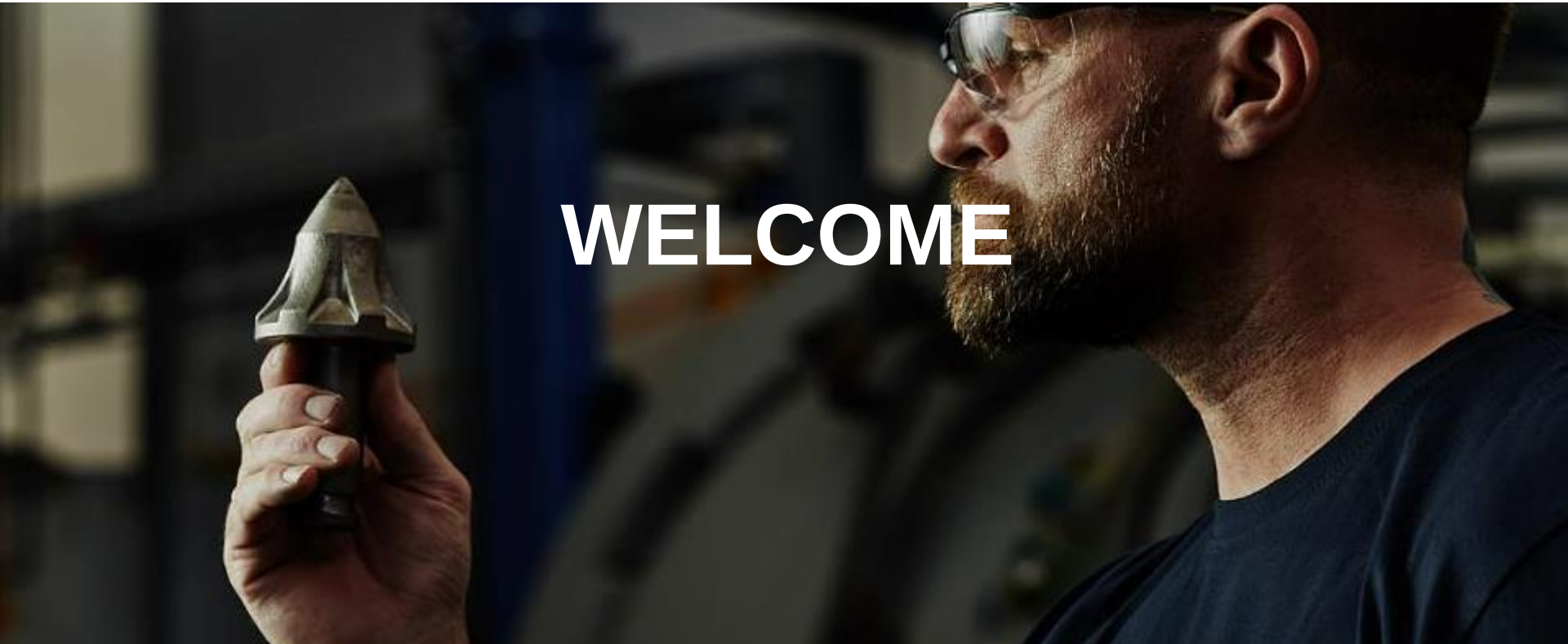




WELCOME



CONTENTS



- **Company overview**
- **Market segments**
- **Application Video**
- **Our Skills**
 - Tungsten Carbide Expertise
 - Joining and Hardening Technology
 - BeCoat® wear protection
 - Tungsten Carbide Recycling
- **TungStuds wear protection**
- **Thats why BETEK?**





INDUS

 **SIMONGROUP**

 **BETEK**



SIMON GROUP

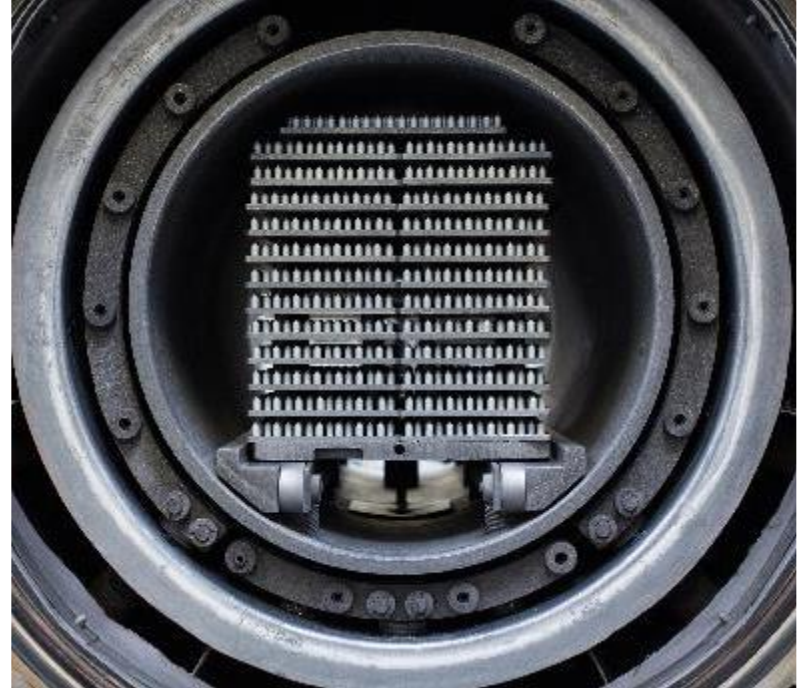


- **Headquarters Aichhalden**
- **Part of INDUS HOLDING AG since 1992**
- **Consisting of 2 companies**
 - BETEK
 - Karl Simon
- **Figures 2023**
 - Sales > €317M
 - Number of employees > 740



TUNGSTEN CARBIDE EXPERTISE

- **Headquarters Aichhalden**
- **Branches in**
 - Taicang, China (production, sales office)
 - Charlotte, USA (warehouse, sales office)
- **Manufacturer and world market leader of carbide-tipped wear tools**
- **Figures 2023**
 - Sales > €297M
 - Number of employees > 400



OUR CAPACITIES



- **Production of 2,000 tons of carbide annually**
 - BETEK: Over 70 million pieces of carbide including 65 million pieces of wear tools (individual weight from approx 0.005 kg to 5 kg)
 - SITEK: Over 700 million pieces of carbide (individual weights from approx 0.001 kg to 0.02 kg)
 - 28 different tungsten carbide grades
- **Processing more than 25,000 tons of steel annually**
- **9,000 truck transports and over 600 (FCL) sea containers annually**
- **Total production area: 26,800 m²**
 - Germany: 22,800 m² (Expansion in 2019: 6,300 m²)
 - China: 4,000 m²



BUSINESS STRUCTURE



➤ Management

- Dipl. Ing. Tobias Hilgert & Dr. Marc Siemer

➤ Split into five market segments:

- Surface Technologies
Thomas Allgaier
- Underground Technologies
Timo Wilhelm
- Environmental Technologies
Fabian Seifried
- Industrial Technologies
Timo Arnold
- SITEK - A BETEK BRAND
Uwe Detemple



