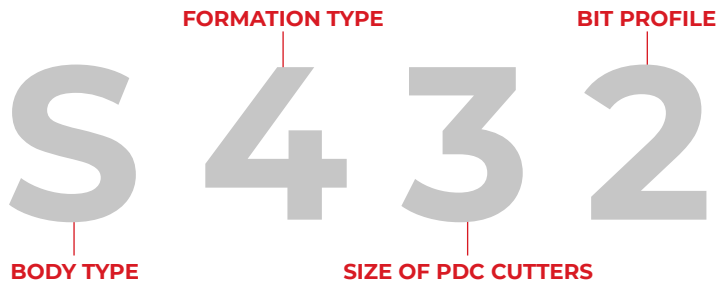




SCAN ME

PDC BIT NOMENCLATURE



BODY TYPE:

- S - Steel
- M - Matrix
- D - Diamond

FORMATION TYPE TO BE DRILLED:

- 1 & 2 - Soft and soft sticky - Highly drillable formations such as clay, marl, gumbo and unconsolidated sands.
- 3 - Soft to medium - Low compressive strength sands, shales and anhydrites with hard layers intermixed.
- 4 - Medium to Moderate - Compressive strength sand, chalk, anhydrite and shale.
- 5 - No code.
- 6 - Medium to hard - Higher compressive strength with non or semi sharp sand, shale, lime and anhydrite.
- 7 - Hard - High compressive strength with sharp layers of sand or siltstone.
- 8 - Extremely hard - Dense and sharp formations such as quartzite and volcanic rock.

SIZE OF PDC CUTTERS:

Very soft (1) to medium (4) formation type pdc bits have one dominant size of PDC cutter. PDC cutting structure is denoted in the following way:

- 2 - mostly 16mm cutters
- 3 - mostly 13mm cutters
- 4 - mostly 8mm cutters

Formation types 6, 7 and 8 are somewhat different. These bits are designed for the harder, more difficult drilling. Their cutting structures are denoted as follows:

- 1 - Natural Diamond
- 2 - TSP (Thermally Stable Polycrystalline)
- 3 - Combination
- 4 - Impregnated Diamond

BIT PROFILE:

- 1 - Short fishtail
- 2 - Short profile
- 3 - Medium profile
- 4 - Long profile



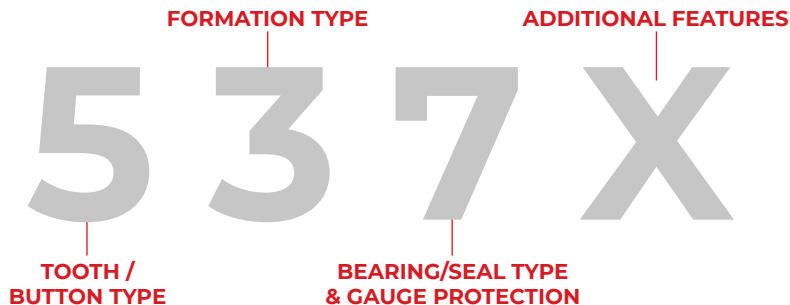
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TRICONE NOMENCLATURE



TOOTH / BUTTON TYPE:

1, 2 & 3 - **Steel Mill Tooth Bits** with 1 for soft, 2 for medium and 3 for hard formations.
 4, 5, 6, 7 & 8 - **Tungsten Carbide Insert Bits** for varying formation hardness with 4 being the softest and 8 the hardest.

FORMATION TYPE TO BE DRILLED:

- 1 - **Soft**
- 2
- 3
- 4 - **Hard**
-

BEARING/SEAL TYPE & GAUGE PROTECTION:

- 1 - Standard open bearing roller bit
 2 - Standard open bearing roller bit, air-cooled
 3 - Standard open bearing roller bit with gauge protection which is defined as carbide inserts in the heel of the cone
 4 - Sealed roller bearing bit
 5 - Sealed roller bearing bit with gauge protection
 6 - Journal sealed bearing bit
 7 - Journal sealed bearing bit with gauge protection

ADDITIONAL FEATURES:

- A - Air Application
- B - Special Bearing
- C - Center Jet
- D - Deviation Control
- E - Extended Jet
- G - Extra Gage Protection
- H - Horizontal/Steering Application
- J - Jet Deflection
- L - Lug Pads
- M - Motor Application
- R - Reinforced Welds
- S - Standard Steel Tooth
- T - Two Cone
- W - Enhanced Cutting Structure
- X - Chisel Insert
- Y - Conical Insert
- Z - Other Insert Shape



