

A detailed close-up of several mining drill bits, showing their complex, multi-faceted geometry and the arrangement of cutting edges. The bits are made of a dark, metallic material, likely tungsten carbide, and are shown in a cluster, highlighting their industrial design.

# Mining Bits

**MICON**  **DRILLING**

Drilling Equipment Made in Germany

MICON-Drilling GmbH  
Im Nordfeld 14, 29336 Nienhagen, Germany  
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## Company Profile

The MICON-Drilling GmbH is a worldwide operating service company, specialized in sales and rental of drilling equipment. Decades of experience, high quality standards and focused customer orientation are our unique selling points.

We are a member of the MICON Group, established in Nienhagen/Germany, in 1994. The privately owned company specializes in design, production, inspection and repair of drill string components, drill bits, sophisticated directional drilling systems and additional equipment. Our main focus lies on the technical service for drilling applications in the mining, oil & gas, tunneling and geothermal industries.

An innovative engineering department ensures continuous optimization of all MICON products. Additionally, we are in close contact with a network of several German universities to foster research and development activities.

The MICON Group manufactures drilling equipment in two independent facilities on state-of-the-art CNC milling, turning and welding machines. Latest technology and implementation of German engineering guarantee the highest degree of efficiency and quality.



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MICON Buildings "Im Nordfeld", Nienhagen/Germany



MICON Buildings "Breite Horst", Nienhagen/Germany

## Quality Policy

MICON stands for high quality products Made in Germany. This high quality standard builds the basis for our success and is an integral part of the company policy. This is reflected by long-term and trustful cooperation with our customers.

In order to achieve our high quality objectives the MICON Group manufacturing companies have implemented quality management systems certified according to international standards. The actual certification status of the Group companies is as follows:

MICON Downhole-Tools GmbH:

- ISO 9001:2015 - 0019058
- API Spec. Q1 (No. Q1-4689)
- API Spec. 7-1 (Monogram License 7-1-1271)

MICON GmbH & Co.KG:

- ISO 9001:2015 - 00007159
- ISO3834-2:2006 (D-ZE-16083-01-00-ISO3834-2019.0013.002)

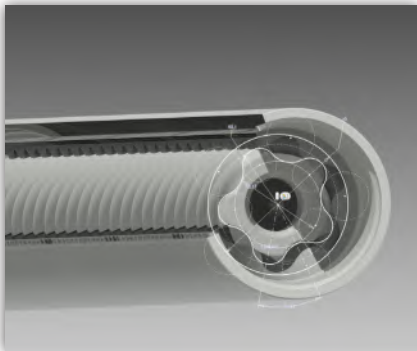
Our global quality objectives lead to specific targets, which are defined by the top management in cooperation with the quality manager. The fulfilment of these specific quality targets is evaluated at least every 12 months in the management review. Our ambition is product reliability and quality that meets the customer requirements as well as your high quality standards. The MICON product cycle includes different process steps. Rigorous acceptance criteria at every process step ensure a consistent high quality level of each product.



