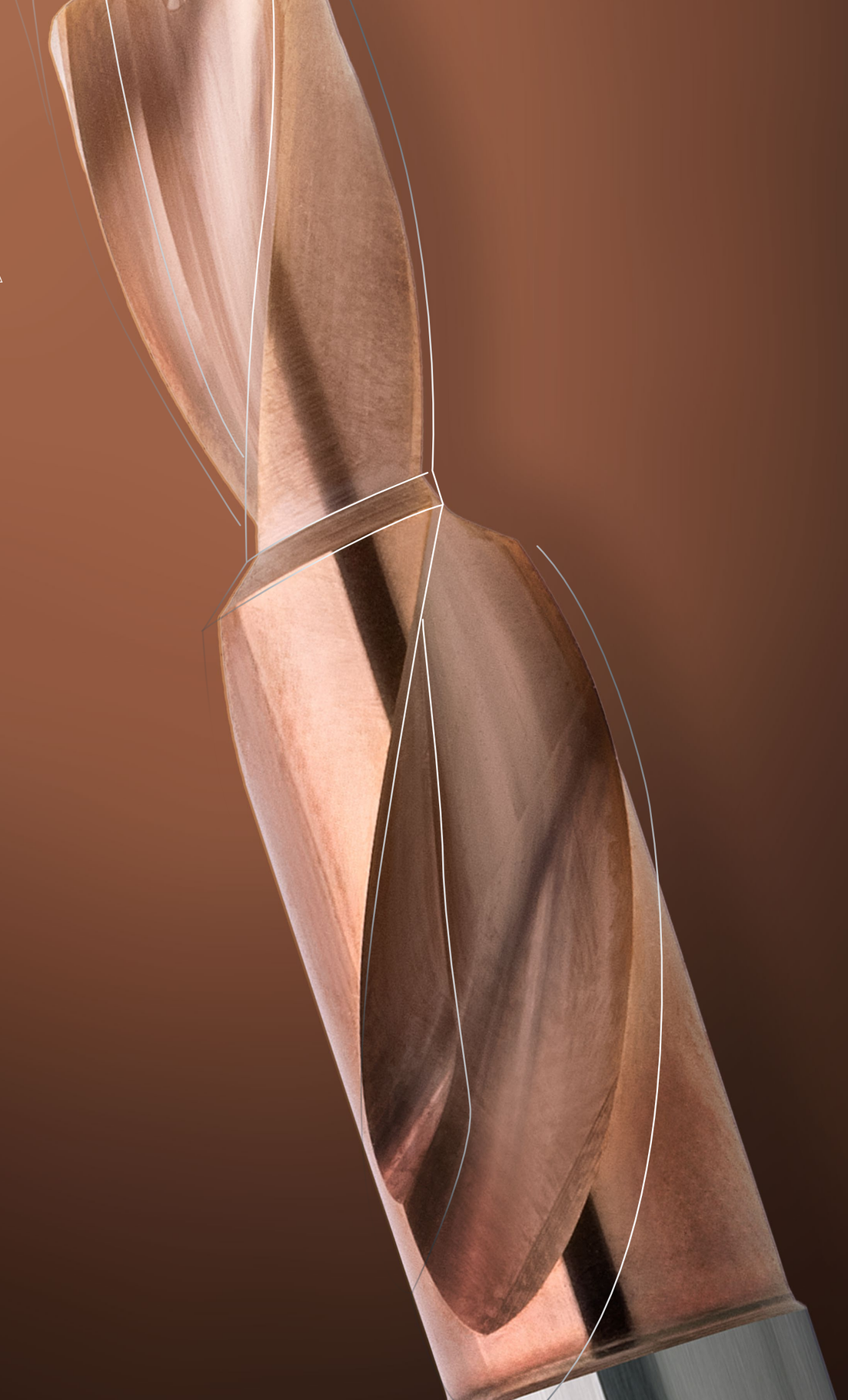
Specially curved face cutting edge for higher feed rates and secure centring

with twisted internal cooling

Tolerance k6 for borehole F7



ALPHA UNI ROSE



AUR

AUR | The universal high-performance coating

The Alpha Uni Rose coating (AUR) is our response to the demands of modern high-performance machining. As a truly universal coating, it combines maximum performance across an extremely wide range of materials.

This innovative formulation not only makes AUR an extremely robust all-rounder in general machining, but also makes it suitable for demanding applications in medical technology.

HOFMANN & VRATNY | EXU1 SERIES

AUR

The benefits of AUR coating at a glance:

- Excellent results when machining almost all materials
- Enables use in sensitive applications in medical and dental technology thanks to its completely chromium-free design
- Effectively protects the tool against heat and wear – in both wet and dry machining
- Minimises material build-up on the cutting edge, ensures efficient chip evacuation and delivers excellent surface finishes

ALPHA UNI ROSE – AT A GLANCE

Components	Aluminium, titanium, silicon and nitrogen (chromium-free)
Layer thickness	Between 1 and 3 µm, depending on the tool diameter
Layer hardness	approx. 3.900 HV
Adhesion factor	Friction coefficient: approx. 0.3 (dry on steel)
Cooling	Dry and wet machining
Main application	Steel and cast iron, titanium, stainless steel
Secondary application (limited suitability)	Aluminium, nickel-based alloys, cobalt-chromium
Max. operating temperature	approx. 1100 °C

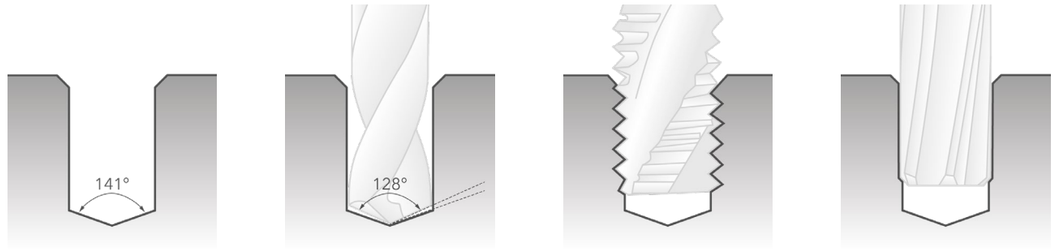
State-of-the-art coating technology

- Completely droplet-free and excellent surface smoothness
- Particularly strong bond between the tool and the coating
- Low tendency to stick during the machining process
- Low internal stress in the coating
- Higher coating density

OUR NEW EXU1 SERIES

EXU1 PRE COREMAKER

Our EXU1 Pre Coremaker combines drilling and chamfering in a single operation, thereby enabling efficient and reliable machining. They are suitable for applications such as pilot holes in preparation for deep-hole drills and are equipped with an integrated lead-in chamfer for this purpose. Furthermore, they can be used to produce threaded core holes with simultaneous 45° countersinking, as well as through-holes and blind holes with a chamfered entry edge, all in a single operation. The pilot drills also offer a reliable solution for pre-drilling prior to subsequent reaming.



(Pilot) hole with a chamfer

k6 tolerance for smooth guidance of deep hole drills

141° at the bottom for precise centring of the deep hole drill

Pilot hole for threading

Pilot hole for reaming

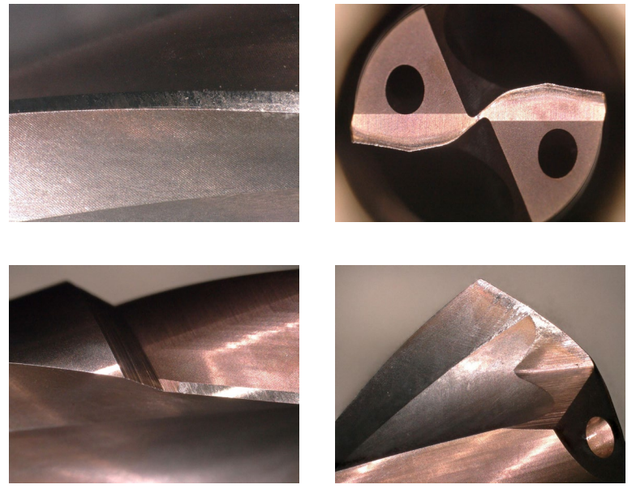
Advantages include:

- Drilling and chamfering in a single operation
- Fewer tool changes
- Shorter machining times
- Higher process reliability
- Less touch-up work thanks to integrated edge deburring
- Improved assembly properties

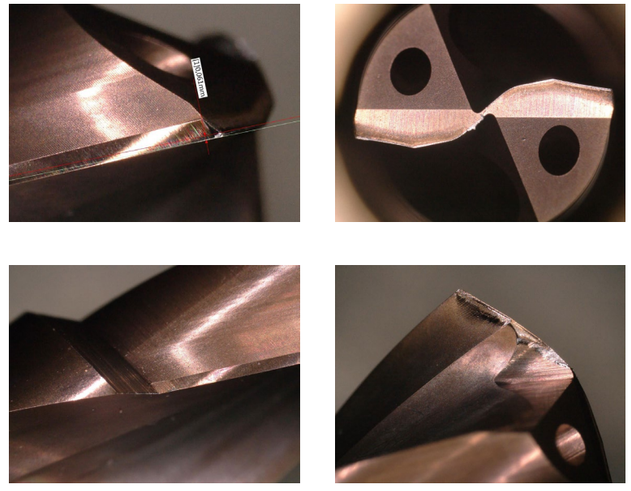
Tool life test of our EXU1 Pre Coremaker

Tests carried out in-house at our research centre have demonstrated the proven tool life of our Pre Coremaker.

The high-resolution images show our EXU1 Pre Coremaker Z2 3xD IC AUR after 2,268 drill holes in 1.4301.
No significant damage or chipping was visible after drilling.



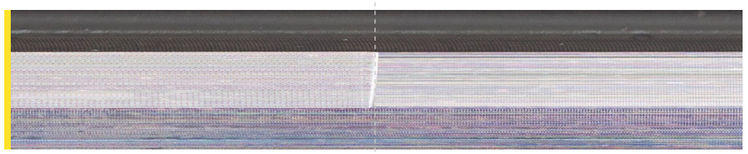
The high-resolution images show our EXU1 Pre Coremaker Z2 3xD IC AUR after drilling 3,222 holes in 1.7225 (42CrMo4).
Once again, no significant damage or chipping was visible on the tool after drilling.