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Rocks	Bit type		Hardness as per professor Protodyakonov's scale, f	Standard rock drillability classification	Building specifications and acts	Uniaxial compressive strength, δ			International Bureau of Rock Mechanics	Ministry of Geology (mining and tunneling)	Ministry of Geology (drilling)					
	IADC	GOST 20692-2003				Kg/cm ²	MPa	1000psi								
Filled-up ground. Sand. Vegetable layer. Peat with no admixture. Loose cinder.	112 122 132 142 412 422 432 442	M OM3	0,2	I	I	less than 50	less than 7	less than 1	1	I	I					
Fine sandy gravel (up to 15 cm). Ice. Dry and dense loess. Sand and vegetable layer with rubble and rock debris. Dense vegetable layer. Light loess-like loam. Peat with gravel. Very soft coke coal. Black soil.			0,3	II						0,4	III	0,5	2	II	II	
Light and sandy ground. Medium plastic clay, moraine, coarse gravel. Very soft marl. Rock fill and monton. Sand with coarse rock debris. Heavy loam. Peat with roots. Soft coal. Rock debris up to 50mm.			0,6	IV						0,7	0,8	0,9	3	III	III	
Heavy, dry and boulder moraine clay. Clay interbedded with sandstone and marl. Silty rock debris and sand. Packed sand and clay ground. Earthy gypsum. Soft marl. Weakly cemented coquina. Construction waste. Medium coal (Donetsk type).			1,0	V	1,2	1,5	2,0	4	IV	III						
Coaly argillite. Weakly cemented rubble and gravel. Porous gypsum. Shaly clay. Wet sand and shingle interbedded with clay and marl. Destructed schist. Medium coal (Kuznetsk type).			2,0	VI	2,0	2,0	2,0	5	V	IV						
Anthracite. Coaly-clay argillite. Crystallized gypsum. Rock debris and detritus ground. Porous limestone			2,0	VII	2,0	2,0	2,0	6	VI	V						
Compact shingle. Soft dolomite. Stone soil. Chalk. Marl. Frozen ground. Opoka. Loose sandstone. Iron ore. Serpentinite. Clay slate. Rock salt. Compact alkaline soil. Hard coal.			212 222 232 242 412 422 432 442	C M3	3,0	VIII	V	200-450	21-28	3-4	6	V	V			
Hard anthracite. Clay siltstone. Barite. Fine grained gypsum. Porous dolomite. Soft limestone. Rock salt. Compact frozen sand. Iron ore. Tuff.			3,0		IX	4,0						X	4,0	7	VI	VI
Siltstone with siliceous and argillaceous cement. Anhydrite. Apatite ore. Siliceous and argillaceous argillite. Compact bauxite. Soft dolomite. Brown hematite, porous and weathered ironstone. Marly and soft limestone. Hard marl. Sandstone with argillaceous and gypseous cement. Weathered serpentinite. Conglomerate of sedimentary rock with argillaceous cement. Very hard clay shale and mica schist and sericitic schist. Slate. Very hard coal.			312 322 332 342 512 522 532 542		T C3	5,0						XI	VII	350-700	41-48	6-7
Siltstone with siliceous and sericitic cement. Apatite-nepheline ore. Stone and jasperoid bauxite. Soft gneiss. Weathered dunite. Run-of-mine limestone. Conglomerate of sedimentary rock with carbonate cement. Iron ore. Striate magnetite and weathered massive magnetite. Coarse grained mineralized marble. Sandstone with clay-argillaceous porous carbonate cement. Serpentinite. Siderite. Silicified, micaceous, hard, coaly and sandstone shale. Phosphorite with phosphoric acid and carbonate cement.			5,0	XI		6,0	XII	6,0	8	VII	VII					
Laminated siltstone with siliceous cement. Solid brown hematite. Dolomite. Compact and dolomitic limestone. Coarse grained granite, granodiorite, gabbro, dunite, pegmatite. Basaltic lava. Massive magnetite. Medium grained mineralized marble. Sandstone with mixed clay carbonate cement. Mica-quartz shale. Weathered porphyrite. Chalcopyrite ore. Kimberlite.	312 322 332 342 612 622 632 642	T T3 TK3	7,0	XII		VIII	550-950	62-76	9-11	8	VII	VII				
Gneiss, granite-gneiss, weathered diabase, conglomerates with limestone gravel. Basaltic-andesite lava. Medium-hard martite and hematite-martite ore. Massive siltstone with siliceous cement. Metamorphic granite rock. Silicified sandstone with calcareous cement. Medium grained anisomeric porphyreous granite, granodiorite, gabbro, peridotite, pyroxenite, pegmatite. Acid tuff. Magnesite.	8,0		XIII	9,0	XIV						9,0	9	VIII	VIII		
Amphibole. Fine, normal and medium grained gabbro. Massive limestone. Conglomerated with igneous rock pebble with mixed cement. Porous acid and medium lava. Fine grained granite, granite diorite. Gabbro. Oxidated ferruginous quartzite. Massive sandstone with siliceous cement. Alkaline dike rock. Silicified magnesite.	612 622 632 642 712 722 732 742		T3 TK3 K	11	XV						IX	750-1350	103-117	15-17	9	IX
Granite – porphyry. Fine grained sandstone. Siliceous limestone. Hard magnetite and hematite-magnetite ore. Fine grained granite, Onezhsky type. Ferruginous quartzite. Sandstone with siliceous cement. Medium size grained diorite. Compact garnet skarn.	13	XVI		14	XVI	14	10	VIII	VIII							
Olivinic basalt and andesite. Medium and fine grained granite. Dacite and dacite porphyrite. Diabase. Massive diorite. Magnetite ferruginous quartzite, very compact. Quartz porphyry. Martite ore. Micro granite and micro diorite. Quartzitic sandstone. Silicified shale. Very fine grained skarn. Quartz, biotite, pyroxene gneiss. Soft pegmatite.	612 622 632 642 712 722 732 742 812 822 832 842	T3 TK3 K OK		15	XVII	X	1100-1700	166-186	24-27	10						X
Jasperite. Fine grained gabbro-diorite. Solid diabase and basalt. Martite ferruginous quartzite. Fine grained solid quartzite. Solid quartzite. Emery chlorite ore. Metabasalt of basalt group. Massive porphyrite. Chert and jasperoid shale.	17		XVIII	18	XVIII						18	11	IX	IX		
Basalt, diabase and very dense porphyrite. Solid jasperite, quartzite and jasper. Corundum ore. Nephrite. Massive pyretic hornfels. Titanium magnetite ore. Jasper. Micro quartzite.	19		XIX	20	XIX						20	12	XI	XI		
	21	XX	22	XX	22	12	XI	XI								
	23		24		24											
	25		26		26											
	27		28		28											
	29		29		29											
	30		30		30											