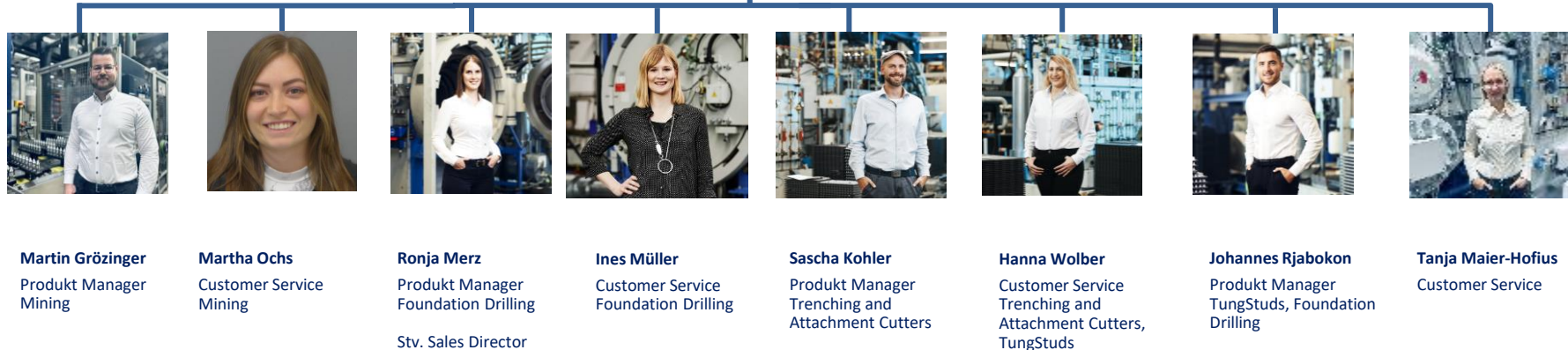
UNDERGROUND TECHNOLOGIES

ORGANIGRAMM



Timo Wilhelm

Sales Director Underground Technologies
Main Focus: BTT, BTI, BAUER Group



SYSTEM PARTNER + CUSTOMERS





MARKET SEGMENTS



SURFACE TECHNOLOGIES

INFO

- **Applications**
 - Road Milling
 - Stabilizers and Recycling
 - Surface Mining
- **System partnership with Wirtgen**



AGRICULTURE

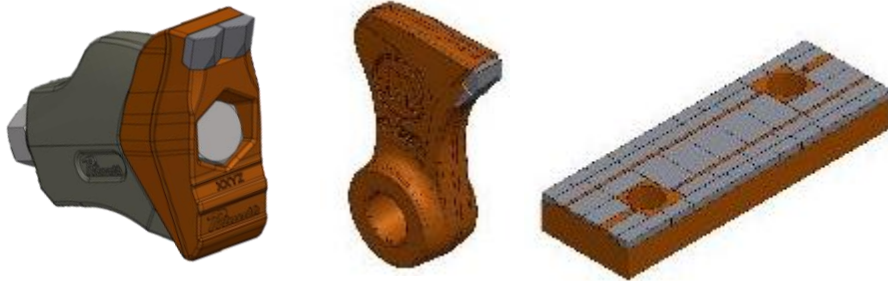
- **Wear tools for:**
 - Tillage
 - Mechanical weed control
 - Seedbed preparation
 - Seeding
 - Harvesting
- **OEM-strategy**



ENVIRONMENTAL TECHNOLOGIES

FORESTRY & RECYCLING

- **Wear tools for:**
 - Mulchers
 - Shredder
 - Wood Chipper
- **OEM-strategy**



UNDERGROUND TECHNOLOGIES



INFO

- **Applications:**
 - Mining
 - Foundation Drilling
 - Trenching
 - Drum Cutters
 - Tunneling
 - HDD
 - TungStuds
- **OEM strategy & worldwide dealer network**



UNDERGROUND TECHNOLOGIES

MINING

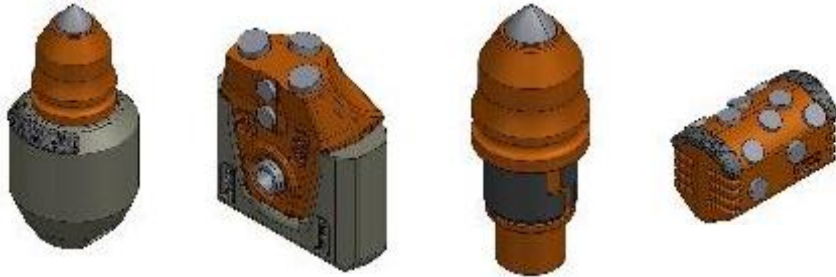
- Round shank cutter bit & Radial picks
- Mining of coal & minerals (i.E. Potash) underground
- Longwall / Continuous Miners / Roadheaders



UNDERGROUND TECHNOLOGIES

FOUNDATION DRILLING

- Welding & quick change bars for drill pipes
- Round shank bits for augers



UNDERGROUND TECHNOLOGIES

TRENCHING

- Round shank cutter bit + holder for chain cutters
- Welding teeth for cutting wheels



DRUM CUTTERS

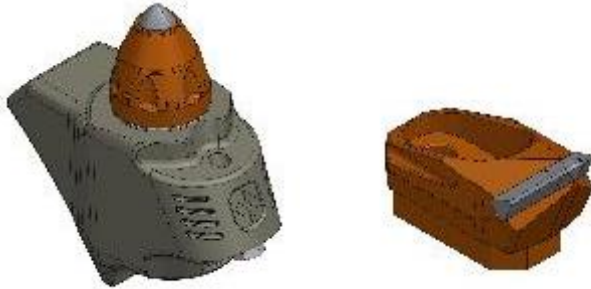
- Round shank cutter bit + holder for drum cutters
- Versatile application possibilities thanks to hydraulic milling



UNDERGROUND TECHNOLOGIES

TUNNELING

- Round shank bits for road headers
- Cutter for tunnel boring machines



TUNGSTUDS

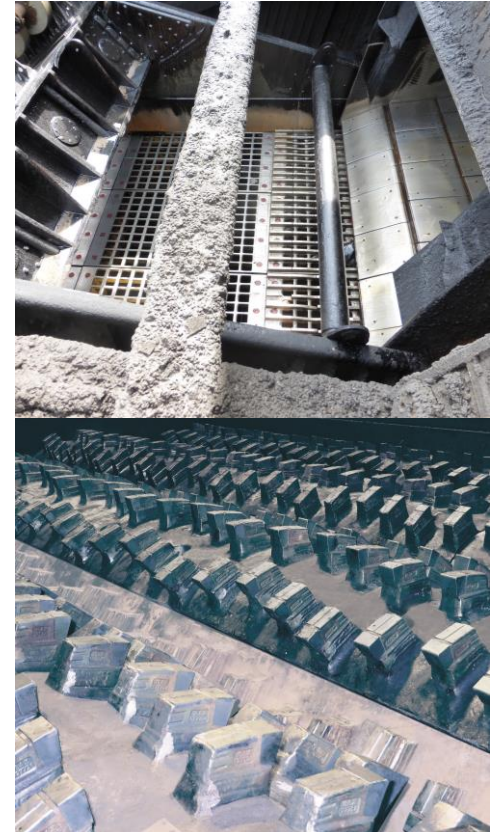
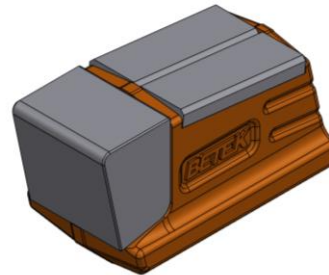
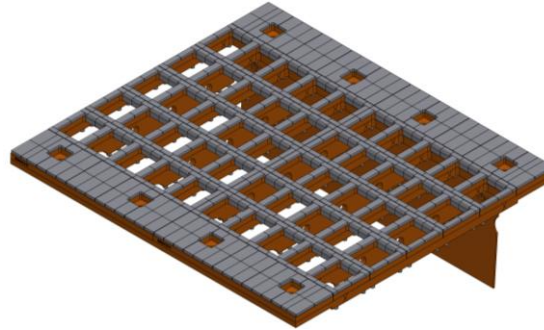
- Welding studs for wear protection through stud welding processes
- Wear protection plate for use with standard welding systems