OUR NEW EXU1 CHAMFMAKER (EXU1-M09-0053)

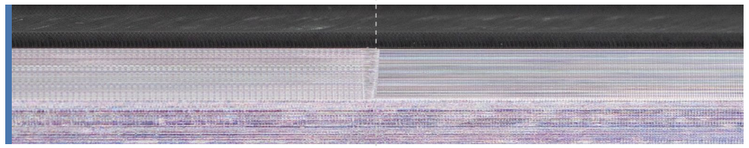
COMPARISON WHEN DEBURRING STANDARD VS. EXU1

Comparison of the chamfer surface after deburring



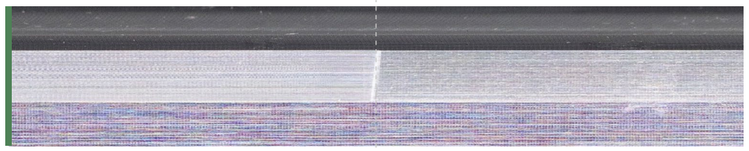
DEBURRED USING BCU1-M09-0153 | DEBURRED USING EXU1-M09-0053

Technical parameters Deburring	
Material	1.4301
Vc	95 m/min
fz	0.08 mm/Z



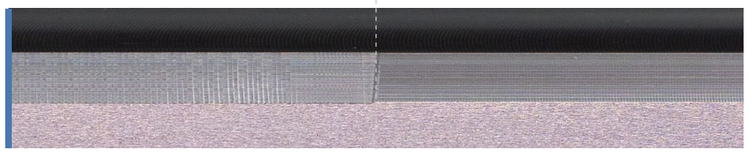
DEBURRED USING BCU1-M09-0153 | DEBURRED USING EXU1-M09-0053

Material	1.7225 (42CrMo4)
Vc	85 m/min
fz	0.085 mm/Z



DEBURRED USING BCU1-M09-0153 | DEBURRED USING EXU1-M09-0053

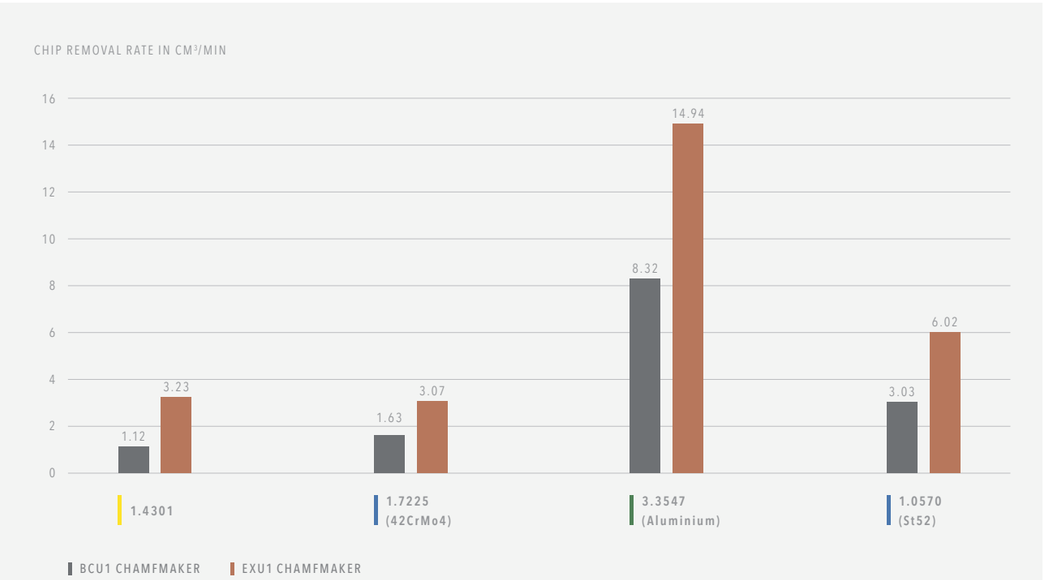
Material	3.3547 (Aluminium)
Vc	320 m/min
fz	0.11 mm/Z



DEBURRED USING BCU1-M09-0153 | DEBURRED USING EXU1-M09-0053

Material	1.0570 (St52)
Vc	135 m/min
fz	0.105 mm/Z

Comparison of the chip removal rate when deburring

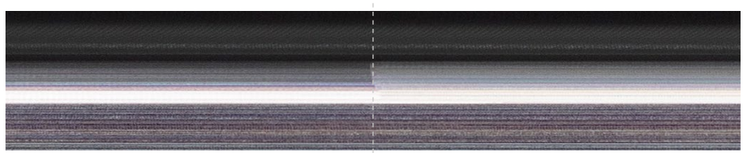


The spiral cutting geometry of the EXU1 chamfering tool ensures continuous, sliding engagement with the material. As a result, the deburring tool operates particularly smoothly and with minimum vibration, which also has a positive effect on tool life. Furthermore, the EXU1 series enables the universal machining of a wide variety of materials.

OUR NEW EXU1 ROUNDMAKER (EXU1-M11-0023)

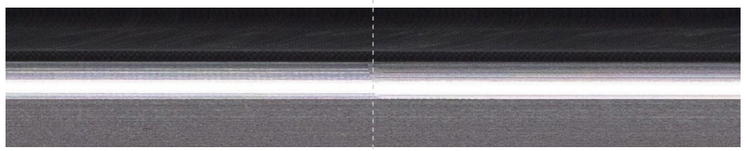
COMPARISON WHEN CORNER ROUNDING STANDARD VS. EXU1

Comparison of the surface after corner rounding



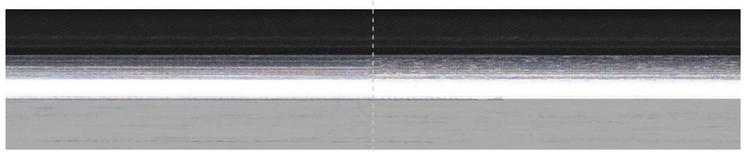
CORNER ROUNDED WITH BCU1-M11-0023 | CORNER ROUNDED WITH EXU1-M11-0023

Technical parameters Corner rounding	
Material	1.4301
Vc	100 m/min
fz	0.032 mm/Z



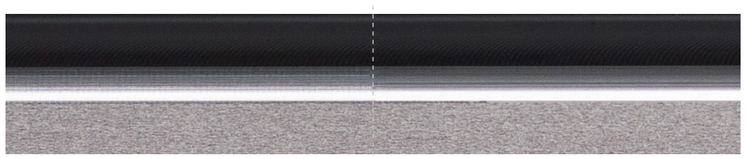
CORNER ROUNDED WITH BCU1-M11-0023 | CORNER ROUNDED WITH EXU1-M11-0023

Material	1.7225 (42CrMo4)
Vc	130 m/min
fz	0.041 mm/Z



CORNER ROUNDED WITH BCU1-M11-0023 | CORNER ROUNDED WITH EXU1-M11-0023

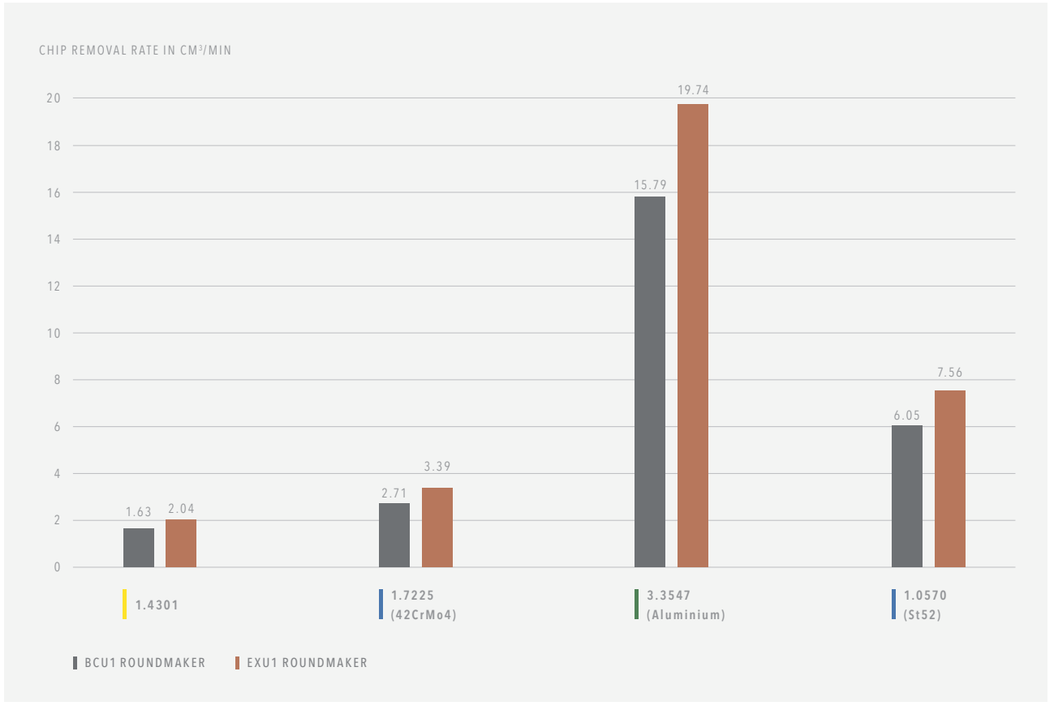
Material	3.3547 (Aluminium)
Vc	500 m/min
fz	0.062 mm/Z



CORNER ROUNDED WITH BCU1-M11-0023 | CORNER ROUNDED WITH EXU1-M11-0023

Material	1.0570 (St52)
Vc	220 m/min
fz	0.054 mm/Z

Comparison of the chip removal rate when corner rounding



The spiral cutting geometry of the EXU1 Roundmaker ensures continuous, smooth engagement with the material. As a result, the corner rounding cutter runs remarkably smooth and with minimum vibration.

DIGITAL SERVICES

DISTRIBUTION PARTNERS

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

FIND OUT MORE ABOUT OUR GLOBAL SALES PARTNERS

Browse all EXU1 Series products in our shop

Discover the products in the EXU1 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 customise an existing tool. Using our configurator for special milling cutters, you can customise 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

EX U 1 - M 11 - 0023

PRODUCT LINE

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

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
- **MED** Medical technology

VERSION

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

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
- **M26** Ball cutter | SMOOTHMAKER
- **M27** Chamfer cutter | BEVELMAKER
- **D01** Spiral drill | COREMAKER
- **D02** Pilot drill | PRE COREMAKER

OTHER DISTINGUISHING FEATURES

EX U 1 - M 11 - 0023 - 12/0,5

PRODUCT IDENT

- **z.B.** 0293

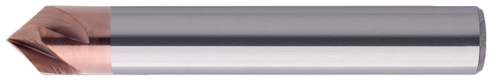
DIMENSION

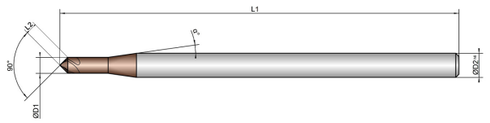
- **3x10** Cutting diameter x length of undercut
- **12/0,5** Cutting diameter / corner radius
- **10** Diameter

Cooling	
Tolerance	
Coating	AlphaUni Rose
Strategy	UNI
Application	
Features	HA, 90°

Expert

- Optimised for universal use in all materials
- The spiral geometry ensures excellent surface finishes at efficient cutting parameters
- The tip ensures excellent accessibility





