Cangzhou Lockheed Drilling Equipment Parts Co., Ltd.

沧州洛克希德钻采设备配件有限公司

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Company Introduction

Established in 1998, Cangzhou Lockheed Drilling Equipment Parts Co., Ltd. is a professional technology-oriented enterprise specialized in the production drilling equipments and tools,which is one of the leading corporations of drilling tools and workover fishing tool manufacturing industry. Including three series with full model types,as follows:

Drilling Bit series: rock roller bit,tricone bit,pdc drill bit,single bit,cone bit and hole opener;

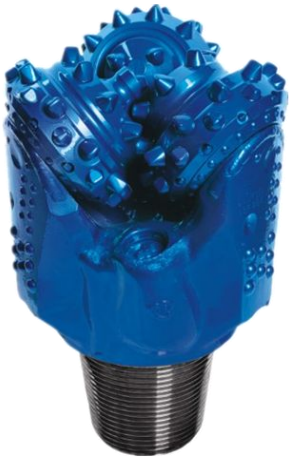
Drilling Equipment Parts series: manual tong,elevator,slips,stabilizer；

Workover Fishing Tool series: releasing spear,junk basket, overshot,reversing sub,die collar, fishing tap etc.

Cangzhou Lockheed Drilling Equipment Parts Co., is located at the center of Beijing-Tianjin-Hebei-Shandong-Henan-Region which is adjacent to National Expressway No.106, 166km away from Beijing, 110km away from Tianjin and 35km away from Baiyangdian, the Pearl of Huabei Area. More convenient transport,faster delivery,and more trustful enterprise is your best choice.Come on,join us.

Our goal:Strive for Perfection and Win by Quality.

SUPER-MD Ultra-high speed motor bit



In consideration of this high speed drilling condition, we specially developed the SUPER-MD ultra-high speed motor bit that is designed with roller-journal composite bearing and metal face seal. The bit is also equipped with advanced cutting structure and special hydraulic system with double extended nozzles that are suitable for high RPM drilling operations. This new Super-MD bit features high bearing reliability and long working life under high speed drilling conditions. SUPER-MD Ultra-high speed motor bit has structure features of metal face sealed, special cone shell protection, enhanced head O.D. Protection and enhanced gage protection, so that the bit is suitable for drilling at ultra-high RPM drilling applications.

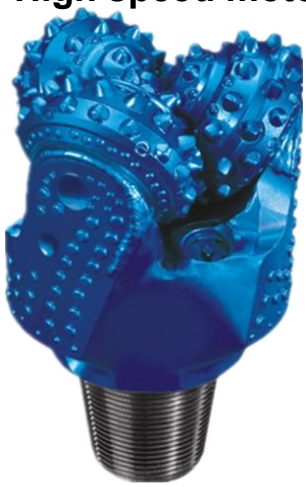
-It is recommended that SMD bits should be run within the range of 250 to 600 RPM in order to get better and economic drilling result.

-The size range of SMD series bit is 8 3/4-11 5/8 inch and its IADC code is 417-617.

Bit size		IADC code
Inch	mm	
8 3/8	212.7	SMD417、SMD437、SMD447、SMD517、SMD537、SMD617
8 1/2	215.9	SMD417、SMD437、SMD447、SMD517、SMD537、SMD617
8 3/4	222.3	SMD417、SMD437、SMD447、SMD517、SMD537、SMD617
10 5/8	269.9	SMD417、SMD437、SMD447、SMD517、SMD537、SMD617

11 5/8	295.3	SMD417、SMD437、SMD447、SMD517、SMD537、SMD617

MD High speed motor bit



Working condition of the bit in directional and horizontal drilling applications is quite different than in vertical well drilling. Our MD series motor bit has structure features of metal face sealed, special cone shell protection, enhanced head O.D. Protection and enhanced gage protection, so that MD bit is suitable for drilling in directional and horizontal well drilling applications.

-MD series motor bit features high RPM, better gage protection and stability, higher reliability, excellent hydraulic effect and longer working life, etc.

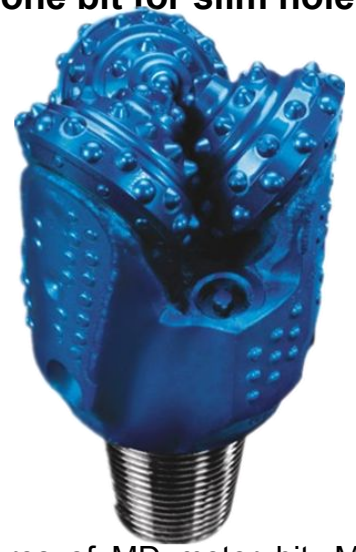
-MD bit is suitable for drilling at 300~90 RPM and is the ideal choice for directional, horizontal and horizontal multilateral well drilling applications.