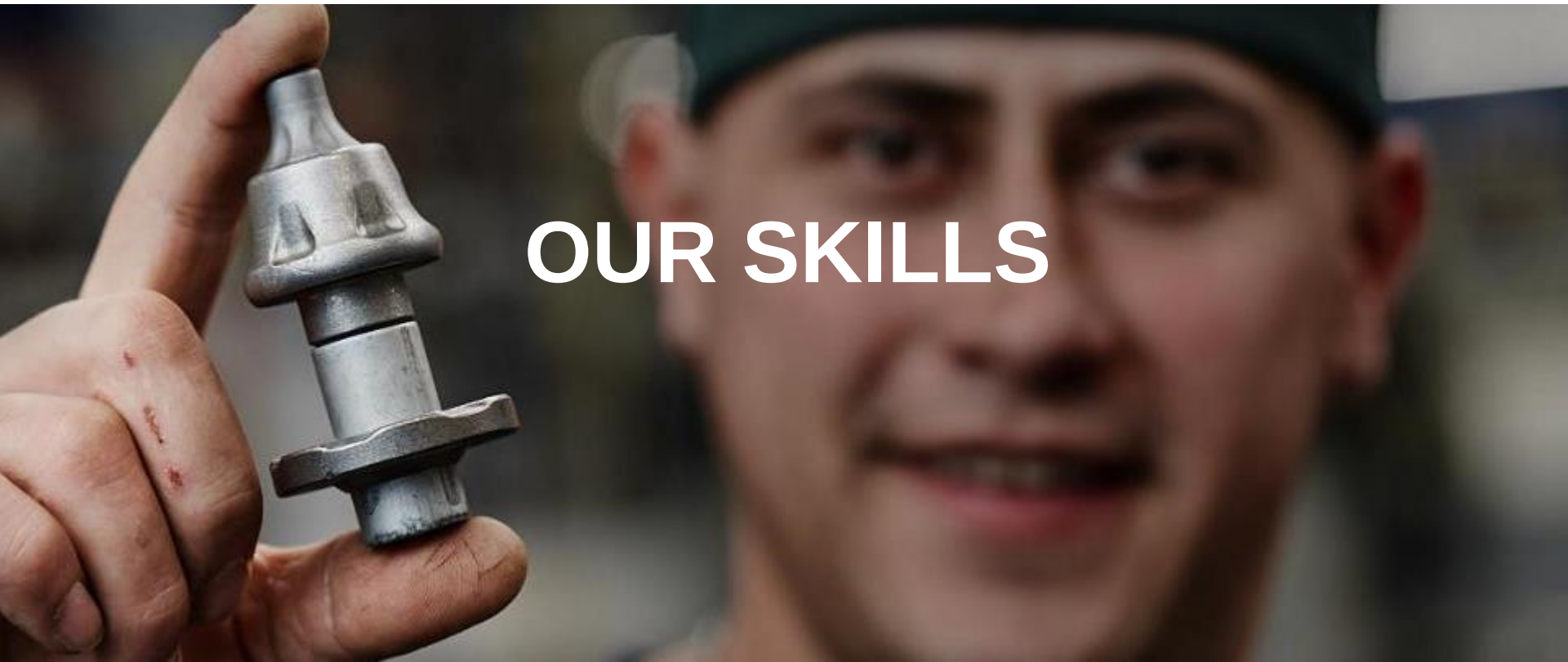


INDUSTRIAL TECHNOLOGIES

INFO

- **Applications:**
 - Crushing & Mixing
 - Track construction
 - Tungsten Carbide
 - New technologies
- **Project-related product developments**
- **Founded in 2021**



A close-up photograph of a male worker wearing a green cap, smiling and holding a complex, silver-colored metal mechanical part between his fingers. The part has a flared top, a central shaft, and a flange at the bottom. The worker's hands show some minor abrasions. The background is blurred, suggesting an industrial setting.

OUR SKILLS

OUR SKILLS

OVERVIEW



Application specific
engineering



Tungsten carbide recycling



Tungsten carbide expertise



Joining and
hardening technology



BeCoat® wear protection



Application technology

TUNGSTEN CARBIDE EXPERTISE

TUNGSTEN CARBIDE

BASICS

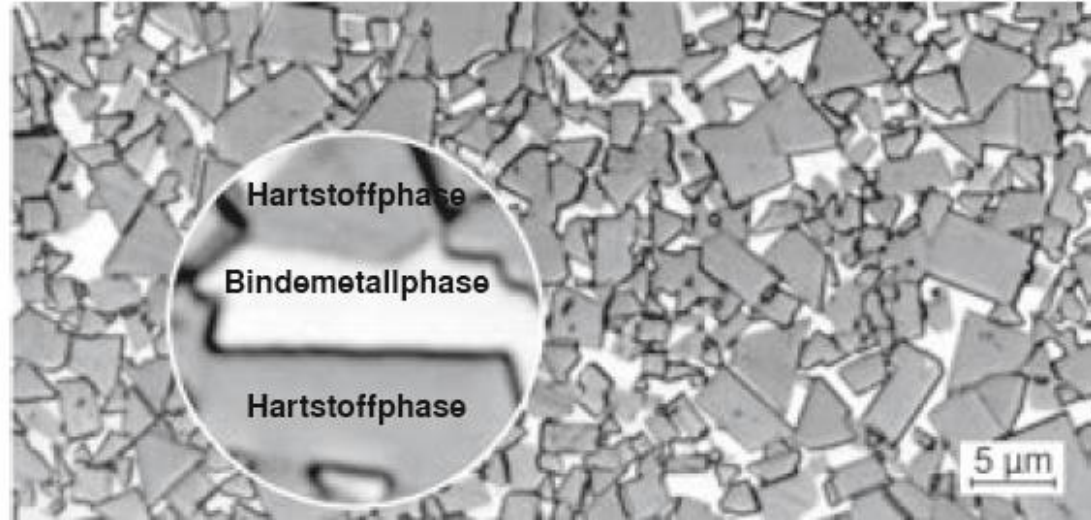
- TC is compared to other cutting materials a very wide material group with hundreds of applications.
- Hardness varies from around 700 HV10 up to 2400 HV10.
- With MOHS hardness rating at 9; After diamond, TC is the second hardest material.
- Tungsten Carbide is a mixture of two main ingredients
 - Wolfram Carbide
 - Cobalt
- BETEK offers a range of Tungsten Carbide from 5,5% up to 25 % of Cobalt, depending on the needs of the application.