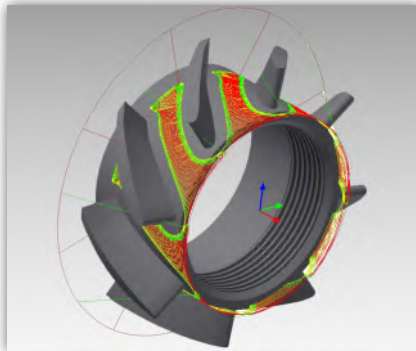
7-1-1271



Q1-4689



CAD based product development



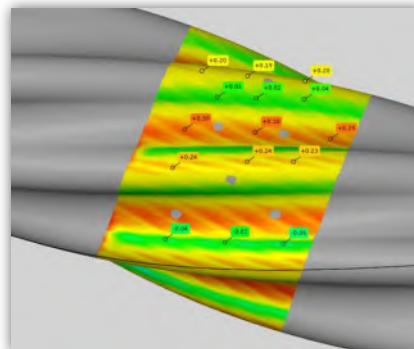
CAD – CAM manufacturing



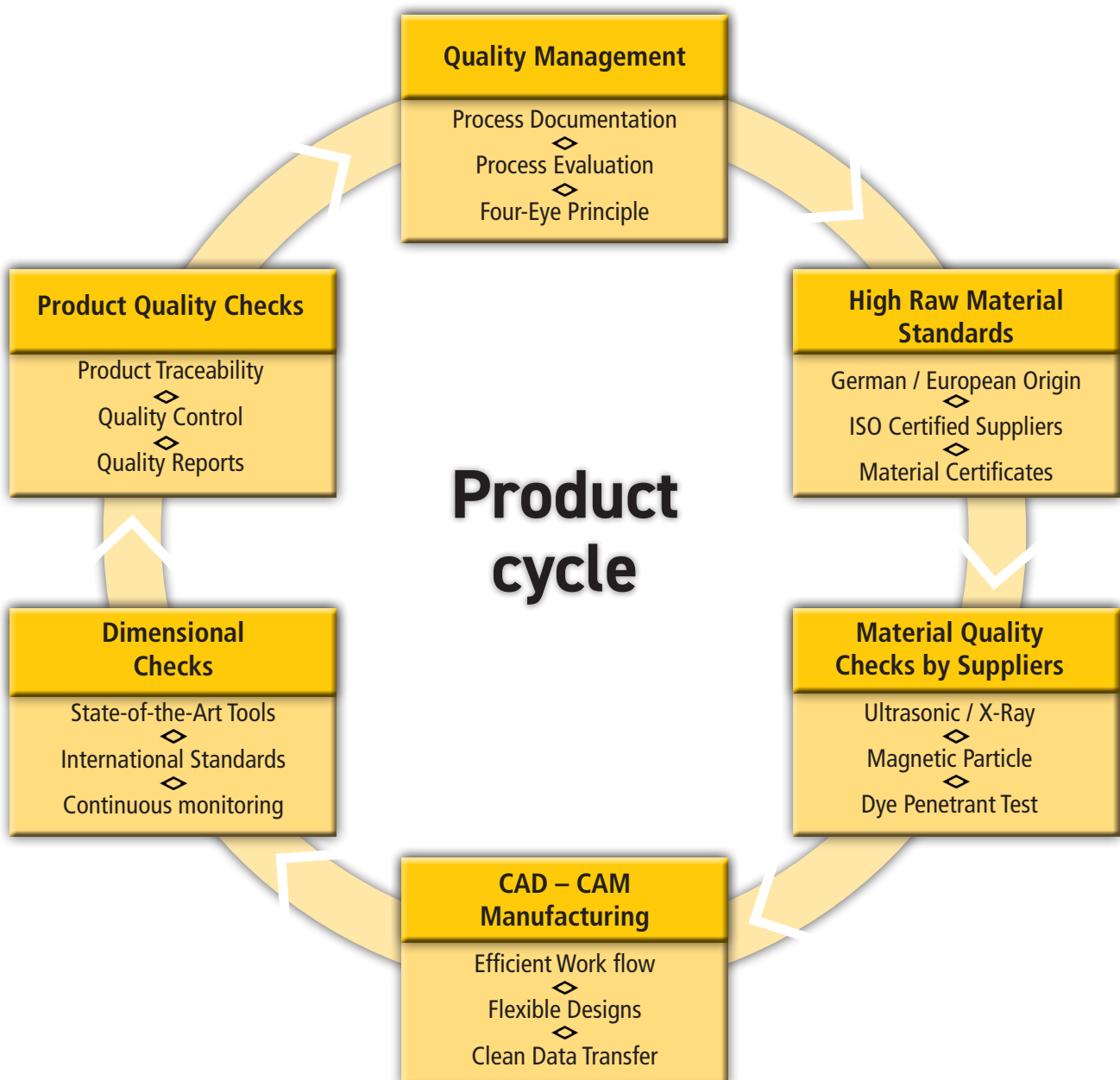
Permanent quality checks



High resolution 3-D scanning



3-D scan evaluation





## Christensen Mining Bits

Christensen mining bits are available for all kinds of mining and geotechnical drilling or coring applications. Examples are the raw material exploration or ground reconnaissance. German engineering, the use of high-grade materials and continuous product development guarantee a maximum rate of penetration and superior wear resistance. Our mining bits are in operation worldwide and have proven on thousands of drill meters under roughest conditions.