Roughing	Finishing
inappropriate – optimal	inappropriate – optimal

EXU1-M09-0053	D1 mm ⌀	L2 mm	L1 mm	D2 mm ⌀	z #	α °
0,5	0.5	0.35	50.0	3.0	3	8
0,8	0.8	0.55	50.0	3.0	3	8
1	1.0	0.7	50.0	3.0	3	8
2	2.0	1.4	50.0	3.0	4	8
3	3.0	2.1	50.0	3.0	4	
4	4.0	2.8	50.0	4.0	4	
6	6.0	4.2	57.0	6.0	4	
8	8.0	5.6	63.0	8.0	4	
10	10.0	7.0	72.0	10.0	4	
12	12.0	8.5	83.0	12.0	4	

Download Catalog Pages (PDF)

	Material	Strength (N/mm²)	Dimension	Ø0.5	Ø0.8	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12
			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	ae= 0.1xD ap= L2 max
			Application										
			Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P	STEEL		**Vc (m/min)**										
1.1	unalloyed	<500	140	0.014	0.02	0.025	0.03	0.04	0.055	0.07	0.085	0.1	0.11
1.2-1.5	unalloyed	<1100	130	0.012	0.018	0.02	0.023	0.03	0.04	0.055	0.075	0.09	0.105
2.1-2.2	low alloyed	<950	120	0.01	0.014	0.016	0.02	0.025	0.035	0.05	0.065	0.08	0.095
2.3-2.4	low alloyed	<1300	85	0.01	0.014	0.016	0.02	0.025	0.035	0.05	0.065	0.08	0.095
3.1-3.2	high alloyed	<1100	105	0.008	0.012	0.014	0.018	0.02	0.025	0.04	0.055	0.07	0.085
3.3	high alloyed	<1400	80	0.008	0.012	0.014	0.018	0.02	0.025	0.04	0.055	0.07	0.085
K	CASTINGS		**Vc (m/min)**										
1.1-1.2	grey cast iron	<1000	120	0.01	0.014	0.016	0.02	0.025	0.035	0.05	0.065	0.08	0.095
M	STAINLESS STEEL		**Vc (m/min)**										
1.1	ferritic/martensitic	<850	100	0.012	0.016	0.018	0.022	0.025	0.03	0.045	0.06	0.075	0.09
2.1	austenitic	<650	95	0.01	0.012	0.014	0.018	0.02	0.025	0.04	0.055	0.07	0.085
2.2	austenitic	<750	80	0.01	0.012	0.014	0.018	0.02	0.025	0.04	0.055	0.07	0.085
3.1	DUPLEX STEEL | super austenitic	<1100	60	0.008	0.01	0.012	0.016	0.018	0.02	0.035	0.05	0.065	0.075
N	NON-FERROUS		**Vc (m/min)**										
1.1-2.3	ALUMINIUM | alloyed/cast	<600	320	0.02	0.025	0.035	0.04	0.055	0.07	0.085	0.095	0.11	0.12
3.1-3.3	COPPER | alloyed	<600	180	0.012	0.018	0.02	0.023	0.03	0.04	0.055	0.075	0.09	0.105
T	TITANIUM		**Vc (m/min)**										
2.1-2.2	pure/alloyed	<1000	50	0.008	0.01	0.012	0.016	0.018	0.02	0.035	0.05	0.065	0.075
S	SUPER ALLOYS		**Vc (m/min)**										
1.1-1.3	HRSA	<1450	35	0.006	0.008	0.01	0.012	0.014	0.016	0.025	0.035	0.045	0.055

ADVICE | Only guide values!
Material group overview: see end of brochure

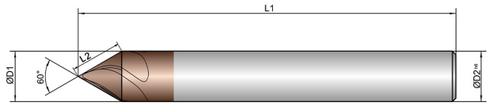
EXU1-M09-0153 | EXU1 CHAMFMAKER Z4 60° AUR

Cooling	
Tolerance	
Coating	AlphaUni Rose

Strategy	UNI
Application	
Features	HA, 60°

Expert

- Optimised for universal use in all materials
- The spiral geometry ensures excellent surface finishes at efficient cutting parameters
- The tip ensures excellent accessibility



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

	D1 mm ø	L2 mm	L1 mm	D2 mm ø	z #
EXU1-M09-0153					
6	6.0	5.9	57.0	6.0	4
8	8.0	7.9	63.0	8.0	4
10	10.0	9.9	72.0	10.0	4
12	12.0	11.9	83.0	12.0	4

Download Catalog Pages (PDF)

Dimension	Ø6	Ø8	Ø10	Ø12
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
Application				

	Material	Strength (N/mm²)	Feed (mm/Z)	fz	fz	fz	fz
P	STEEL		**Vc (m/min)**				
1.1	unalloyed	<500	140	0.07	0.085	0.1	0.11
1.2-1.5	unalloyed	<1100	130	0.055	0.075	0.09	0.105
2.1-2.2	low alloyed	<950	120	0.05	0.065	0.08	0.095
2.3-2.4	low alloyed	<1300	85	0.05	0.065	0.08	0.095
3.1-3.2	high alloyed	<1100	105	0.04	0.055	0.07	0.085
3.3	high alloyed	<1400	80	0.04	0.055	0.07	0.085
K	CASTINGS		**Vc (m/min)**				
1.1-1.2	grey cast iron	<1000	120	0.05	0.065	0.08	0.095
M	STAINLESS STEEL		**Vc (m/min)**				
1.1	ferritic/martensitic	<850	100	0.045	0.06	0.075	0.09
2.1	austenitic	<650	95	0.04	0.055	0.07	0.085
2.2	austenitic	<750	80	0.04	0.055	0.07	0.085
3.1	DUPLEX STEEL | super austenitic	<1100	60	0.035	0.05	0.065	0.075
N	NON-FERROUS		**Vc (m/min)**				
1.1-2.3	ALUMINIUM | alloyed/cast	<600	320	0.085	0.095	0.11	0.12
3.1-3.3	COPPER | alloyed	<600	180	0.055	0.075	0.09	0.105
T	TITANIUM		**Vc (m/min)**				
2.1-2.2	pure/alloyed	<1000	50	0.035	0.05	0.065	0.075
S	SUPER ALLOYS		**Vc (m/min)**				
1.1-1.3	HRSA	<1450	35	0.025	0.035	0.045	0.055

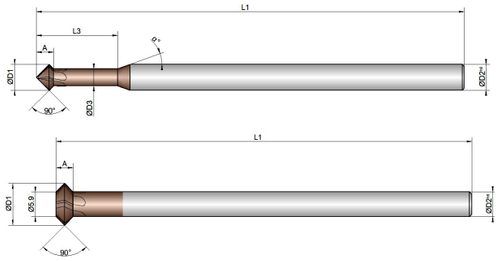
ADVICE | Only guide values!
Material group overview: see end of brochure

Cooling	
Tolerance	Manufacturer tolerance
Coating	AlphaUni Rose

Strategy	UNI
Application	
Features	HA, 90°

Expert

- Optimised for universal use in all materials
- Thanks to the rake angle, excellent surface finishes are achieved at high cutting speeds



Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

EXU1-M10-0023	D1 mm ø	D3 mm ø	A mm	L3 mm	L1 mm	D2 mm ø	z #	α °
3	3.0	2.2	2.0	12.0	75.0	4.0	4	20
3,8	3.8	2.9	2.5	15.5	75.0	4.0	4	20
4	4.0	2.9	2.7	15.7	75.0	4.0	4	20
4,8	4.8	3.9	3.0	18.0	75.0	5.0	5	20
5	5.0	3.9	3.1	18.1	75.0	5.0	5	20
5,8	5.8	3.9	4.0	19.0	100.0	6.0	5	20
6	6.0	3.9	4.2	19.2	100.0	6.0	5	20
7,8	7.8		2.0		100.0	6.0	5	
8	8.0		2.0		100.0	6.0	5	
9,8	9.8		4.0		100.0	6.0	5	
10	10.0		4.0		100.0	6.0	5	
11,8	11.8		6.0		100.0	6.0	5	
12	12.0		6.0		100.0	6.0	5	

EXU1-M10-0023 | EXU1 FB-CHAMFMAKER Z4-5 90° AUR

Download Catalog Pages (PDF)

	Material	Strength (N/mm²)	Dimension	Ø3	Ø3.8	Ø4	Ø4.8	Ø5	Ø5.8	Ø6	Ø7.8
			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
			Application								
			Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz
P	STEEL		**Vc (m/min)**								
1.1	unalloyed	<500	90	0.025	0.03	0.03	0.035	0.035	0.044	0.044	0.052
1.2-1.5	unalloyed	<1100	85	0.02	0.025	0.025	0.032	0.032	0.04	0.04	0.048
2.1-2.2	low alloyed	<950	70	0.016	0.022	0.022	0.028	0.028	0.035	0.035	0.045
2.3-2.4	low alloyed	<1300	55	0.016	0.022	0.022	0.028	0.028	0.035	0.035	0.045
3.1-3.2	high alloyed	<1100	60	0.012	0.016	0.016	0.024	0.024	0.03	0.03	0.04
3.3	high alloyed	<1400	50	0.012	0.016	0.016	0.024	0.024	0.03	0.03	0.04
K	CASTINGS		**Vc (m/min)**								
1.1-1.2	grey cast iron	<1000	70	0.016	0.022	0.022	0.028	0.028	0.035	0.035	0.045
M	STAINLESS STEEL		**Vc (m/min)**								
1.1	ferritic/martensitic	<850	55	0.02	0.025	0.025	0.032	0.032	0.04	0.04	0.048
2.1	austenitic	<650	50	0.016	0.022	0.022	0.028	0.028	0.035	0.035	0.045
2.2	austenitic	<750	45	0.016	0.022	0.022	0.028	0.028	0.035	0.035	0.045
3.1	DUPLEX STEEL | super austenitic	<1100	35	0.012	0.016	0.016	0.024	0.024	0.03	0.03	0.04
N	NON-FERROUS		**Vc (m/min)**								
1.1-2.3	ALUMINIUM | alloyed/cast	<600	200	0.03	0.035	0.035	0.04	0.04	0.05	0.05	0.055
3.1-3.3	COPPER | alloyed	<600	100	0.02	0.025	0.025	0.032	0.032	0.04	0.04	0.048
T	TITANIUM		**Vc (m/min)**								
2.1-2.2	pure/alloyed	<1000	35	0.012	0.016	0.016	0.024	0.024	0.03	0.03	0.04
S	SUPER ALLOYS		**Vc (m/min)**								
1.1-1.3	HRSA	<1450	25	0.01	0.015	0.015	0.02	0.02	0.024	0.024	0.03

ADVICE | Only guide values!
Material group overview: see end of brochure

			Dimension	Ø8	Ø9,8	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	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
P	STEEL		**Vc (m/min)**					
1.1	unalloyed	<500	90	0.052	0.058	0.058	0.065	0.065
1.2-1.5	unalloyed	<1100	85	0.048	0.054	0.054	0.06	0.06
2.1-2.2	low alloyed	<950	70	0.045	0.052	0.052	0.058	0.058
2.3-2.4	low alloyed	<1300	55	0.045	0.052	0.052	0.058	0.058
3.1-3.2	high alloyed	<1100	60	0.04	0.048	0.048	0.055	0.055
3.3	high alloyed	<1400	50	0.04	0.048	0.048	0.055	0.055
K	CASTINGS		**Vc (m/min)**					
1.1-1.2	grey cast iron	<1000	70	0.045	0.052	0.052	0.058	0.058
M	STAINLESS STEEL		**Vc (m/min)**					
1.1	ferritic/martensitic	<850	55	0.048	0.054	0.054	0.06	0.06
2.1	austenitic	<650	50	0.045	0.052	0.052	0.058	0.058
2.2	austenitic	<750	45	0.045	0.052	0.052	0.058	0.058
3.1	DUPLEX STEEL | super austenitic	<1100	35	0.04	0.048	0.048	0.055	0.055
N	NON-FERROUS		**Vc (m/min)**					
1.1-2.3	ALUMINIUM | alloyed/cast	<600	200	0.055	0.065	0.065	0.072	0.072
3.1-3.3	COPPER | alloyed	<600	100	0.048	0.054	0.054	0.06	0.06
T	TITANIUM		**Vc (m/min)**					
2.1-2.2	pure/alloyed	<1000	35	0.04	0.048	0.048	0.055	0.055
S	SUPER ALLOYS		**Vc (m/min)**					
1.1-1.3	HRSA	<1450	25	0.03	0.038	0.038	0.045	0.045

ADVICE | Only guide values!
Material group overview: see end of brochure

STILL CAN'T FIND A SUITABLE TOOL?