TUNGSTEN CARBIDE

MICROSTRUCTURE

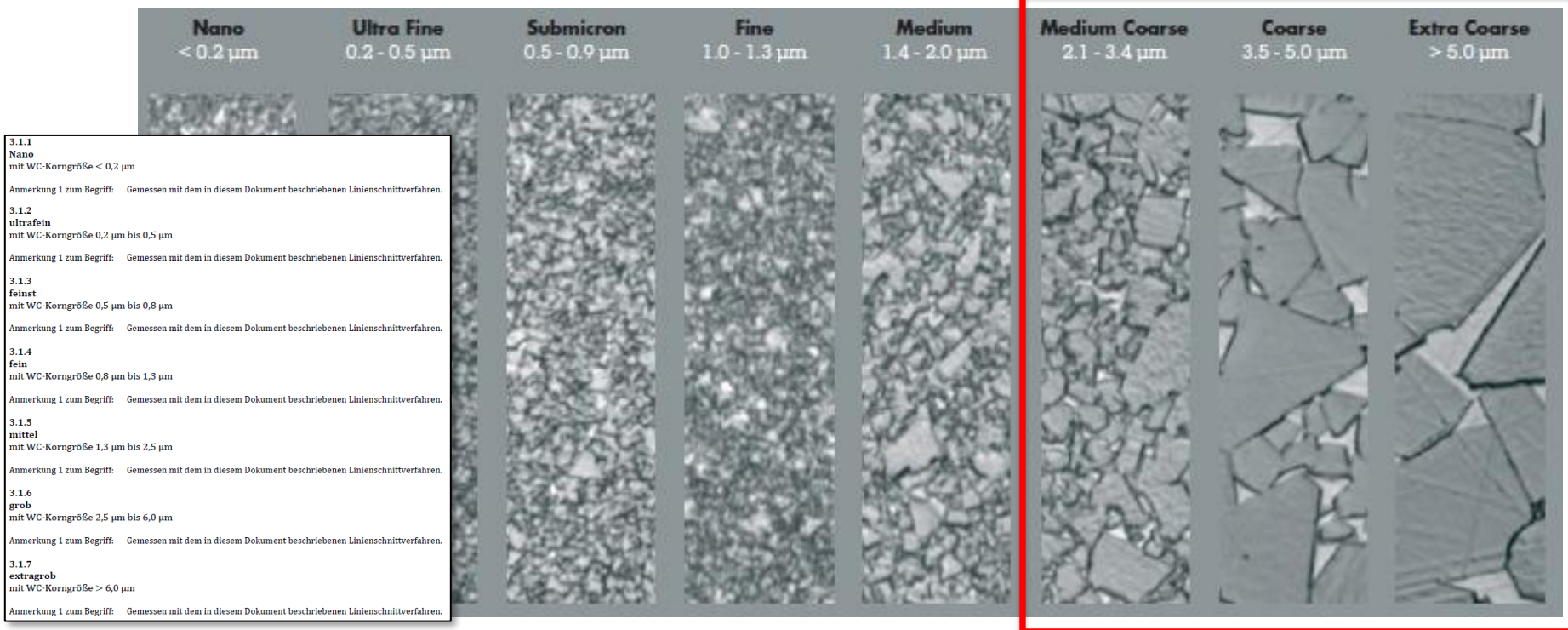
- WC is responsible for
 - Hardness
 - Wear resistance
- Cobalt is responsible for
 - Toughness
 - Binder



Gefügaufnahme Hartmetall

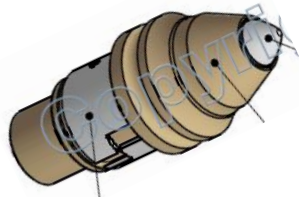
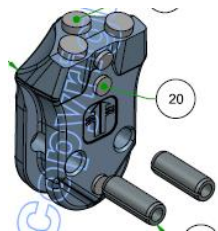
TUNGSTEN CARBIDE

GRAIN SIZES



TUNGSTEN CARBIDE

SPECIFICATIONS



BET-F-QM-001-e

Blatt 1 von 1

Formblatt

HM-Sorten Übersichtsblatt (nur interne Verwendung)

BETEK

Weiterkommen!

HM-Sorte	Sorten- endung	Bodenform Markierung	Zusammensetzung (Gew.-%)			C-Gehalt (%) - 0,05	mittlere Korngröße (µm)	Dichte (g/cm³) ± 0,20	Biegebruchfest. (N/mm²) min.	Koerzitivkraft (Oe) ⬆	Magn. Sätt. (10-4 Tcm³/g) ⬆	Verschleiß RS (mm)	Härte HV 10 ± 70	Härte HRA		
			WC Balance	Co ±0,2	TiC/ Ta(Nb)C											
Feinkorn-Sorten																
B-10-F/1	...99	+	94,00	6,00	< 0,20	5,75	4 - 5	14,90	2900	120 - 150	99 - 125	—	1400 ± 40	89,8 - 90,6		
B-10-F/1M	...62	..	94	6	< 0,20	5,75	4-5	14,9	2900	130 - 160	99 - 125	—	1430 ± 30			
B-10-F	...80	-	94,00	6,00	< 0,20	5,75	4	14,90	2600	120 - 180	99 - 125	0,6 - 1,2	1475 ± 50	—		
B-10-F/2	...85	n.a.	94,00	6,00	< 0,20	5,75	3	14,95	2600	140 - 190	99 - 125	0,5 - 1,0	1535 ± 50	—		
B-20-F	...52	n.a.	91,5	8,5	< 0,20	5,60	2	14,65	3000	120-180	150-172	0,8-1,3	1420 ± 30			
mittlere Korngrößen																
B-15	...73	n.a.	92,50	7,50	< 0,20	5,67	4	14,75	2700	90 - 140	129 - 155	1,0 - 1,5	1350	—		
B-20	...74	n.a.	90,50	9,50	< 0,20	5,55	4	14,55	2700	90 - 140	170 - 196	1,0 - 1,8	1300	—		
B-25	...83	n.a.	90,00	10,00	—	5,51	6	14,50	2600	70 - 110	180 - 206	1,5 - 2,5	1200	—		
B-25B	...61	n.a.	90,00	10,00	< 0,20	5,51	4 - 8	14,50	2600	70 - 130	180-206	1,5 - 2,5	1200			
B-30	...76	n.a.	89,00	11,00	—	5,46	6	14,40	2600	70 - 100	200 - 226	1,7 - 2,5	1100 - 1200	—		
BO-30	...82	n.a.	89,00	11,00	—	5,46	5 - 7	14,40	2600	70 - 120	200 - 226	1,6 - 2,5	1100 - 1300	—		
B-40	...78	n.a.	85,00	15,00	—	5,21	6	14,00	2500	50 - 90	280 - 307	3,0 - 4,0	1030	—		
BO-40	...87	n.a.	85,00	15,00	< 0,20	5,21	4 - 8	14,00	2500	70 - 120	280 - 307	2,5 - 4,5	1100	—		
Grobkorn-Sorten																
B-10-G	...70	n.a.	94,00	6,00	< 0,20	5,76	20	14,90	1800	60 - 80	99 - 125	1,5 - 3,0	1160	—		
B-10-GG/5,5	...93	n.a.	94,50	5,50	< 0,20	5,76	30	14,95	1600	45 - 55	90 - 115	1,5 - 3,5	1040	—		
B-10-GG/6	...88	n.a.	94,00	6,00	< 0,20	5,73	30	14,90	1500	40 - 50	99 - 125	1,5 - 4,0	1020	—		
B-12-G	...53	n.a.	93,00	7,00	< 0,20	5,67	20	14,85	2400	50-60	120-140	2,0 - 3,0	1100	—		
B-20-G	...71	n.a.	91,50	8,50	—	5,61	20	14,65	1750	50 - 60	150 - 176	1,5 - 3,0	1030	—		
B-25-G	...75	n.a.	90,50	9,50	—	5,55	25	14,55	1700	40- 50	170 - 196	2,5 - 4,0	1000	—		
B-40-G	...79	n.a.	85,00	15,00	< 0,20	5,21	20	14,00	1800	45 - 55	280 - 307	3,0 - 5,0	900	—		
Bemerkung:  Die magnetischen Werte (Koerzitivkraft und Magnetische Sättigung) sind nur Anhaltswerte																
Erstellt:			Datum:			Geändert:			Datum:			Freigabe:			Datum:	
D. Sieber			18.11.2009			T. Wilhelm			24.04.2015			W. Mauch			29.04.2015	