For special needs we manufacture customized bits according to customer's specifications. Additionally, we offer a repair service for our PDC bits. Please contact us for further details.



Christensen TSD Core Bit



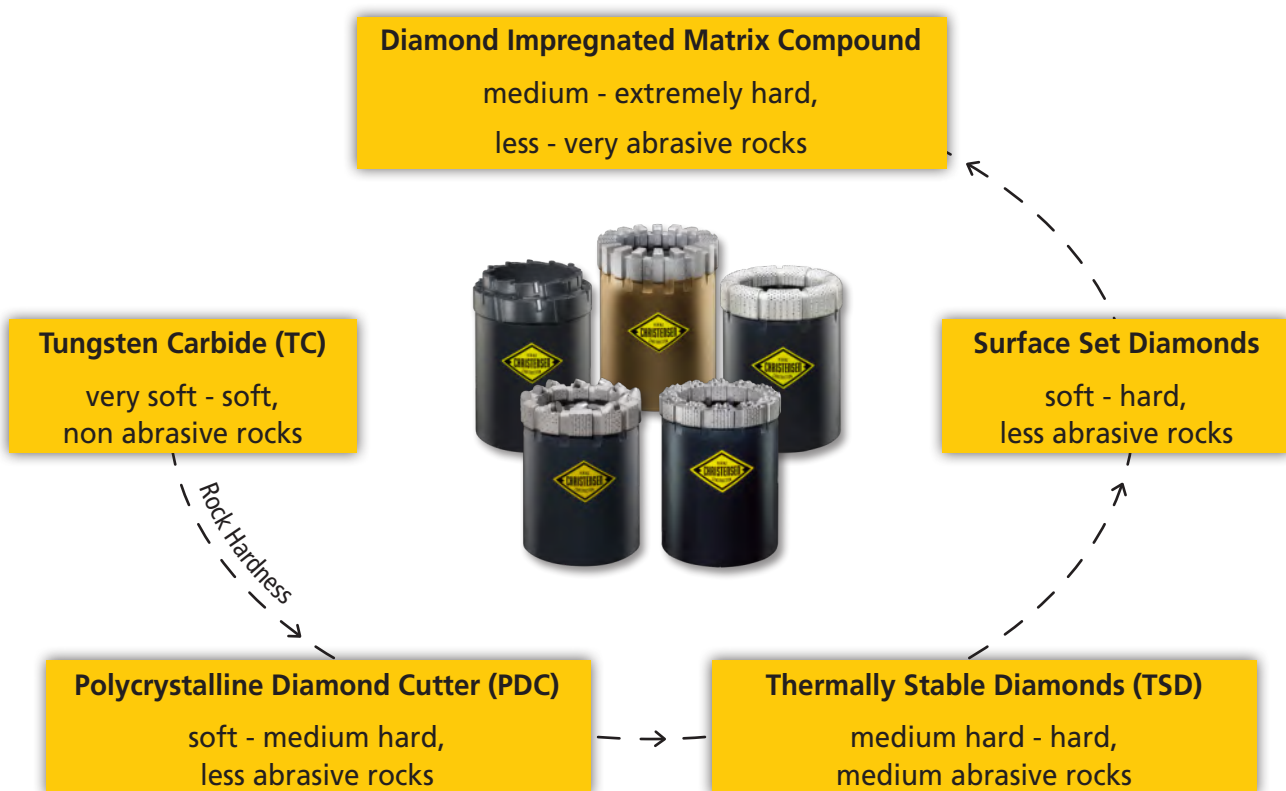
Christensen PDC Mining Bit



## Cutter Type Selection

Formation Properties*				Cutter Types											
Moh's Hardness	UCS [MPa]	Rock Examples	Hardness	TC	PDC	TSD	Surface Set [st/ct]		Diamond Impreg.						
							6 - 15	15 - 30							
1	10	Soil, Soft Clay, Quartz-poor Sand, Marl, Sandy Limestone, Gypsum	Very Soft												
2		Hard Clay, Sand, Soft Limestone, Soft Sandstone, Soft Shale, Salt, Anhydrite	Soft												
3															
4	50	Sandstone, Siltstone, Claystone, Conglomerate, Shale, Weathered Hard Rock	Medium Hard												
5		Dolomite, Hard Shist, Marble, Granite, Greenstone, Andesite	Hard												
6	100	Porphyry, Pegmatite, Diabase, Gabbro, Andesite, Gneiss	Very Hard												
7		Chert, Taconite, Banded Ironstone, Quartzite	Extremely Hard												

\* Selection can differ according to geological variations.



