

## 2. DRILLING TOOLS

### 2.1. Carbide coring bits

**Carbide coring bits** are assigned to drillings with rotational method using single or double core barrel. Coring bit is a component of the drill string and has the task of machining rock. The bit is reinforced by pillars from tungsten-carbide, soldered into frontal teeth of the crown. TrW threads (outer on single, inner on double crown) enable winding onto the core breaker body (single crown) or link of the core barrel (double crown).



#### 2.1.1. Single crown

Used with single core barrel. Winded onto body of core breaker.

Type	Outer diam. (mm)	Inner diam. (mm)	Length (mm)	Weight (kg)
59 PW	59	44	90	0,4
76 PW	76	61	90	0,8
93 PW	93	77	90	1,0
112 PW	112	95	100	1,2
132 PW	132	114	100	1,6
151 PW	151	134	105	2,8
46 B	46	31,7		
56 B	56	41,7		
66 B	66	51,7		
76 B	76	61,7		
86 B	86	71,7		
101 B	101	86,7		
116 B	116	101,7		
131 B	131	116,7		
146 B	146	131,7		

2.1.2. Double crown

Used with double core barrel. Winded onto link of the dore barrel. Crown T6S is used for core drilling with additional plastic split tube.

Type	Outer diam. (mm)	Inner diam. (mm)	Długość (mm)	Masa (kg)
59	59	35	165	0,6
76	76	49	200	1,6
93	93	66	207	2,0
112	112	85	210	2,6
132	132	101	215	3,5
151	151	121	230	4,7
46 T2	46	31,7		
56 T2	56	41,7		
66 T2	66	51,7		
76 T2	76	61,7		
86 T2	86	71,7		
101 T2	101	83,7		
76 T6	76	57		
86 T6	86	67		
101 T6	101	79		
116 T6	116	93		
131 T6	131	108		
146 T6	146	123		
101 T6S	101	71,7		
116 T6S	116	85,7		
131 T6S	131	100,7		
146 T6S	146	115,7		

## 2.2. Diamond core bits.

Like carbide core bits they are used for core drilling, but in harder rock. Diamond coring bits are divided into three types:

1. Impregnated
2. Surface set
3. PCD/TSD

2.2.1. Impregnated diamond core bits are used mainly in case of drilling in rocks cracked, strongly abrasive and very hard.

Below you can find a chart of impregnated tools selection:

Table of impregnated tools selection					
Matrix		Formation			
		Hardness	Rock Type	Granulation	Abrasiveness
S1	Extremely Soft	Extremely hard	Quartz, silica, quartzite Formations with very high Percentage of silica	Very fine grained	Non abrasive
S2	Very Soft	Very hard	Quartz, silica, quartzite Clenched puddingstones	Very fine grained	Non abrasive
S3	Soft	Very Hard	Taconite, granite, diorite, schist fossilized limestone, gneiss	Very fine grained	Non abrasive
S4	Soft	Hard to very hard	Amphibolite, granite, schist, gneiss	Fine grained	Non abrasive or slightly abrasive
S5	Medium Soft	Hard to medium hard	Gneiss, schist, fossilized basalt	Fine grained	Non abrasive
S6	Medium	Hard	Granite, schist, gneiss, concrete	Fine to medium grained	Non abrasive or moderately abrasive
S7	Medium	Medium hard	Quartzite, dolomite, norite, coarse granite	Medium grained	moderately abrasive
S8	Medium Hard	Medium hard	Norite, quartzite	Medium grained	Abrasive
S9	Hard	Medium hard	Sandstone, norite, quartzite	Medium grained	Very abrasive
S10	Very Hard	Medium hard	Sandstone, chalk with addition of silica, quartzite	Medium grained	Very abrasive
S11	Extremely Hard	Medium hard	Sandstone, monzonite	Coarse grained	Extremely abrasive

2.2.2. Surface set diamond coring bits are divided depending on the shape of the face:

- a) semi round profile – standard profile.
- b) pilot profile – food core recovery in soft, friable formations.
- c) conical profile – good penetration and stability. Stronger than stepped profile.
- d) stepped profile – popular in wireless core drilling. Characterised by high penetration and stability in fractured formations.



The size and arrangement of the diamonds depend on the formation that the bit is designed for.

2.2.3. PCD and TSD coring bits

PCD – polycrystalline diamond consisting of synthetic diamonds wrapped in tungsten carbide . PCD coring bits are characterized by high speeds of the drilling, long vitality and in consequence low costs of meter of the borehole, particularly in soft to medium rocks. Bigger blades allow for getting higher speeds than in case of surface set tools.

Material named TSD is a thermally stabilized blend of polycrystalline diamonds. Coring bits with TSD fillers guarantee high speeds of drilling, particularly in hard rocks.