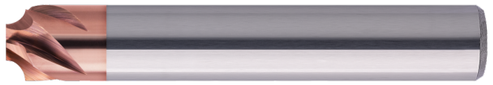
No problem – simply customise an existing tool. Using our configurator for special milling cutters, you can customise existing tools to your needs in an instant or create your own tools based on predefined types.

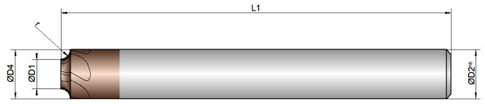
WE WILL RESPOND TO ALL REQUESTS SUBMITTED VIA THE CONFIGURATOR WITHIN ONE WORKING DAY AT THE LATEST

Cooling	
Tolerance	
Coating	AlphaUni Rose
Strategy	UNI
Application	
Features	HA

Expert

- Optimised for universal use in all materials
- The helical design ensures excellent surface finishes combined with efficient cutting parameters





Roughing

inappropriate — optimal

Finishing

inappropriate — optimal

EXU1-M11-0023	D1 mm ø	D4 mm ø	L1 mm	D2 mm ø	z #	r mm
5/10	5.0	25	100.0	25.0	5	10.00
5,2/0,4	5.2	6	57.0	6.0	5	0.40
5,4/0,3	5.4	6	57.0	6.0	5	0.30
5,6/0,2	5.6	6	57.0	6.0	5	0.20
6/1	6.0	8	70.0	8.0	5	1.00
6/2	6.0	10	75.0	10.0	5	2.00
6/3	6.0	12	73.0	12.0	5	3.00
6,4/0,8	6.4	8	70.0	8.0	5	0.80
6,8/0,6	6.8	8	70.0	8.0	5	0.60
7/0,5	7.0	8	70.0	8.0	5	0.50
7/1,5	7.0	10	75.0	10.0	5	1.50
7/2,5	7.0	12	73.0	12.0	5	2.50
7/4,5	7.0	16	82.0	16.0	5	4.50
8/4	8.0	16	82.0	16.0	5	4.00
8/6	8.0	20	80.0	20.0	5	6.00
9/3,5	9.0	16	82.0	16.0	5	3.50
9/8	9.0	25	100.0	25.0	5	8.00
10/5	10.0	20	80.0	20.0	5	5.00

EXU1-M11-0023 | EXU1 ROUNDMAKER Z5 AUR

Download Catalog Pages (PDF)

	Material	Strength (N/mm²)	Dimension	Ø5.6 R0.2	Ø5.4 R0.3	Ø5.2 R0.4	Ø7 R0.5	Ø6.8 R0.6	Ø6.4 R0.8	Ø6 R1	Ø7 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										
			Feed (mm/Z)	fz	fz	fz	fz	fz	fz	fz	fz	fz	fz
P	STEEL		**Vc (m/min)**										
1.1	unalloyed	<500	250	0.035	0.035	0.035	0.035	0.044	0.044	0.044	0.046	0.052	0.055
1.2-1.5	unalloyed	<1100	220	0.033	0.033	0.033	0.033	0.04	0.04	0.04	0.042	0.048	0.052
2.1-2.2	low alloyed	<950	190	0.028	0.028	0.028	0.028	0.033	0.033	0.033	0.036	0.042	0.048
2.3-2.4	low alloyed	<1300	130	0.028	0.028	0.028	0.028	0.033	0.033	0.033	0.036	0.042	0.048
3.1-3.2	high alloyed	<1100	150	0.022	0.022	0.022	0.022	0.028	0.028	0.028	0.03	0.036	0.042
3.3	high alloyed	<1400	110	0.022	0.022	0.022	0.022	0.028	0.028	0.028	0.03	0.036	0.042
K	CASTINGS		**Vc (m/min)**										
1.1-1.2	grey cast iron	<1000	160	0.028	0.028	0.028	0.028	0.033	0.033	0.033	0.036	0.042	0.048
M	STAINLESS STEEL		**Vc (m/min)**										
1.1	ferritic/martensitic	<850	110	0.022	0.022	0.022	0.022	0.028	0.028	0.028	0.03	0.036	0.042
2.1	austenitic	<650	100	0.016	0.016	0.016	0.016	0.022	0.022	0.022	0.025	0.03	0.036
2.2	austenitic	<750	100	0.016	0.016	0.016	0.016	0.022	0.022	0.022	0.025	0.03	0.036
3.1	DUPLEX STEEL | super austenitic	<1100	85	0.014	0.014	0.014	0.014	0.02	0.02	0.02	0.022	0.028	0.033
N	NON-FERROUS		**Vc (m/min)**										
1.1-2.3	ALUMINIUM | alloyed/cast	<600	500	0.04	0.04	0.04	0.04	0.046	0.046	0.046	0.05	0.055	0.06
3.1-3.3	COPPER | alloyed	<600	240	0.028	0.028	0.028	0.028	0.033	0.033	0.033	0.036	0.042	0.048
T	TITANIUM		**Vc (m/min)**										
2.1-2.2	pure/alloyed	<1000	55	0.016	0.016	0.016	0.016	0.022	0.022	0.022	0.025	0.03	0.036
S	SUPER ALLOYS		**Vc (m/min)**										
1.1-1.3	HRSA	<1450	35	0.014	0.014	0.014	0.014	0.02	0.02	0.02	0.022	0.028	0.033

ADVICE | Only guide values!
Material group overview: see end of brochure

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

			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	unalloyed	<500	250	0.055	0.06	0.06	0.06	0.062	0.062	0.068	0.068
1.2-1.5	unalloyed	<1100	220	0.052	0.056	0.056	0.056	0.058	0.058	0.063	0.063
2.1-2.2	low alloyed	<950	190	0.048	0.05	0.05	0.05	0.052	0.052	0.055	0.055
2.3-2.4	low alloyed	<1300	130	0.048	0.05	0.05	0.05	0.052	0.052	0.055	0.055
3.1-3.2	high alloyed	<1100	150	0.042	0.045	0.045	0.045	0.047	0.047	0.05	0.05
3.3	high alloyed	<1400	110	0.042	0.045	0.045	0.045	0.047	0.047	0.05	0.05
K	CASTINGS		**Vc (m/min)**								
1.1-1.2	grey cast iron	<1000	160	0.048	0.05	0.05	0.05	0.052	0.052	0.055	0.055
M	STAINLESS STEEL		**Vc (m/min)**								
1.1	ferritic/martensitic	<850	110	0.042	0.045	0.045	0.045	0.047	0.047	0.05	0.05
2.1	austenitic	<650	100	0.036	0.04	0.04	0.04	0.042	0.042	0.044	0.044
2.2	austenitic	<750	100	0.036	0.04	0.04	0.04	0.042	0.042	0.044	0.044
3.1	DUPLEX STEEL | super austenitic	<1100	85	0.033	0.036	0.036	0.036	0.038	0.038	0.04	0.04
N	NON-FERROUS		**Vc (m/min)**								
1.1-2.3	ALUMINIUM | alloyed/cast	<600	500	0.06	0.065	0.065	0.065	0.068	0.068	0.07	0.07
3.1-3.3	COPPER | alloyed	<600	240	0.048	0.05	0.05	0.05	0.052	0.052	0.055	0.055
T	TITANIUM		**Vc (m/min)**								
2.1-2.2	pure/alloyed	<1000	55	0.036	0.04	0.04	0.04	0.042	0.042	0.044	0.044
S	SUPER ALLOYS		**Vc (m/min)**								
1.1-1.3	HRSA	<1450	35	0.033	0.036	0.036	0.036	0.038	0.038	0.04	0.04

ADVICE | Only guide values!
Material group overview: see end of brochure

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

STILL CAN'T FIND A SUITABLE TOOL?

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

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

Cooling	
Tolerance	k6
Coating	AlphaUni Rose

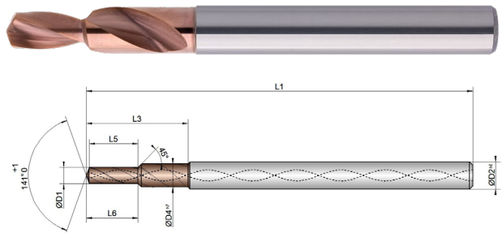
Strategy	HPC UNI
Application	
Features	HA 3xD 141°

Expert

- Optimized for universal use in all materials
- Dual-guided chip space for ideal chip evacuation

- Tolerance k6 for borehole F7

- Specially curved face cutting edge for higher feed rates and secure centring
- The integrated deburring edge ensures an excellent surface finish on the resulting chamfer



EXU1-D02-0213	D1 (k6) mm ø	L5 mm	L6 mm	D4 (h7) mm ø	L3 mm	D2 mm ø	L1 mm	z #	°
2	2.0	6.0	6.4	3.0	12.36	4	57	2	30
2,1	2.1	6.3	6.7	3.1	12.98	4	57	2	30
2,2	2.2	6.6	7.0	3.2	13.60	4	57	2	30
2,3	2.3	6.9	7.3	3.3	14.22	4	57	2	30
2,4	2.4	7.2	7.6	3.4	14.84	4	57	2	30
2,5	2.5	7.5	7.9	3.5	15.45	4	57	2	30
2,6	2.6	7.8	8.3	3.6	16.07	4	57	2	30
2,7	2.7	8.1	8.6	3.7	16.69	4	57	2	30
2,8	2.8	8.4	8.9	3.8	17.31	4	57	2	30
2,9	2.9	8.7	9.2	3.9	17.93	4	57	2	30
3	3.0	9.0	9.5	4.5	18.55	6	66	2	30
3,1	3.1	9.3	9.8	4.6	19.16	6	66	2	30
3,2	3.2	9.6	10.2	4.7	19.78	6	66	2	30
3,3	3.3	9.9	10.5	4.8	20.40	6	66	2	30
3,4	3.4	10.2	10.8	4.9	21.02	6	66	2	30
3,5	3.5	10.5	11.1	5	21.64	6	66	2	30