## Tungsten Carbide

**Very soft - soft,  
non abrasive rocks**

Tungsten carbide cutter guarantee a superior rate of penetration and sufficient wear resistance. Tungsten carbide (TC) bits are a cost efficient solution for soft formations or milling operations. Beside octahedral pins, rectangular plate cutters or crushed TC coated bits are available.



CSK 146 TC Core Bit

## Polycrystalline Diamond Compact

**Soft - medium hard,  
less abrasive rocks**

Polycrystalline Diamond Compact (PDC) cutter enable high rates of penetration and assure long endurance. These cutter consist of a hard metal cylinder covered by a synthetic diamond layer. PDC cutter are also known as "stratapax", "diapax" or "PCD". We offer a repair service for our PDC bits. In most cases it is possible to renew the worn cutters. Thereby, drilling costs can be reduced significantly.



CSK 146 PDC Core Bit

## Thermally Stable Diamond

**Medium hard - hard,  
medium abrasive rocks**

Thermally Stable Diamond (TSD) cutter are available in triangular or cubic shape. They are also known as "tripax" or "synset". TSD cutter consist of multiple layers of synthetic diamond fragments. This feature gives TSD cutter a self-sharpening wear behavior, ensuring a high endurance in abrasive formations.



CSK 146 TSD Core Bit



CSK 146 Surface Set Core Bit

## Surface Set Diamonds

**Soft - hard,  
less abrasive rocks**

Our surface set diamond bits are exclusively equipped with natural diamonds. Each diamond is oriented and inserted individually. This process assures the maximal impact and wear resistance of each diamond. Drilling diamonds are available in different sizes from 6 to 30 stones per carat [st/ct]. In general, smaller diamonds are used for harder formations.







CSK 146 Impregnated Core Bit

## Diamond Impregnated Matrix

**Medium hard - extreme hard,  
less - very abrasive rocks**

Multiple layers of synthetic diamond fragments are sintered into a hard metal matrix. This compound behaves self-sharpening during progressing abrasion. Worn diamonds are released and replaced by new ones, until the matrix compound is completely eroded. The availability of different matrix materials permits to adapt these bits to a variety of formation types. For this reason, they can be used in extremely hard, as well as in extremely abrasive rocks. A color coding simplifies the re-ordering process.

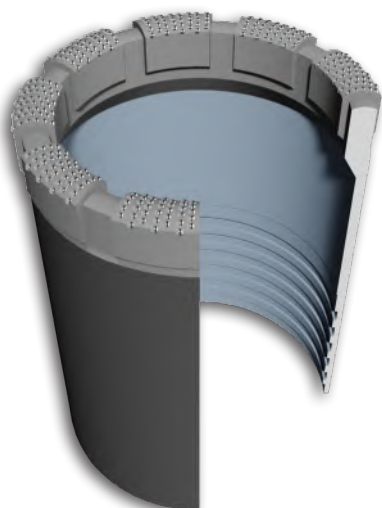
Matrix Type Selection Chart			
			
Yellow	Green	Gold	Platinum
<div> <div>Very Abrasive Very Soft Coarse Grained Highly Fractured</div> <div> <div>Hard Matrix</div> <div>Soft Matrix</div> </div> <div>Less Abrasive Extremely Hard Fine Grained Homogeneous</div> </div>			

## Design Options Core Bits

The design characteristics of each core bit are important features that affect drilling speed, hole deviation and core recovery rate. We provide a wide range of designs and profiles to cover all coring applications. The most important design options are described on the next pages. Additionally, we design and manufacture customized core bits for special applications on request.