-The size range of MD series bit is 7 7/8-12 1/4 inch and its IADC code is 437-647.

Bit size		IADC code
Inch	mm	
7 7/8	200.0	MD437、MD447、MD517、MD527、MD537、MD617、MD637、MD647
8 3/8	212.7	MD437、MD447、MD517、MD527、MD537、MD617、MD637、MD647
8 1/2	215.9	MD437、MD447、MD517、MD527、MD537、MD617、MD637、MD647
8 3/4	222.3	MD437、MD447、MD517、MD527、MD537、MD617、MD637、MD647
9 1/2	241.3	MD437、MD447、MD517、MD527、MD537、MD617、MD637、MD647
9 7/8	250.8	MD437、MD447、MD517、MD527、MD537、MD617、MD637、

		MD647
12 1/4	311.2	MD437、MD447、MD517、MD527、MD537、MD617

MINI-MD roller cone bit for slim hole drilling applications



In addition to the features of MD motor bit, Mini MD slim hole bit is also designed with special bearing & seal structure and lubrication system. Mini MD bit's cutter material and cutting structure are reasonably matches with rock properties of the formation and this eliminated the specific problems such as low drilling efficiency and cutter breakage and loss, etc.

Mini MD slim hole bit has structure feature of meatal face sealed and enhanced head O.D. protection, so that the bit is suitable for drilling slim hole and ultra-deep well drilling applications.

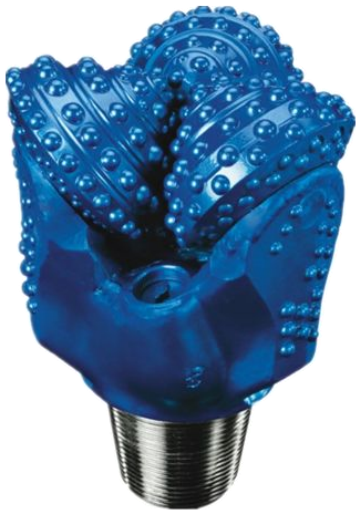
-Mini MD slim hole bit is the ideal choice for drilling slim hole sections in deep and ultra-deep well drilling applications.

-The size range of Mini MD series bit is 5 3/4-51/2 inch and its IADC code is 437-647.

Bit size		IADC code
Inch	mm	
5 3/4	146.1	MD437、MD517、MD537、MD547、MD617、MD637
5 7/8	149.2	MD437、MD517、MD537、MD547、MD617、MD637、MD647
6	152.4	MD437、MD517、MD537、MD547、MD617、MD637、MD647
6 1/8	155.6	MD437、MD517、MD537、MD547、MD617、MD637、MD647
6 1/4	158.8	MD437、MD517、MD537、MD547、MD617、MD637、MD647

6 1/2	165.1	MD437、MD517、MD537、MD547、MD617、MD637、MD647

HF series bit for hard formation drilling



Failure types, such as tooth break, tooth wear, cone tip wear and bit diameter shrink etc., usually appear when conventional cone bits drill in hard formations. So we have developed HF series bit for hard formations. HF series bit has structure features of metal face sealed and enhanced head O.D., so that the bit is suitable for drilling in hard formations.

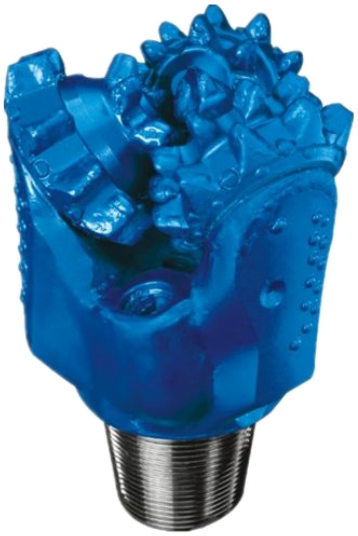
-HF series bit has the advantages of long service life, high reliability, fast ROP and strong gage protection ability etc.

-HF series bit is the ideal choice for drilling in hard formations ans high abrasive formations effectively and safely.

-The size range of HF series bit is 7 7/8-12 1/4 inch and its IADC code is 537-737.