EXU1-D02-0213	D1 (k6) mm ø	L5 mm	L6 mm	D4 (h7) mm ø	L3 mm	D2 mm ø	L1 mm	z #	°
3,6	3.6	10.8	11.4	5.1	22.26	6	66	2	30
3,7	3.7	11.1	11.8	5.2	22.87	6	66	2	30
3,8	3.8	11.4	12.1	5.3	23.49	6	66	2	30
3,9	3.9	11.7	12.4	5.4	24.11	6	66	2	30
4	4.0	12.0	12.7	5.5	24.73	6	66	2	30
4,1	4.1	12.3	13.0	5.6	25.35	6	66	2	30
4,2	4.2	12.6	13.3	5.7	25.96	6	66	2	30
4,3	4.3	12.9	13.7	5.8	26.58	6	66	2	30
4,4	4.4	13.2	14.0	5.9	27.20	6	66	2	30
4,5	4.5	13.5	14.3	6	27.82	6	66	2	30
4,6	4.6	13.8	14.6	6.1	28.44	8	79	2	30
4,7	4.7	14.1	14.9	6.2	29.06	8	79	2	30
4,8	4.8	14.4	15.2	6.3	29.67	8	79	2	30
4,9	4.9	14.7	15.6	6.4	30.29	8	79	2	30
5	5.0	15.0	15.9	6.5	30.91	8	79	2	30
5,1	5.1	15.3	16.2	6.6	31.53	8	79	2	30
5,2	5.2	15.6	16.5	6.7	32.15	8	79	2	30
5,3	5.3	15.9	16.8	6.8	32.76	8	79	2	30
5,4	5.4	16.2	17.2	6.9	33.38	8	79	2	30
5,5	5.5	16.5	17.5	7	34.00	8	79	2	30
5,6	5.6	16.8	17.8	7.1	34.62	8	79	2	30
5,7	5.7	17.1	18.1	7.2	35.24	8	79	2	30
5,8	5.8	17.4	18.4	7.3	35.86	8	79	2	30
5,9	5.9	17.7	18.7	7.4	36.47	8	79	2	30
6	6.0	18.0	19.1	7.5	37.09	8	79	2	30

EXU1-D02-0213 | EXU1 PRE COREMAKER Z2 3XD IC AUR

Download Catalog Pages (PDF)

	Material	Strength (N/mm²)	Dimension	Ø2.0 - Ø2.4	Ø2.5 - Ø3	Ø3.1 - Ø4	Ø4.1 - Ø5	Ø5.1 - Ø6
			Depth (mm)	L2	L2	L2	L2	L2
			Application					
			Feed (mm/r)	fu	fu	fu	fu	fu
P	STEEL		**Vc (m/min)**					
1.1	unalloyed	<500	190	0.07	0.095	0.115	0.14	0.16
1.2-1.5	unalloyed	<1100	170	0.065	0.09	0.11	0.13	0.15
2.1-2.2	low alloyed	<950	130	0.065	0.09	0.11	0.13	0.15
2.3-2.4	low alloyed	<1300	90	0.06	0.085	0.1	0.12	0.14
3.1-3.2	high alloyed	<1100	110	0.06	0.085	0.1	0.12	0.14
3.3	high alloyed	<1400	85	0.055	0.075	0.09	0.11	0.13
K	CASTINGS		**Vc (m/min)**					
1.1-1.2	grey cast iron	<1000	150	0.1	0.11	0.13	0.15	0.17
M	STAINLESS STEEL		**Vc (m/min)**					
1.1	ferritic/martensitic	<850	110	0.05	0.065	0.08	0.09	0.11
2.1	austenitic	<650	90	0.045	0.06	0.07	0.08	0.1
2.2	austenitic	<750	80	0.045	0.06	0.07	0.08	0.1
3.1	DUPLEX STEEL | super austenitic	<1100	80	0.035	0.05	0.058	0.067	0.09
N	NON-FERROUS		**Vc (m/min)**					
1.1-2.3	ALUMINIUM | alloyed/cast	<600	250	0.11	0.15	0.16	0.18	0.2
3.1-3.3	COPPER | alloyed	<600	180	0.045	0.07	0.085	0.095	0.125
T	TITANIUM		**Vc (m/min)**					
2.1-2.2	pure/alloyed	<1000	35	0.045	0.06	0.07	0.08	0.1
S	SUPER ALLOYS		**Vc (m/min)**					
1.1-1.3	HRSA	<1450	20	0.018	0.03	0.05	0.065	0.08

ADVICE | The values marked in turquoise are side applications!
Use spindle cooling (IC).

STILL CAN'T FIND A SUITABLE TOOL?

No problem – simply customise an existing tool. Using our configurator for special milling cutters, you can customise 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

EXPLANATION

APPLICATIONS

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

COOLINGS

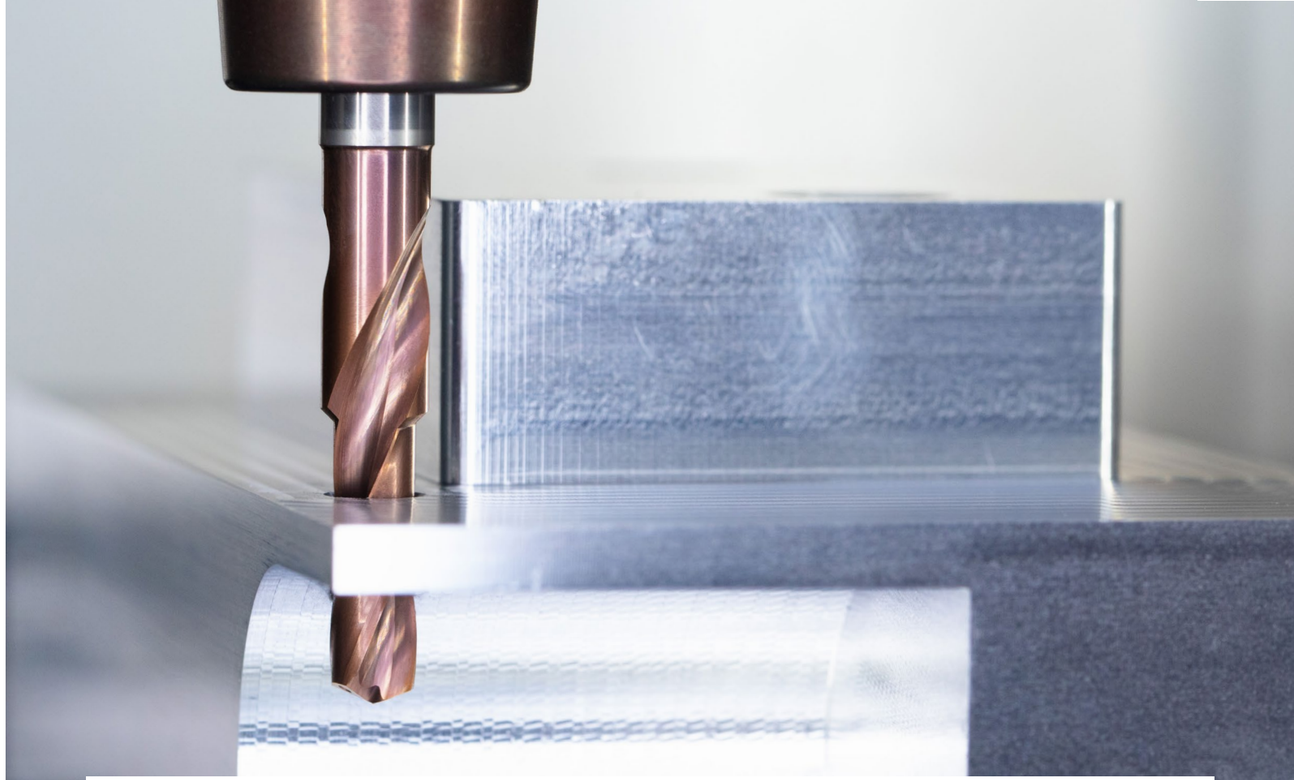
Air-cooling	Dry machining	Oil cooling	Cooling Lubricant
Minimum quantity lubrication			

FEATURES

0,5xD	1xD	1,5xD	2xD
2,5xD	3xD	3,5xD	4xD
5xD	8xD	Centre cutting	Non-centre cutting
HA Without Weldon	HB With Weldon	HE With Notch surface	Internal cooling
Twisted 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)	Feed direction z	Corner radius	Corner bevel
Sharp edged	60° Tip	90° Tip	140° Tip
141° Tip			

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

APPLICATION TABLE

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

FIGURES

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

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
1.0498	ST42.8							STPT 42	
1.0044	ST442		E28-2	4360-43 B	Fe 430 BFN	1412	AE 275-B	SM 41 B	570 Gr. 40
1.0420	GS38	GE 200	230-400M			1306			
1.0446	GS45	GE 230	E23-45M	A1		1305	F.221	SC 450	
1.0136	St42-3								
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								
1.1151	Ck22	2 C 22	XC 25	050 A 20	C 20		C 25 k	S 22 C	1023
1.5523	19MnB4			170 H 20			20 Mn B 4 DF	SWRCHB	
1.8961	WTSt373				Fe 360 D FF			SMA 50 A	
1.0035	ST33		A 33		FE 320			SS 330	
1.0037	ST37-2							STKR 400	
1.0710	15S10								
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
1.0721	10S20	10 S 20	10 F 1	210 M 15	CF 10 S 20		10 S 20		1108
1.0722	10SPb20	10 SPb 20	10 Pb F 2		CF 10 SPb 20		10 SPb 20		11 L 08
1.0736	9SMn36		S300	240 M 07	CF 9 SMn 36		12 SMn 35	SUM 25	1215
1.0737	9SMnPB36		S 300 Pb		CF 9 SMnPb 36	1926	12 SMnPb 35		12 L 14