Profile Cutter	W	BY	S	Teeth	Flat	Red. Cut- ting Area	Junk Slots	Ports	Counter- flush
TC							✓	✓	✓
PDC							✓	✓	✓
TSD							✓	✓	✓
Surface Set	✓	✓	✓				✓	✓	✓
Impregnated				✓	✓	✓	✓	✓	✓

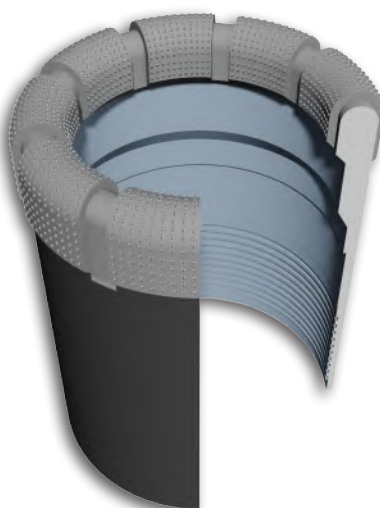
W Profile



◇ Higher specific contact pressure

◇ Higher ROP

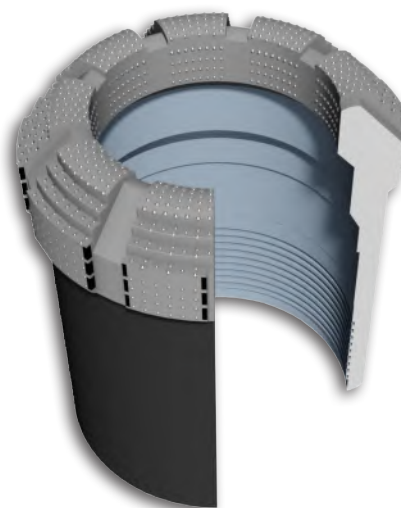
BY Profile



◇ Increased diamond quantity at inner and outer gage

◇ Enhanced gage wear resistance

S Profile

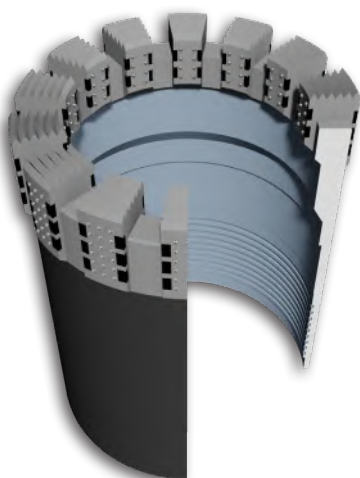


◇ Optimal directional bore-hole stability

◇ Enhanced core quality in difficult formations

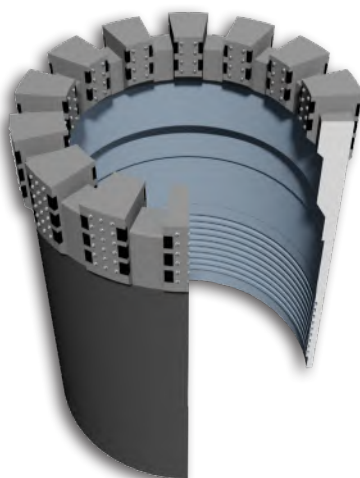


## Teeth Profile



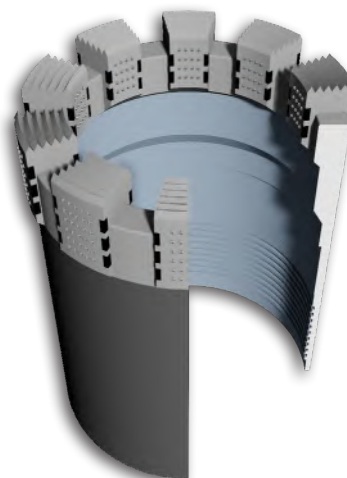
- ◇ Small grooves in the matrix top face
- ◇ Enables a smooth, low vibration drill start

## Flat Profile



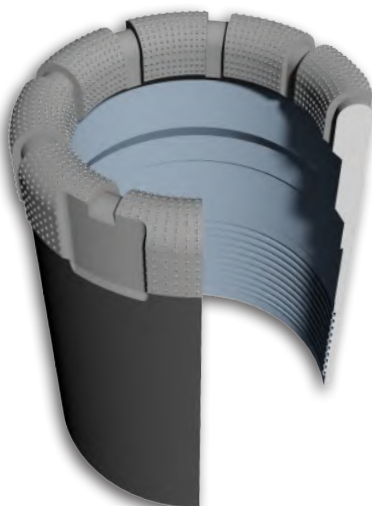
- ◇ Increased stability of the matrix compound
- ◇ Advantageous in hard, fractured formations