FLOW DIAGRAM

CARBIDE PRODUCTION



Raw materials
tungsten carbide, cobalt



Milling process
8-80 h



Spraying tower
2 different procedures



Pressing carbide
pressing of 12 t-120 t



Sintering process
up to 1,800 °C & 100 bar



QA control
in our in-house laboratory

JOINING AND HARDENING TECHNOLOGY

FLOW DIAGRAM

JOINING AND HARDENING TECHNOLOGY



Washing



Placement



Brazing



Sandblasting

- Automated brazing
 - brazing of more than 25.000 t of steel per year
 - production capacity: >70M. wear parts
 - High-end equipment due to high investments every year
 - brazing temperature between 750 and 1.050 °C
 - Different type of soldering material depending on the applications and requirements



PRODUCTION FINAL WEAR PARTS

➤ Brazing

- 6 fully-automated brazing units
- 6 semi-automated brazing units
- 2 robot operated brazing units
- 8 manual brazing units -> now 25 hand brazing units



PRODUCTION FINAL WEAR PARTS

- Assembly / Packaging
 - fully and semi-automated assembly processes
 - Assembly of long/short retainers
 - Packing of material with C-Clips, packing of holders etc.



BECOAT[®] WEAR PROTECCION

BECOAT® WEAR PROTECTION



BeCoat® hardfacing

- Wear protection for almost all product and tool geometries
- Cost saving due to increased lifetime
- Optimized material properties
- Consistent distributed tungsten carbides and low dilution



PLASMA TRANSFERRED ARC (PTA)

- **What is the PTA process?**
 - High energy ignition to melt down the workpiece surface
 - Coating powder is melted and applied to the workpiece
 - Forming of a metallurgical bond with the molten base material

- **Advantages PTA process:**
 - Low mixing of the base material (5-10%)
 - Small heat influence zone
 - High order rates
 - Automatic plant and manually operated plant available at BETEK



BECOAT® WEAR PROTECTION

BENEFIT FROM BETEK BECOAT® 10063

- Most Competitors using a FeCr hard material matrix **without** FTC (fused tungsten carbide)
- Composition of BeCoat® 10063:

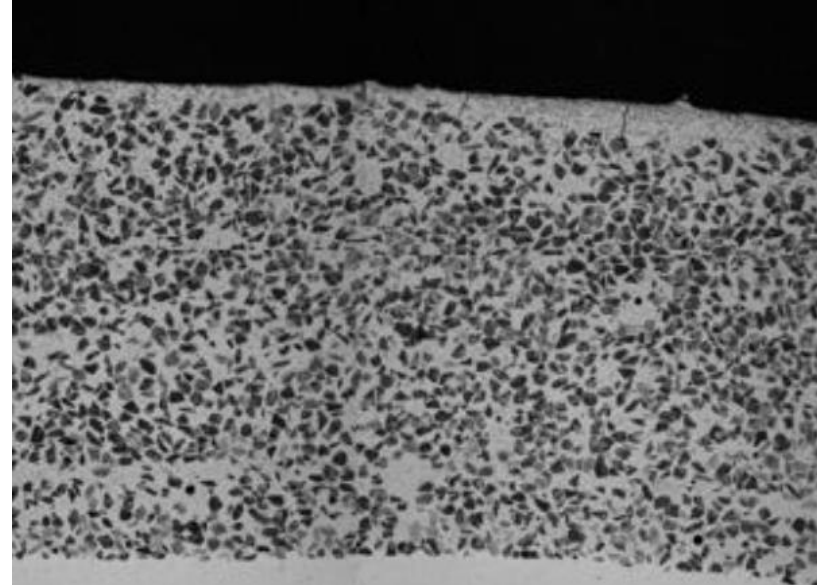
Facts

Composition

NiCr-Matrix	40%
FTC	60%

Hardness

NiCr-Matrix	58 - 63	HRC
FTC	ca. 2000	HV ₁



BECOAT® WEAR PROTECTION



BENEFIT FROM BETEK BECOAT® 10063

Usage

- Excellent wear properties due to high matrix hardness combined with fused tungsten carbide (FTC) grains
- For abrasive, rolling and sliding wear
- Corrosion resistant
- Heat resistant



PTA COMPETITOR EVALUATION

CHINESE COMPETITION WITH CRUSHED CARBIDE IN PTA

➤ Recent examination June 2024

4.2 Macroscopy

A very low proportion of hard material particles is clearly visible in this Hardfacing (Figure 20).

5.4 Hardfacing

Examination of the armour reveals cracks, flaws and eta phase, which has a serious impact on protection and longevity. Flaws, cracks, gas pockets and brittle phases can affect the structural integrity of the armour. A low proportion of hard material in the armour leads to increased wear of the steel body and can cause the carbides to fall out prematurely, which can ultimately lead to total failure of the bit.



Figure 20: Macroscopic image of the Hardfacing, hard material particles (red), Hardfacing matrix (blue)

TUNGSTEN CARBIDE RECYCLING

RECYCLING PROGRAMM

- BETEK has developed and patented an own Recycling process of Tungsten Carbide.
- Main targets:
 - More independent from supply chain & supply chain disruptions
 - Save logistic costs
 - CO² Footprint
 - Cost stability, see recent price development

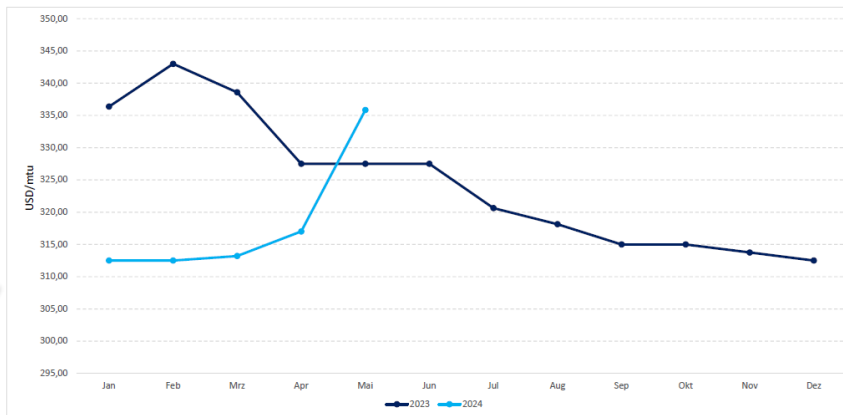
APW in USD/mtu - Monatsmittelwerte

 SIMONGROUP

Quelle: Metal Bulletin, Europa

	Jan	Feb	März	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez
2023	336,38	343,00	338,58	327,50	327,50	327,50	320,63	318,13	315,00	315,00	313,75	312,50
2024	312,50	312,50	313,20	317,00	335,83							

Beim Wert im aktuellen Monat handelt es sich um die aktuelle Hochrechnung.