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
1.0553	S244J0	S355J0	E 36-3	En 50 C	Fe 510 C FN			SM 520 M	S355J0
1.0581	ST52.4							STS 49	
1.1140	C15R	C15R	C15R	C15R			C 16 k-1		
1.1141	Ck15	2 C 15	XC 15	080 M 15	C 15	1370	C 16 k	S 15 C	1015
1.1190	S355G15								
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
1.0461	STE255								
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
1.0505	STE315							SM 50 A	
1.0511	C40	1 C 40		080 M 40			F.114.A	S 40 C	1040
1.0528	C30	1 C 30	CC 32	080 M 30	C30			SUP 7	1030
1.0540	C50	1 C 50		080 M 50		1674		S 50 C	1050
1.0552	GS52	GE 260							
1.0558	GS60	GE 300	320-560M	A3	C 45	1606			
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
1.0970	38Si7		41 S 7						
1.1106	ESTE355			P 355 NL 2				STK 500	
1.1127	36Mn6			212 M 36				SMn 443	1141
1.1133	20MN5			120 M 19	G 22 Mn3		20 Mn 6	SMn 420	1022
1.1169	20Mn6								
1.1520	C70W1				C 70 KU				
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		
1.1158	Ck25	2 C 25	XC 25	070 M 26	C 25		C 25 k	S 25 C	1025
1.1178	Ck30	2 C 30	XC 32	080 M 30	C30			S 30 C	1030
1.1181	Ck35	2 C 35	XC 38 H1	080 M 36	C35	1572	C 35 k	S 35 C	1034
1.1183	Cf35		XC 38 TS	060 A 35	C35	1572		S 35 C	1035
1.1191	Ck45	2 C 45	XC 42	080 M 46	C40		C45 k	S 45 C	1045
1.1206	Ck50	2 C 50		080 M 50	C50	1674		S 50 C	1050
1.1730	C45W	C 45 U	Y3 42						
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
1.1165	GS30Mn5		35 M 5	120 M 36		1330	30 Mn 5	SMn 433 H	1330
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	
1.1820	C55W								
1.1830	C85W	C 90 U	Y3 90					SK 5	1084
1.1744	C67W		Y1 70				F.512		A-6
1.1750	C75W			BW 1A					W 1
1.5404	21MoV53								
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	
1.7258	24CrMo4							SCM 822 H	
1.7259	26CrMo7								
1.7273	24CrMo10								
1.7337	16CrMo44				A18 CrMo 4 5 KW				A 387 Gr. 12 Cl. 2
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						
1.7766	17CrMoV10								
1.7779	20CrMoV135								

P 1.4 STEEL | unalloyed <950 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.0062	ST601								
1.0532	ST522	S 390 G 1 S							
1.0535	C55	1 C 55	C 55	070 M 55	C 55	1655		C 55	1055
1.0570	ST523	S 355 J2 F3	E 36-3	4360-50 B	Fe 510 B	2132	A 510 C	SM 50 YB	
1.0728	60S20	60 S 20	60 MF 4						1151
1.1203	Ck55	2 C 55	XC 55 H1	070 M 55	C 55	1655	C 55 k	S 55 C	1055
1.7276	10CrMo11		12 CD 10						
1.7281	16CrMo93		20 CD 8						

P 1.5 STEEL | unalloyed <1100 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.0070	ST702		A 70-2		Fe 70-2		A 690-2		
1.0601	C60	1 C 60	AF 70 C 55	080 A 62	C 60			S 60 C-CSP	1060
1.1221	Ck60	2 C 60	XC 60	060 A 62	C 60	1678		S 58 C	1060
1.1223	Cm60	3 C 60	C 60 R	080 A 67	C 60 R				
1.0603	C67W								

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
1.2101	62SiMnCr4								
1.2162	21MnCr5	21 MnCr 5	20 NC 5					SCR 420 H	
1.2208	31CrV3								
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
1.2307	29CrMoV9								
1.2323	48CrMoV67		45 CDV 6						
1.2382	GX155CrVMo121								
1.2414	120W4						F.532		
1.2542	45WCrV7	45 WCrV 8		BS 1	45 WCrV 8 KU	2710	45 WCrSi 8		S1
1.2552	80WCrV8						60 WCrSi 8		
1.2726	26NiCrMoV5								
1.2737	28NiCrV5								
1.2738	40CrMnNiMo864	40CrMnNiMo8-6-4							
1.2826	60MnSi4		60 MSC 4						
1.2838	145V33								
1.2842	90MnCrV8	90 MnV 8	90 MV 8	BO 2	90 MnVCr 8 KU				0 2
1.5752	14NiCr14	13 NiCr 12	16 NC 12	655 M 13	16 NiCr 11			SNC 815 H	E3310
1.5919	15CrNi6	14 CrNi 6	16 NC 6	S 107	16 CrNi 4			SNCM 420	
1.7003	38Cr2	38 Cr 2 KD	38 C 2	120 M 36	38 Cr 3		38 Cr 3	SMn 438	50 B40
1.7012	13Cr2								
1.7045	42Cr4	40 NiCrMo 3	42 C 4 TS	530 A 40	41 Cr 4	2245	42 Cr 4	SCr 440	5140
1.7103	67SiCr5	67 SiCr 5			67 SiCr 5				
1.7131	16MnCr5	16 MnCr 5 KD	16 MC 5	527 M 17	16 MnCr 5	2173	16 MnCr 5	SCR 415	5115
1.7271	23CrMoB33								
1.7715	14MoV63	14 MoV 6-3		1503-660-440			13 MoCrV 6		
1.8907	STE500							SM 58	
1.8911	ESTE380								

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		
1.0906	65Si7			250 A 61					
1.0985	QSTE500N								
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	
1.2056	90Cr3								
1.2057	105Cr4						F.120.J	SKC 11	
1.2108	90CrSi5	P 280 GH			C 100 KU	2092		SFVC 2A	
1.2109	125CrSi5								
1.2127	105MnCr4				100 CrMn 4 KU			SUJ 3	
1.2206	140CrV1		130 C 3						0 6
1.2242	59CrV4								
1.2243	61CrSiV5								
1.2249	45SiCrV6								
1.2303	100CrMo5						F.520.F		L 7
1.2312	40CrMnMoS86		40 CMD 8						
1.2519	110WCrV5						102 WCrV 5		
1.2562	142WV13								
1.2740	28NiCrMoV10								
1.2743	60NiCrMoV124								
1.2747	28NiMo17								
1.2766	35NiCrMo16								
1.2851	34CrAl6								
1.3501	100Cr2		100 C 2						E 50100
1.3503	105Cr4								E51100
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 2.3 STEEL | low alloyed <1100 N/mm²

MaterialNumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.2419	105WCr6	105 WCr 5	105 WC 13		107 WcR 5 KU	2140	105 WCr 5	SKS 31	
1.2511	80WCrV3								
1.2515	100WV4							SKS 21	
1.3561	44Cr2	46 Cr 1 KD	44 Cr 2						5046
1.3563	43CrMo4		43 CrMo 4						4142
1.3565	48CrMo4								
1.5023	38Si7								
1.5025	51Si7	50 Si 7			48 Si 7	2090			9259 H
1.5029	71Si7								
1.5085	51Mn7								
1.5094	38MnS6	38 MnS 6							
1.5131	50MnSi4								
1.5141	53MnSi4								
1.5142	60MnSi5								
1.5213	15MnV5								
1.5217	20MnV6								
1.5223	42MnV7								
1.5225	51MnV7								
1.5231	38MnSiVS5								
1.5232	27MnSiVS6								
1.5233	44MnSiVS6								
1.5403	17MnMoV64			1501-261				SBV 3	
1.5526	30MnB4								
1.5710	36NiCr6		30 NC 6	640 A 35				SNC 236	3135
1.5736	36NiCr10		30 NC 11		35 NiCr 9			SNC 631 H	3435
1.5755	31NiCr14		18 NC 13	653 M 31				SNC 836	
1.6225	11NiMn54								
1.6310	20MnMoNi55		18 MND 5						
1.6368	15NiCuMoNb5			3604-591				SBV 2	
1.6511	36CrNiMo4	36 CrNiMo 4	40 NCD 3	816 M 40	38 NiCrMo 4 KB		35 NiCrMo 4		9840
1.6582	34CrNiMo6	34 CrNiMo 6	35 NCD 6	817 M 40	35 NiCrMo 6 KB	2541	40 NiCrMo 7	SNCM 447	4340
1.6946	30CrMoNiV511								
1.6948	26NiCrMoV115								
1.6971	79Ni1								
1.6972	83Ni1								
1.7038	37CrS4	37 CrS 4						SUP 11	50 B50 H
1.7214	25CrMo4				25 CrMo 4 F				
1.7389	GX12CrMo101								
1.7561	42CrV6								
1.7701	51CrMoV4		51 CDV 4		51 CrMoV 4				
1.7707	30CrMoV9								
1.7711	40CrMoV47	40 CrMoV 4 6	42 CDV 4	1506-670-860				SNB 21-1-5	
1.7725	GS30CrMoV64								
1.7733	24CrMoV55		20 CDV 6		24 CrMoV 5 5				
1.7735	14CrMoV69								
1.7741	42CrMoV73								
1.7755	GS45CrMoV104								
1.7756	GS36CrMoV104	G 36 CrMoV 10 4							
1.8070	21CrMoV511				21 CrMoV 5 11				
1.8159	50CrV4	51 CrV 4	50 CV 4	735 A 50	50 CrV 4	2230	51 CrV 4	SUP 10	6150
1.8212	21CrVMoW12								
1.8521	15CrMoV59								
1.8509	41CrAlMo7	41 CrAlMo 7	40 CAD 6. 12	905 M 39	41 CrAlMo 7	2940	41 CrAlMo 7	SACM 645	E 71400
1.8515	31CrMo12	31 CrMo 12	30 CD 12	722 M 24	31 CrMo 12	2240	31 CrMo 12		
1.8523	39CrMoV139	39 CrMoV 13 9		897 M 39	36 CrMoV 10				
1.8550	34CrAlNi7	34 CrAlMo 5							
1.8827	S460M	S 460 M	E 460	S 460 M	S460M		S460M		

P 2.4 STEEL | low alloyed <1300 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.1273	90Mn4			060 A 96				SUP 4	1090
1.2311	40CrMnMo7			BP 20	35 CrMo 8 KU				P 20
1.2710	45NiCr6								
1.2762	75CrMoNiW67								
1.5864	35NiCr18								
1.6587	17CrNiMo6	17 CrNiMo 7	18 NCD 6	820 A 16	18 NiCrMo 7	2523	14 NiCrMo 13	SNCM 815	
1.7222	42CrMoPb4								
1.7225	42CrMo4.M4S	42 CrMo 4	42 CD 4	708 A 42	42 CrMo 4	2244		SCM 440 H	4140
1.7227	42CrMoS4	42 CrMoS 4	42 CD	708 H 42	42 CrMoS 4	2244	40 CrMo 4		
1.7238	49CrMo4								

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
1.2362	X63CrMoV51								
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						
1.2376	X96CrMoV12								
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
1.2631	X50CrMoW911								
1.2786	X13NiCrSi3615	X 13 CrNiSi 36 15	Z 35 NCS 37-18						
1.2889	X45CoCrMoV553								

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		
1.2622	X60WCrMoV94								
1.2678	X45CrCoVW555								H 19
1.2731	X50NiCrWV1313								
1.2764	X19NiCrMo4								
1.2767	X45NiCrMo4	40 NiCrMo 4	Y 35 NCD 16		42 NiCrMo 15 7 KU				A 9
1.2779	X6NiCrTi2615			S 66286					660
1.2787	X23CrNi17	HS 6-5-2	Z 85 WDCV 06 05 04 02	BM 2	HS 6 5 2 2	2722		SKH 9	
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