## Reduced Cutting Area



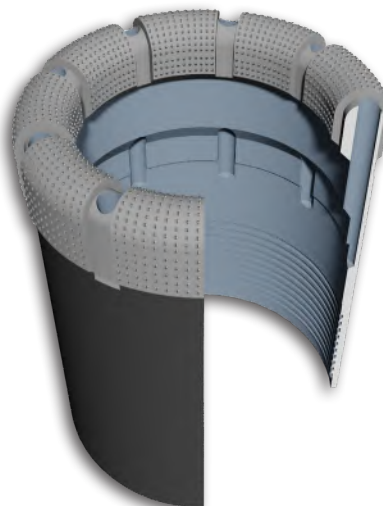
- ◇ Higher specific contact pressure
- ◇ Faster drilling start in most formations

## Junk Slots



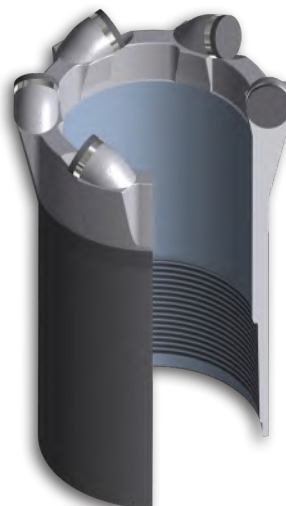
- ◇ Partly extended annular space at the bit face
- ◇ Enhanced removal of bigger cuttings (junk)

## Ports



- ◇ Reduced contamination of the core by drilling fluids
- ◇ Better bit cleaning

## Counterflush



- ◇ Reverse circulation of drilling fluids (up through pipe)
- ◇ Enables to operate without a core barrel (e.g. in salt)

## Datatables Core Bits

Standard Mining / Geotechnics		
System*	ID [mm]	OD [mm]
CA / AQ	26.9	47.8
CB / BQ	36.5	59.7
CN / NQ	47.5	75.4
CH / HQ	63.4	95.8
CP / PQ	85.0	122.3
NXB I + II	47.6	75.7
HXB I + II	61.2	92.8
CSK 146	102.0	146.0
CSK 176	132.0	176.0
Geobor S	102.0	146.0
B 36 - B 146	22.0 - 132.0	36.0 - 146.0
T2 36 - T2 101	22.0 - 84.0	36.0 - 101.0
T6 76 - T6 146	57.0 - 123.0	76.0 - 122.0
D 76 - D 146	56.0 - 122.0	76.0 - 122.0
SF 94 - SF 219	51.0 - 190.0	79.0 - 219.0
NSK 78 - NSK 178	47.5 - 132.0	78.0 - 178.0

Heavy Duty Mining / Geotechnics				
System*	ID		OD	
	[mm]	[inch]	[mm]	[inch]
SK 4 ¼" B	69.0	2 ¾	120.6	4 ¾
SK 4 ½" B	78.0	3	123.8	4 7/8
SK 5 ½" B	101.4	4	161.9	6 ¾
SK 5 ¾"	88.9	3 ½	157.0	6 1/8

Special Mining Applications / Oil + Gas				
System*	ID		OD	
	[mm]	[inch]	[mm]	[inch]
250 P 4 ¾" x 2 5/8"	66.7	2 5/8	152.4	6
250 P 6 ¾" x 4"	101.6	4	215.9	8 ½
250 P 8" x 5 ¼"	133.4	5 ¼	311.2	12 ¼
HT 10 4 ¾" x 2 5/8"	66.7	2 5/8	149.2	5 7/8
HT 30 6 ¾" x 4"	101.6	4	215.9	8 ½
HT 40 8" x 5 ¼"	133.4	5 ¼	311.2	12 ¼

\* Additionally, we offer customized types according to customer's specifications.