TUNGSTEN CARBIDE RECYCLING



NEW RECYCLING PROCESS DEVELOPMENT OF BETEK



Cemented Carbide
Scrap



Cemented Carbide with
broken bonds („Cake“)



Crushed „Cake“



Ground Cemented-
Carbide-regenerate

SUSTAINABILITY

ECOLOGICAL, ECONOMIC, STRATEGIC

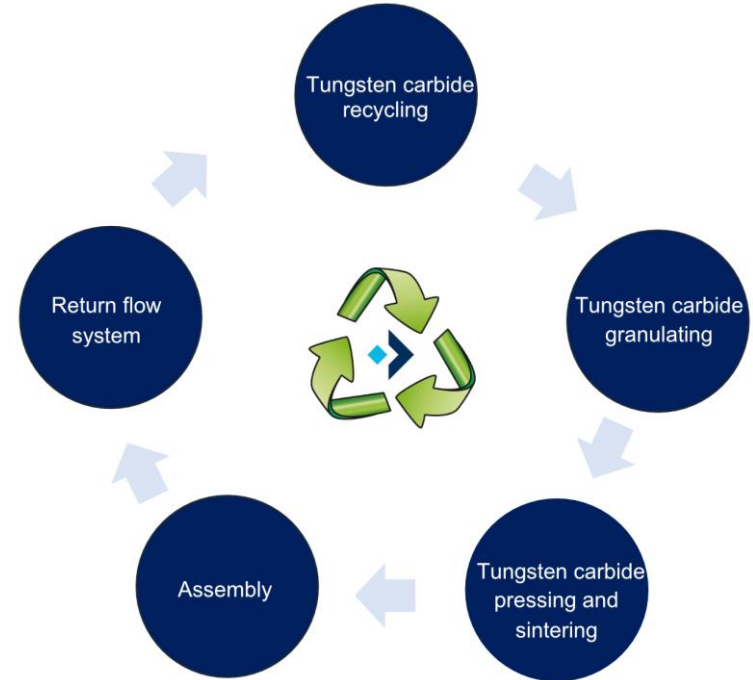
➤ CO2 reduction

- CO₂ savings of approx. 330,000 kg p.a. due to the installed PV systems
- Reduction of the CO₂ footprint for tungsten carbide through in-house carbide recycling to 1/60 compared with the virgin tungsten carbide from China used to date
- Reduction of CO₂ footprint (Scope 1-3) in 2022 by 4.3 % compared to 2021 (4,273 t CO₂-eq)

➤ Global purchase of carbide scrap

- If necessary, desoldering of hard metals
- Chemical cleaning/solder removal
- Recycling and granulation
- Reuse as carbide product

➤ Current capacity 80 tons carbide p.a.





TUNGSTUDS

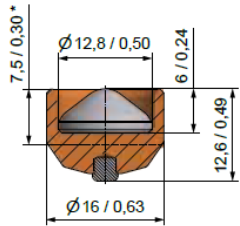
WEAR PROTECTION FOR
ALL APPLICATIONS



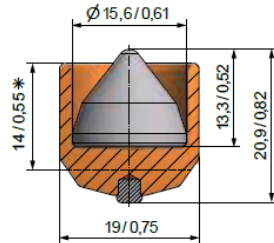
TUNGSTUDS

WHAT IS TUNGSTUDS?

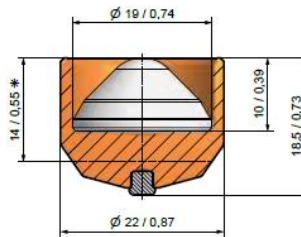
- Small weld on studs with a tungsten carbide core to generate a wear pattern on a surface, to protect these specific surface from wear.
- Welding with a specific stud welding machine with a welding gun.