P 3.3 STEEL | high alloyed <1400 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.2709	X3NiCoMoTi1895								
1.2790	72SiNiCrMoV54								
1.2888	X20CoCrWMo109								
1.3202	S12145	HS12-1-5-5		BT 15	HS 12-1-5-5		12-1-5-5		T 15
1.3207	S104310	HS10-4-3-10	Z130WKCDV10-10-04-04	BT 42	HS 10-4-3-10		10-4-3-10	SKH 57	M 44
1.3243	S6525	HS6-5-2-5	KCV 06-05-05-04-02		HS 6-5-2-5	2723	6-5-2-5	SKH 55	M 35
1.3246	S7425	HS1-8-1	Z110 WKCDV 07-05-04	T 11341	HS 7-4-2-5		7-4-2-5		M 41
1.3247	S21018	HS2-9-1-8	Z110 DKCWV 09-08-04	BM 42	HS 2-9-1-8		2-10-1-8		M 42
1.3249	S2928			BM 34			2-9-2-8		
1.3255	S18125	HS18-1-1-4	Z80 WKCV 18-05-04-01	BT 4	HS 18-1-1-5		18-1-1-5	SKH 3	T 4
1.3257	S181215								
1.3265	S181210	HS18-0-1-10		BT 5	HS 18-0-1-10		18-0-2-10	SKH 4A	T 5
1.3342	SC652	HS6-5-2	Z90 WDCV 06-05-04-02		HSC 6-5-3				M 3
1.3343	S652	HS6-5-3	Z85 WDCV 06-05-04-02	BM 2	HS 6-5-2	2722	6-5-2	SKH 51	M2
1.3344	S653		Z120 WDCV 06-05-04-03				6-5-3	SKH 52	M 3 Cl.2
1.3346	S291	HS1-8-1	Z85 DCWV 08-04-02-01	BM 1	HS 1-8-1				M1
1.3348	S292	HS2-9-2	Z100 DCWV 09-04-02-02		HS 2-9-2	2782	2-9-2		M 7
1.3355	S1801	HS18-0-1	Z80 WCV 18-04-01	BT 1	HS 18-0-1		18-0-1	SKH 2	T 1
1.3549	X89CrMoV81								
1.3551	80MoCrV4216		80 DCV 40	T 11350	X 80 MoCrV 4 4		80 MoCrV 40-16		M 50

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

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
1.4003	X2CrNi12	X2CrNi12	CLC 4003		F 12N				
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
1.4017	X6CrNi171	X 6 CrNi 17 1	F 17 N		X 6 CrNi 17 1				
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 C 13	420 S 45	X 30 Cr 13	2304	X 30 Cr 13	SUS 420 J2	420
1.4031	X40Cr13	X 40 Cr 13	Z 40 C 14		X 40 Cr 14	2304	X 40 Cr 13	SUS 420	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
1.4059	GX22CrNi17		Z 20 CN 17.2 M	ANC 2					
1.4085	GX70Cr29								
1.4086	GX120Cr29			425 C 11					
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
1.4106	X10CrMo13								
1.4107	GX8CrNi12	GX 8 CrNi 12	GX 8 CrNi 12		GX 8 CrNi 12				
1.4108	X100CrMo13								
1.4109	X65CrMo14	X 70 CrMo 15	Z 70 CD 14					SUS 440 A	440 A
1.4110	X55CrMo14		Z 50 CD 13						
1.4111	X110CrMoV15		Z 4 CN b 17		X 6 CrNb 17			SUS 430 LX	
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
1.4115	X20CrMo171								
1.4116	X45CrMoV15	X 50 CrMoV 15	Z 50 CD 15		X50 CrMoV 15		X 46 CrMo 16		
1.4117	X38CrMoV15								
1.4119	X15CrMo13								
1.4120	X20CrMo13		Z 20 CD 14						
1.4122	X35CrMo17	X 39 CrMo 17 1	X39CrMo17-1		X 35 CrMo 17				
1.4123	X15TN								
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						
1.4138	GX120CrMo292								
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				
1.4502	X8CrTi18	X 6 Cr 18 KE							
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						
1.4528	X105CrCoMo182								
1.4535	X90CrCoMoV17								
1.4543	X3CrNiCuTi129				X 6 CrNiNB 18 11				
1.4704	X45SiCr4	45SiCr16-11							HNV 2
1.4710	GX30CrSi6	GX 30 CrSi 6							
1.4712	X10CrSi6		K 51255						
1.4713	X10CrAlSi7	X 10 CrAlSi 7							
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						
1.4729	GX40CrSi13				GX 35 Cr 13			SCH 1	
1.4740	GX40CrSi17				GX 35 Cr 17				
1.4742	X10CrAl18		Z 10 CAS 18	403 S 15	X 8 Cr 17		X 10 CrAl 18	SUH 21	430
1.4745	GX40CrSi23								
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							
1.4773	X8Cr30								
1.4776	GX40CrSi29			452 C 11	GX 35 Cr 28			SCH 2	

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				
1.4319	X3CrNiN178			302 S 26	X 10 CrNi 18 09			SUS 302	
1.4350	X5CrNi189		Z 6 CN 18.09	304 S 31	X 5 CrNi 18 10				304
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
1.4407	GX 5 CrNiMo 13 4	GX 5 CrNiMo 13 4	J 91550						A757
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
1.4440	X2CrNiMo18165								
1.4442	X2CrNiMo18154		X 3 CrNiMoN 18 14						

M 2.2 STAINLESS STEEL | austenitic <750 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.4429	X2CrNiMoN17133	X 3 CrNiMoN 17 12 2	Z 2 CND 17.13 Az	316 S 62	X 2 CrniMoN 17 13	2375		SUS 316 LN	316 LN
1.4432	X2CrNiMo17123	X 2 CrNiMo 17 12 2	Z 3 CND 17 13 30	316 S 13	X 2 CrNiMo 17 12 3			SUS 316L	316 L
1.4434	X2CrNiMoN18124		CLC 18.12.4.LN		X 2 CrNiMoN 18 12 4				317 LN
1.4439	X2CrNiMoN17135	X 3 CrNiMo 17 13 5	Z 3 CnD 18.14-05 Az						
1.4465	X1CrNiMoN25252								
1.4505	X5NiCrM-oCuNb2018								
1.4506	X5NiCrMoCuTi2018								
1.4529	X1NiCrMoCuN25206								
1.4536	GX2NiCrM-oCuN2520	GX 2 CrNiMoCuN 25 20 6							
1.4539	X1NiCrMoCuN25205	X 1 NiCrMoCu 25 20 5	Z 1 NCDU 25.20	904 S 13		2662			
1.4541	X6CrNiTi1810	X 6 CrNiTi 18 10	Z 6 CNT 18.10	321 S 12	X 6 CrNiTi 18 11	2337	X 7 CrNiTi 18 11	SUS 321	321
1.4542	X5CrNiCuNb164	X 5 CrNiCuNb 16 4	Z 7 CNU 17.04		X 5 CrNiCuNb 16 4			SUS 630	630
1.4550	X6CrNiNb1810	X 6 CrNiNb 18 10	Z 6 CNNb 18.10	347 S 17	X 6 CrNiNb 18 11	2338	X 6 CrNiNb 18 11	SUS 347	347
1.4551	X5CrNiNb199	X 5 CrNiNb 20 10 KE	Z 6 CNNb 20-10					SUS 347 Y	
1.4552	GX5CrNiNb189	GX 5 CrNiNb 19 11	Z 4 CNNb 19.10 M	347 C 17	GX 5 CrNiNb 19 11			SCS 21	
1.4571	X6CrNiMoTi17122	X 6 CrNiMoTi 17 12 2	Z 6 CNDT 17.12	320 S 31	X 6 CrNiMoTi 17 12	2350	X 6 CrNiMoTi 17 12 03	SUS 316 Ti	316 Ti
1.4573	X10CrNiMoTi812			320 S 33	X 6 CrNiMoTi 17 13			SUS 316 Ti	316 Ti
1.4575	X2CrNiMoNb2842								
1.4577	X3CrNiMoTi2525								
1.4580	X6CrNiMoNb17122	X 6 CrNiMoNb 17 12 2	Z 6 CNDNb 17.12	318 S 17	X 6 CrNiMo 17 12 2				316 Cb
1.4581	GX5CrnNi-MoNb1810	GX 5 CrNiMoNb 19 11 2	Z 4 CNDNb 18.12 M	318 C 17	GX 6 CrNoMoNb 20 11			SCS 22	
1.4582	X4CrNiMoNb257							SCS 22	
1.4583	X10CrNiMoNb1812				X 6 CrNiMoNb 17 13				318
1.4585	GX7CrNiMoNb257								
1.4586	X5CrNiMo-CuNb2218								
1.4821	X20CrNiSi254	X 20 CrNiSi 25 4	Z 20 CNS 25.04			2322			
1.4822	GX40CrNi245		J 92605	J 92605					
1.4823	GX40CrNiSi274								
1.4825	GX25CrNiSi189			302 C 35	GX 16 CrNi 20 10				
1.4826	GX40CrNiSi229							SCH 12	
1.4828	X15CrNiSi2012	X 15 CrNiSi 20 12	Z 15 CNS 20.12	309 S 24	X 16 CrNiSi 20 12		X 15 CrNiSi 20 12	SUH 309	309
1.4833	X7CrNi2314	X 12 CrNi 23 13	Z 15 CN 24.13	309 S 24	X 6 Cni 23 14			SUS 309 S	309 S
1.4837	GX40CrNiSi2512			309 C 30	GX 35 CrNi 25 12			SCS 17	

M 2.2 STAINLESS STEEL | austenitic <750 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.4841	X15CrNiSi2520	X 15 CrNiSi 25 20	Z 15 CNS 25.20	314 S 25	X 16 CrNiSi 25 20		X 15 CrNiSi 25 20	SUH 310	310
1.4845	X12CrNi2521	X 8 CrNi 25 21	Z 12 CN 25.20	310 S 24	X 6 CrNi 25 20	2361	F.331	SUS 310 S	310 S
1.4848	GX40CrNiSi2520			310 C 40	GX 40 CrNi 26 20		X 40 CrNi 25 20	SCH 21	HK
1.4861	"	X10NiCr3220"							
1.4866	X33CrNiMnN238	X 33 CrNiMnN 23 8	X 33 CrNiMnN 23 8						
1.4871	X53CrMnNiN219		Z 52 CMN 21.09	349 S 54	X 53 CrMnNiN 21 9		X 53 CrMnNiN 21-09	SUH 35	EV 8
1.4873	X45CrNiW189	X 45 CrNiW 18 9	Z 35 CNWS 14.14	331 S 40	X 45 CrNiW 18 9		X 45 CrNiSiW 18-09	SUH 31	
1.4878	X12CrNiTi189	X 10 CrNiTi 18 10	Z 6 CNT 18.12	321 S 20	X 6 CrNiTi 18.11	2337	X 6 CrNiTi 18 11	SUS 321	321
1.4881	X70CrMnNiN216				X 70 CrMnNiN 21 6				EV 11
1.4882	X50CrMnNiNbN219	X 50 CrMnNiNbN 21 9	Z 50 CMNNb 21.09						
1.4919	X6CrNiMo1713	X 6 CrNiMo 17 12 2	Z 6 CND 17.13 B	316 S 51					316 H
1.4948	X6CrNi1811	X 6 CrNi 18 10	Z 6 CN 18.09	304 S 51	X 5 CrNi 18 10 KW	2333			
1.4949	X3CrNi1811				X 2 CrNiN 18 11				
1.4961	X8CrNiNb1613			347 S 51			X 7 CrNiNb 16 13		
1.4981	X8CrNiMoNb1616						X 7 CrNiMo 16 16		