Weight on Bit					
System	Cutting Area [cm²]	PDC (ø 13 mm) Min - Max [t]	TSD Min - Max [t]	Surface Set Min - Max [t]	Impregnated** Min - Max [t]
CA	12.4	0.2 - 0.8	0.4 - 1.1	0.5 - 0.9	0.5 - 1.5
CB	17.4	0.3 - 1.0	0.5 - 1.2	0.8 - 1.3	0.7 - 2.1
CN / NXB	21.8	0.3 - 1.2	0.4 - 1.0	1.1 - 1.8	0.9 - 2.6
CH / HXB	33.0	0.4 - 1.6	0.7 - 1.8	1.4 - 2.4	1.3 - 4.0
CP	49.0	0.5 - 2.0	0.8 - 2.0	2.4 - 4.0	2.0 - 5.9
CSK 146	68.6	0.6 - 2.4	0.9 - 2.3	3.6 - 6.0	2.8 - 8.4
CSK 176	85.1	0.7 - 2.8	1.5 - 2.7	4.5 - 7.5	3.4 - 10.2
SK 4 ¼" B	61.4	0.5 - 2.0	0.9 - 2.3	2.7 - 4.5	2.5 - 7.4
SK 5 ½" B	100.1	0.7 - 2.6	1.5 - 3.8	5.4 - 9.0	4.0 - 12.0
250 P 4 ¾" x 2 5/8"	111.9	2.0 - 7.0	3.0 - 9.0	6.0 - 10.0	4.7 - 14.2
250 P 6 ¾" x 4"	228.0	3.0 - 9.6	4.0 - 10.0	10.5 - 17.5	9.1 - 27.4

50 - 200 kg/PDC    10 - 25 kg/TSD    3 - 5 kg/Diamond    40 - 120 kg/cm²

\*\* For reduced cutting area please correct values: Red. 1 = 70 %, Red. 2 = 60 %, Red. 3 = 50 %.

Rotational Speed*					
System	Diameter [mm]	PDC (ø 13 mm) Min - Max [min <sup>-1</sup> ]	TSD Min - Max [min <sup>-1</sup> ]	Surface Set Min - Max [min <sup>-1</sup> ]	Impregnated Min - Max [min <sup>-1</sup> ]
CA	47.8	240 - 600	240 - 720	360 - 960	720 - 1200
CB	59.7	200 - 480	200 - 580	280 - 760	580 - 960
CN / NXB	75.7	160 - 380	160 - 460	220 - 600	460 - 760
CH / HXB	96.3	120 - 300	120 - 360	180 - 480	360 - 600
CP / SK 4 ¼" B	122.6	100 - 240	100 - 280	140 - 380	280 - 460
SK 5 ½" B	161.9	80 - 180	80 - 220	100 - 280	220 - 360
CSK 146	146.0	80 - 200	80 - 240	120 - 320	240 - 400
CSK 176	176.0	60 - 160	60 - 200	100 - 260	200 - 320
250 P 4 ¾" x 2 ⅝"	152.4	80 - 180	80 - 220	120 - 300	220 - 380
250 P 6 ¾" x 4"	215.9	60 - 140	60 - 160	80 - 220	160 - 260

\* Correlates with 0.6 - 1.5 m/s for PDC core bits, 0.6 - 1.8 m/s for TSD core bits, 0.9 - 2.4 m/s for surface-set core bits and 1.8 - 3.0 m/s for impregnated matrix compound core bits.

Circulation Pump Rate**						
System	Borehole Diameter [mm]	Drill String OD [mm]	[l/min]		[gal (US)/min]	
			Min.	Max.	Min.	Max.
CA	47.8	44.5	34.1	51.2	9.0	13.5
CB	59.7	55.6	47.3	71.0	12.5	18.8
CN / NXB	75.7	70.0	39.1	58.7	10.3	15.5
CH	96.3	88.9	64.6	96.9	17.1	25.6
CP	122.6	117.5	57.7	86.6	15.2	22.9
SK 4 ¼" B	120.6	103.5	180.6	270.9	47.7	71.6
SK 5 ½" B	161.9	141.0	298.3	447.5	78.8	118.2
CSK 146	146.0	140.0	80.9	121.3	21.4	32.0
CSK 176	176.0	172.0	65.6	98.4	17.3	26.0
250 P 4 ¾" x 2 ⅝"	152.4	88.9	722.1	1,083.1	190.8	286.1
250 P 6 ¾" x 4"	215.9	114.3	1,580.9	2,371.4	417.6	626.5

\*\* Recommendations for  $V_a$  (annular velocity) range from 200 ft/min to 300 ft/min. Please correct values according to fluid composition and drilled formation.

## Notes











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