■ **BTSD20**
BTSD16/12,5SG



■ **BTSD100**
BTSD19/15,6SG

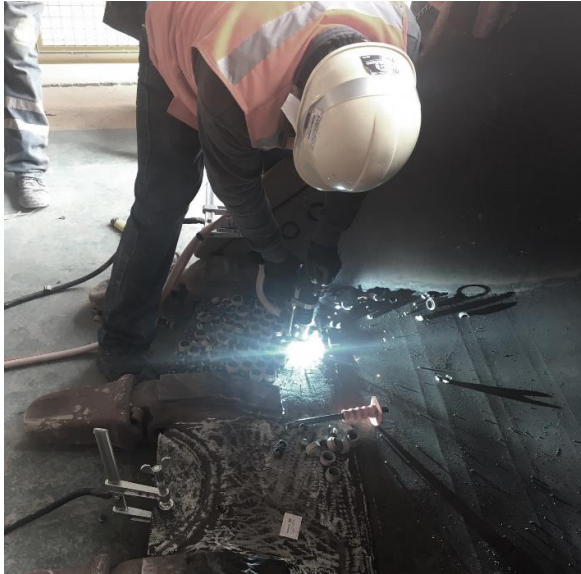


■ **BTSD08**
BTSD22/18,5SG

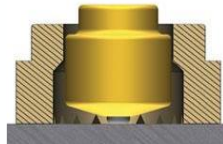


TUNGSTUDS

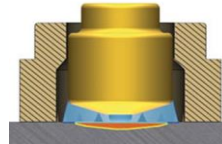
WELDING PROCESS



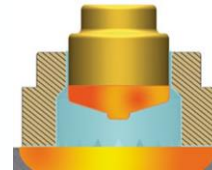
TungStud
placed



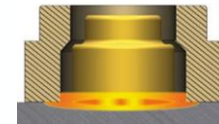
Ignition



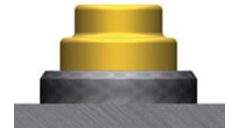
Arc causes
high
temperature



TungStud
dives in

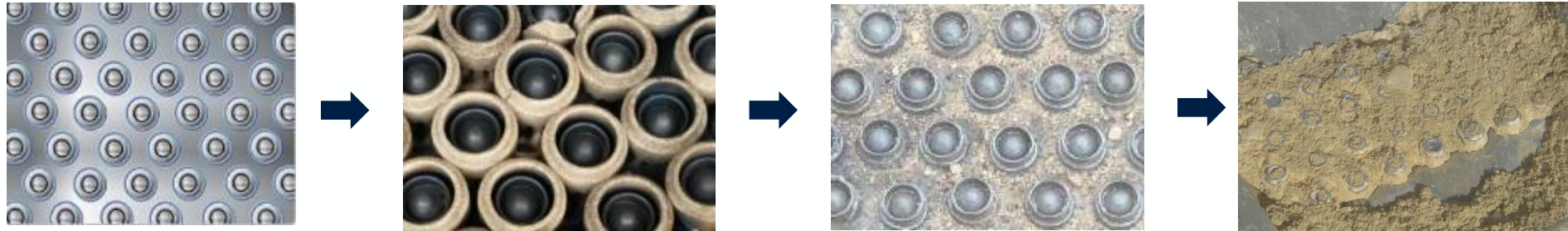


Completely
joined



TUNGSTUDS

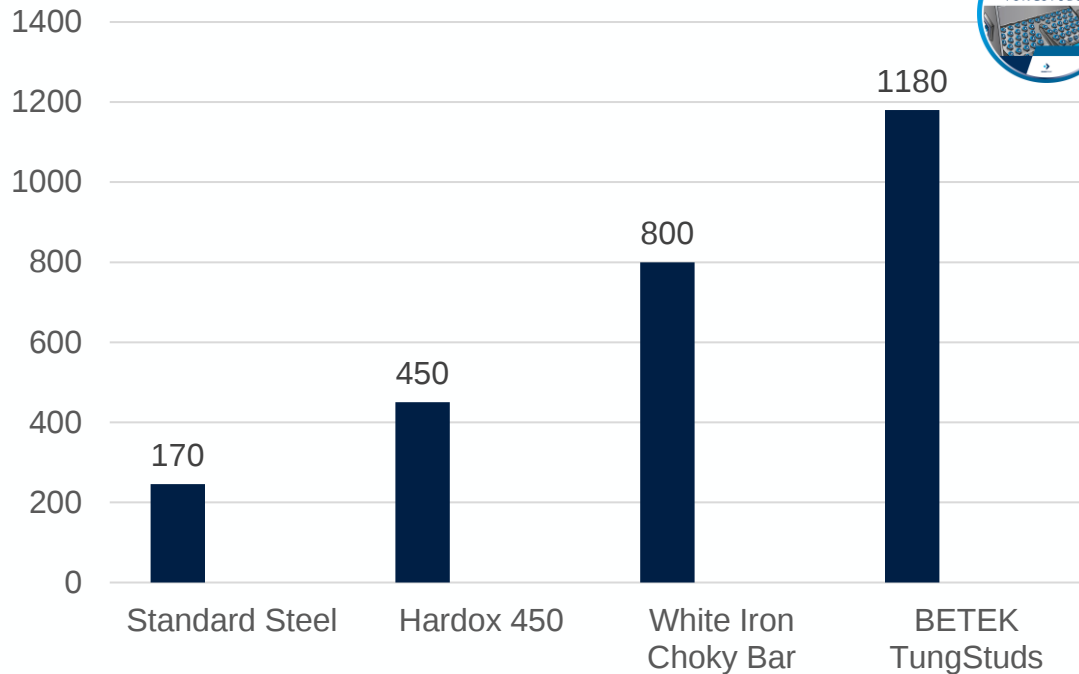
WELDING PATTERN



Recommended Welding Pattern (ceramic ferrule to ceramic ferrule)
Rock-Box-Effect through TungStuds embedded with mineral debris

TUNGSTUDS HARDNESS COMPARISON

Vickers Hardness Comparison Sheet



TungStuds are composed of tungsten carbide encased in steel.

Tungsten carbide comprises a blend of extremely hard tungsten and highly durable cobalt.

Through the sintering process, these two attributes are fused, resulting in a hardness of approximately 1200 HV.

Moreover, the ability for fast and convenient welding, along with the unique flexibility in welding on round and irregular surfaces, further underscores its advantages.



TUNGSTUDS

CUTTER SOIL MIXING



TUNGSTUDS

SHOWELS / DOZERS / LOADERS



TUNGSTUDS

TUNNELING



TUNGSTUDS

TRENCHING



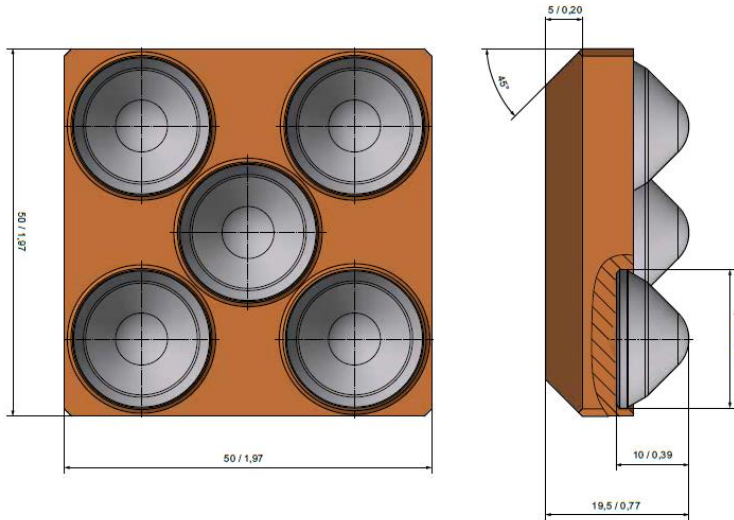
TUNGSTUDS

TRENCHLESS



BTS PLATES

WEAR PROTECTION



DIMENSIONS

Width in mm	Length in mm
50	50
75	75
100	100
125	125
150	150

Other sizes on request

TUNGSTUDS

BENEFITS

- Quick – Fast and easy welding procedure
- Flexible – Can also be applied in irregular surfaces
- Replaceable – TungStuds can be replaced when worn
- Tough – High wear resistance due to tungsten carbide core
- Effective – Less maintenance and higher productivity
- Efficient – Cost reduction through less downtime



THAT'S WHY BETEK

BETEK VS. COMPETITORS



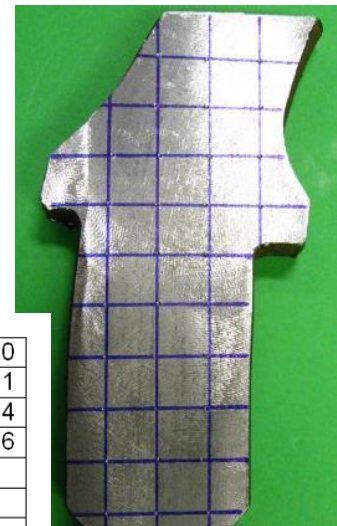
1. Steel Quality / Tempering
2. Brazing Connection
3. Tungsten Carbide Length
4. Tungsten Carbide Quality
5. PTA Hardfacing



COMPETITION

1. STEEL QUALITY / TEMPERING

- Often uses low quality steel grades
- Differences in hardness due to non-proper tempering
 - High steel wear
 - High breakage risk

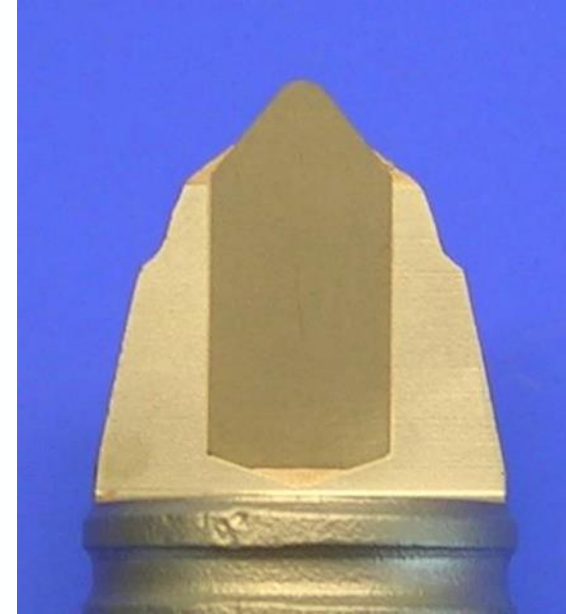


HRC		19,7	23,3	30,0
		14,4	23,6	25,1
	16,9	15,9	22,0	24,4
	16,3	13,6	24,8	21,6
	19,2	6,9	21,7	
	21,7	14,2	22,0	
	16,1	18,4	17,8	
	16,9	13,6	12,5	
	20,3	11,9	9,3	
	23,0	14,3	18,3	
	16,4	21,0	13,3	
	20,3	18,5	16,2	
	21,7	23,6	13,1	
	22,5	25,6	24,0	
		24,5		