M 3.1 DUPLEX STEEL | austenitic <1100 N/mm²

Materialnumber	Germany | DIN	Europe | EN	France | AFNOR	Great Britain | BS	Italy | UNI	Sweden | SIS	Spain | UNE	Japan | JIS	USA | AISI
1.4162	X2CrMnNiN2252	X 2 CrMnNiN 22 5 2			X2CrMnNiN21-5-1		S32101	LDX 2101	S321 01
1.4362	X2CrNiN234	X 2 CrNiN 23 4	Z 3 CN 23 04 AZ			2327			S323 04
1.4410	X2CrNiMoN2574	X 2 CrNiMoN 25 7 4	Z 5 CND 20.10 M		X 2 CrNiMoN 25 7 4			SCS 14 A	S327 50
1.4460	X4CrNiMo2752	X 3 CrNiMo 27 5 2	X 2 CrNiMo 25 7 3		X 3 CrNiMo 27 5 2	2324	X 8 CrNiMo 27 05	SUS 329 J1	S325 50
1.4462	X2CrNiMoN2253	X 2 CrNiMoN 22 5 3	Z 3 CND 22.05 AZ	318 S 13	X 2 CrNiMoN 22 5 3	2377		SUS 329 J3L	S318 03
1.4465	X1CrNiMoN25252	X 1 CrNiMoN 25 25 2	Z 1 CND 25.22 AZ						S310 50
1.4501	X2CrNiMo-CuWN2574	X 2 CrNiMoCuWN 25 7 4	Z 3 CND 25.06 AZ					SM 25 Cr	S327 60
1.4507	X2CrNiMoCuN2563	X 2 CrNiMoCuN 25 6 3	Z 3 CNDU 25.06 AZ					QSA 2505	S325 20
1.4534	13-8 PH	X 3 CrNiMoAl 13 8 2	Z 4 CNDAT 13.09						S138 00
1.4542	17-4 PH	X 5 CrNiCuNb 16 4	Z 7 CNU 17 04					SUS 630	630
1.4545	15-5 PH	X 5 CrNiCu 15 5	Z 6 CNU 15 05						XM-12
1.4548	17-4 PH	X5CrNiCuNb1744	X 5 CrNiCuNb 16 4					SUS 630	S174 00
1.4568	17-7 PH	X 7 CrNiAl 17 7	Z 9 CNA 17 07	301 S 81	X 7 CrNiAl 17 7	2388	X 7 CrNiAl 17 7	SUS 631	S177 00

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 | cast <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	CoCr26Ni9Mo5W								
2.4682	Stellite® 31	G-CoCr25NiW		KC 25 WN						ASTM A567
2.4683	Conicro® 4023 W	CoCr22NiW								
2.4691	HS 21	G-CoCr28Mo		KC 27 D5 NFe						ASTM F-75
2.4964	Stellite® 25	CoCr20W15Ni		KC 22 WN	HR 240	L605 Haynes® 25				R 30605
2.4979	S 816	CoCr28Mo6								

Technical formulas

Calculate cutting speed (m/min)	$Vc = \frac{D * \pi * n}{1000}$
Calculate rotational speed (rpm)	$n = \frac{Vc * 1000}{D * \pi}$
Calculate feed rate (mm/min)	$Vf = n * z * fz$
Calculate feed per tooth (mm/number of teeth)	$fz = \frac{Vf}{n * z}$
Calculate chip removal rate (cm^3/min)	$Q = \frac{ap * ae * Vf}{1000}$
Calculate average chip thickness (mm)	$hm = fz * \frac{\sqrt{ae}}{D}$

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 cm^3/min
D	Diameter of tool	in mm

CONVERSION TABLE STRENGTH HARDNESS

Material		Strength (N/mm²)	Hardness (HRC)	Hardness (HB)
P	**(Steel)**			
1.1	STEEL | unalloyed	<500	<15,2	<147
1.2-1.5	STEEL | unalloyed	<1100	<33,5	<325
2.1-2.2	STEEL | low-alloyed	<950	<28,8	<280
2.3-2.4	STEEL | low-alloyed	<1300	<40	<385
3.1-3.2	STEEL | high-alloyed	<1100	<33,5	<325
3.3	STEEL | high-alloyed	<1400	<44	<410
K	**(Castings)**			
1.1-1.2	CASTINGS | Grey cast iron	<1000	<30	<295
2.1-2.2	CASTINGS | Modular cast iron	<850	<25	<250
3.1-3.2	CASTINGS | Malleable cast iron	<800	<24	<235
M	**(Stainless Steel)**			
1.1	STAINLESS STEEL | ferritic/martensitic	<850	<25	<250
2.1	STAINLESS STEEL | austenitic	<650	<20	<190
2.2	STAINLESS STEEL | austenitic	<750	<22	<220
3.1	DUPLEX STEEL | super austenitic	<1100	<33,5	<325
N	**(Non-Ferrous Metal)**			
1.1	ALUMINIUM | alloyed	<500	<15,2	<147
1.2	ALUMINIUM | alloyed	<600	<18,2	<177
2.1-2.3	ALUMINIUM | cast	<600	<18,2	<177
3.1-3.3	COPPER | alloyed	<650	<20	<190
4.1	MAGNESIUM | alloyed	<250	<7,5	<76
5.1	PLASTICS | thermoplastic	<100	0	0
5.2	PLASTICS | duroplastic	<150	0	0
S	**(Superalloys)**			
1.1	IRON-BASED ALLOY | HRSA	<1200	<36	<355
1.2	NICKEL-BASED ALLOY | HRSA	<1450	<45	<425
1.3	COBALT-BASED ALLOY | HRSA	<1450	<45	<425
T	**(Titanium)**			
2.1-2.2	TITANIUM | pure; alloyed	<1000	<30	<295
2.3	TITANIUM | alloyed	<1400	<44	<410

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. Notwithstanding the placement of timely and sufficient orders by Hofmann & Vratny, recent developments affecting the supply of various raw materials may prevent Hofmann & Vratny from ensuring the continuous availability of materials required to fulfill all outstanding orders. Accordingly, any offers issued by Hofmann & Vratny, as well as any acceptance by Hofmann & Vratny of offers made by the Ordering Party, shall be deemed subject to a self supply reservation. This means that in the event that Hofmann & Vratny does not receive delivery, or receives delivery only in insufficient quantities, for its manufacturing and production facilities despite having placed corresponding orders with reliable suppliers, Hofmann & Vratny shall be released from its obligation to perform to the extent that agreed-upon delivery dates must be postponed or Hofmann & Vratny rescinds the contract. Hofmann & Vratny shall be obligated to notify the Ordering Party without undue delay of any unavailability of performance and, in the event of rescission, shall reimburse the Ordering Party without undue delay for any and all consideration paid up to that time. The foregoing self supply reservation shall not apply where the non delivery, insufficient delivery, or delay is attributable to fault on the part of Hofmann & Vratny.

5. 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 comply with binding delivery deadlines for reasons other than those set forth in § 2 4 hereof, and such reasons are not attributable to Hofmann & Vratny (constituting a non availability of services beyond § 2 4), Hofmann & Vratny shall notify the Ordering Party without undue delay and shall provide an estimated revised delivery date. Should the services remain unavailable upon expiration of the revised delivery deadline, Hofmann & Vratny shall be entitled to rescind the contract in whole or in part. Hofmann & Vratny shall reimburse the Ordering Party without undue delay for any and all consideration paid up to that time.

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 Par-

ty shall be free to prove that Hofmann & Vratny did not incur any damages or that any damages incurred were lower than the Warehousing Allowance. If the Ordering Party fails to recall the Goods within the Recall Period determined by Hofmann & Vratny, Hofmann & Vratny shall be entitled to dispose of the Goods as Hofmann & Vratny sees fit. The statutory provisions regarding rescission shall remain unaffected.

§ 4 DELIVERY AND DEFAULT OF ACCEPTANCE

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

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

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

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

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

§ 5 TERMS OF PAYMENT

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

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

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

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

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

§ 6 RETENTION OF TITLE

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

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

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

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

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

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

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

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

§ 7 LIABILITY FOR DEFECTS AND CLAIMS FOR DEFECTS

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

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

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

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

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

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

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

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

§ 8 OTHER LIABILITIES

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

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

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

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

§ 9 APPLICABLE LAW AND JURISDICTION

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

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

Hofmann & Vratny OHG
March 2026

CONTACT HOFMANN & VRATNY

Hofmann & Vratny OHG – Headquarters

Steinkirchen 4½
85617 Aßling

Telephone: +49 80 92 / 85 333-0
E-Mail: info@vhmhv.de

Hofmann & Vratny OHG – Regrinding centre

Steinkirchen 4½
85617 Aßling

Telephone: +49 80 92 / 85 333-152
E-Mail: nbg@vhmhv.de

A RELIABLE PARTNER

DISCOVER OUR H&V PRODUCT RANGE.

Our goal is to provide companies around the world with the best tools.

> **We** are constantly developing our product portfolio. We experiment with new geometries, coatings and materials at our research and development centre to make the right milling cutter for every application.

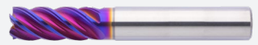
SCAN THE QR CODE NOW

EXPERT | Non-ferrous materials

EXPERT | Steel & cast iron

EXPERT | Stainless steel

EXPERT | Titanium



EXPERT | Hardened steel

BASIC | Universal

MILLING CUTTERS

MADE IN BAVARIA

PROVEN QUALITY

DRILLS

MADE IN CZECHIA

PROVEN QUALITY

Expert 2026

EN

HOFMANN & VRATNY EXU1 SERIES – OUR EXPERTS FOR UNIVERSAL USE

Hofmann & Vratny OHG
Steinkirchen 4½
85617 Aßling

Telephone: +49 80 92 / 85 333-0
E-Mail: info@vhmhv.de
Web: www.vhmhv.de

OFFICIAL PARTNER OF H&V

SolidCAM The Ecosystem for Digital Manufacturing

Die einzigartige, revolutionäre Frästechnologie
imachining patent by SolidCAM