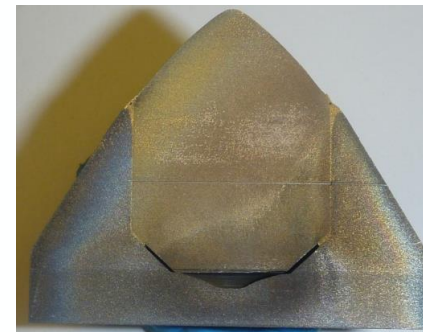
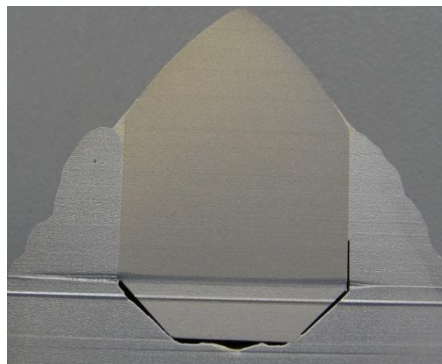
2. BRAZING CONNECTION

- BETEK is using high quality brazing material in combination with exact boring tolerances for an optimal brazing connection and high lifetime.
- No competitor uses so far the same brazing material. Brazing material of BETEK consists high content of Manganese, which has a good property when it comes to applications with heat above 400° C.
- To talk about a stable brazing connection, more than 70% of the surface must be connected to the body.



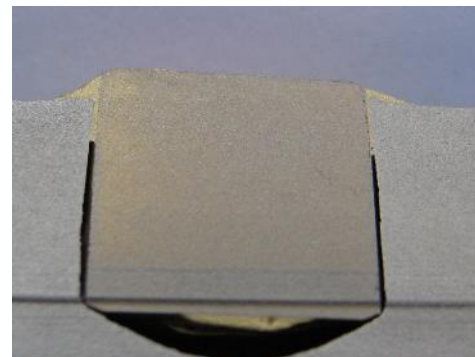
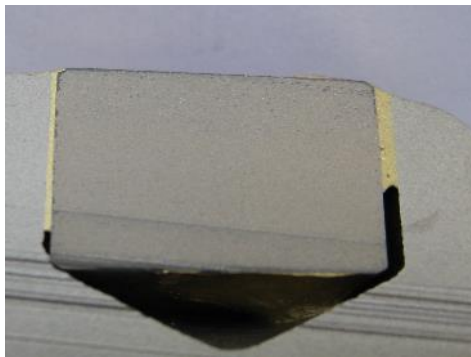
COMPETITION

2. BRAZING CONNECTION



COMPETITION

2. BRAZING CONNECTION



3. TUNGSTEN CARBIDE LENGTH

- Our competitors are using very short carbides to save costs!
- From BETEK you get what is on the print, every batch!

BETEK BKH47

- (Ø 22 mm x 34mm)



BETEK

Competitors

- (Ø 22 mm x 23-25 mm)



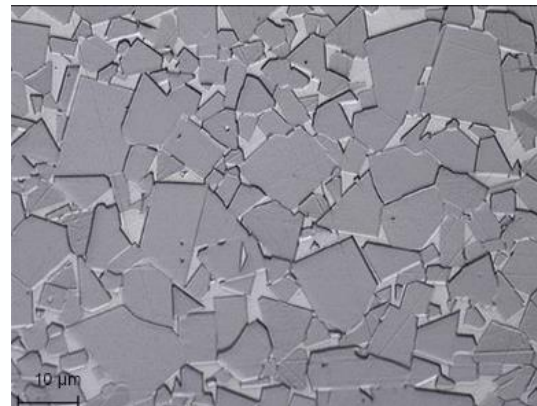
3. TUNGSTEN CARBIDE QUALITY



Fine grain size



Medium grain size

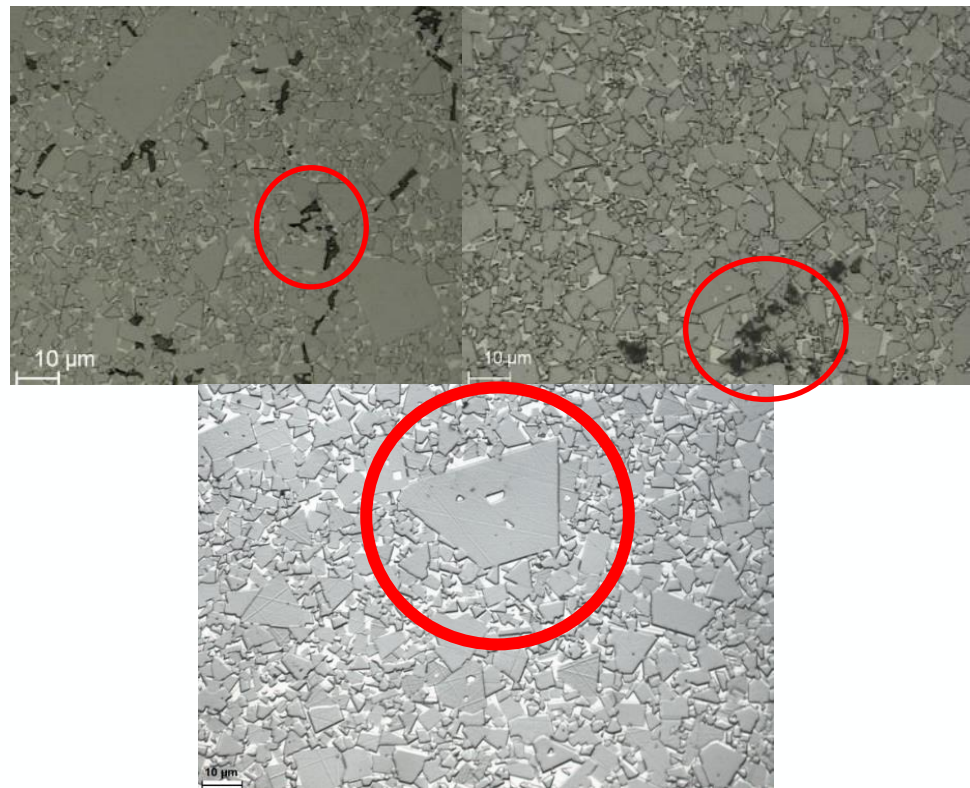


Coarse grain size

COMPETITION

3. TUNGSTEN CARBIDE QUALITY

- Usage of low quality material
- No stardardized production processes
- High wear due to Carbon Porosity
- Different grain sizes due to non proper mixing of raw materials
- Huge difference in grain sizes



THAT'S WHY BETEK

CONCLUSION

- Made in Germany
- In-house carbide development - from production to final product
- State-of-the-art production with a high degree of automation
- Established and constantly evolving quality management with production support
- Innovative power & investment power
- Loyal partner for decades



CONTACT



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THANK YOU