Bit size		IADC code
Inch	mm	
7 7/8	200.0	537、547、617、627、637、647、737
8 1/2	215.9	537、547、617、627、637、647、737
8 3/4	222.3	537、547、617、627、637、647、737
9 1/2	241.3	537、547、617、627
9 7/8	250.8	537、547、617、627
12 1/4	311.2	537、547、617、627、637

SWT steel tooth bit with high efficiency

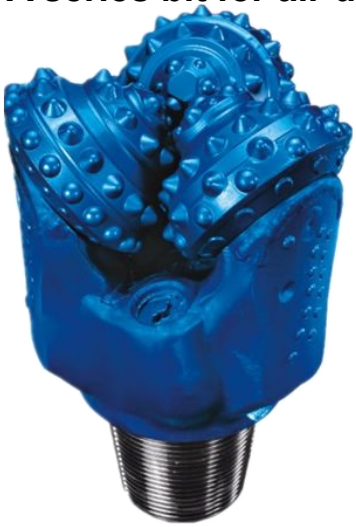


SWT series steel tooth bit with high efficiency has strong wear resistant teeth and fast ROP, bit can work more stably, which is more suitable for drilling in soft or middle soft formations.

-The size range of SWT series bit is 8 1/2- 17 1/2 inch and its IADC code is 117-127 (or 115-125)

Bit size		IADC code
Inch	mm	
8 1/2	215.9	SWT117、SWT127
8 3/4	222.3	SWT117、SWT127
9 1/2	241.3	SWT117、SWT127
12 1/4	311.2	SWT117、SWT127
13 1/2	342.9	SWT115、SWT125
13 3/4	349.3	SWT115、SWT125
15 1/2	393.7	SWT115、SWT125
16	406.4	SWT115、SWT125
17 1/2	444.5	SWT115、SWT125

A series bit for air drilling



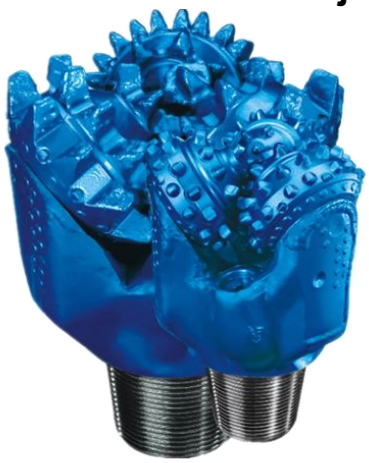
In hard formation with less water content, formation with serious leakage or with low pressure, in order to achieve higher drilling speed, air drilling process is usually adopted. Problems such as short service life, low ROP, weak gage protection ability etc. Appear frequently for conventional cone bit in air drilling conditions.

Aim at air drilling condition, we have developed A series bit for air drilling which has structure features of center jet hole and enhanced head O.D.. The bit with these features is suitable for drilling at air drilling application to increase observably ROP and life of the bit.

-The size range of A series bit is 5 7/8-12 3/8 inch and its IADC code is 537-627.

Bit size		IADC code
Inch	mm	
5 7/8	149.2	537、547、617、627
6	152.4	537、547、617、627
6 1/8	155.6	537、547、617、627
7 7/8	200.0	537、547、617、627
8 1/2	215.9	537、547、617、627
8 3/4	222.3	537、547、617、627
9 1/2	241.3	537、547、617、627
9 7/8	250.8	537、547、617、627
12 1/4	311.2	537、547、617、627
12 3/8	314.3	537、547、617、627

HJ/HJT metal sealed bit with journal bearing



HJ/HJT series bit adopts metal seal with journal bearing, which can drill stably with higher rotary speed.

-The size range of HJ/HJT series bit is 7 1/2-18 7/8 inch and its IADC code is 437-547

Main structure features:

-Metal face seal journal bearing. New processes of head bearing hardfacing and cone bearing silver plating are used to improve the load capacity, anti-galling ability and stability of the bearing.

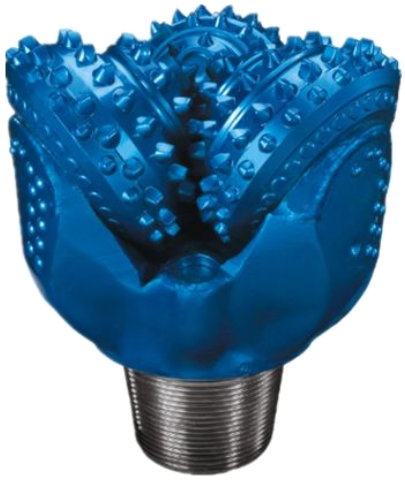
-Various shapes of inserts can be equipped on this series of bits, including scoop inserts, wedge inserts, conical-spherical insert and double spherical inserts, etc. Drilling process & formation and bit are efficient integrated by scientific insert shape selection to realize safety and high efficient drilling.

-A row of inserts is added between gage row and heel row of HJ bit to trim borehole wall and protect cone shell, and as a result, HJT series bit is formed.

Bit size		IADC code
Inch	mm	
7 7/8	200.0	437G、447G、517G、537G
8 1/2	215.9	417G、437G、447G、517G、527G、537G、547G
8 3/4	222.3	437G、447G、517G
9 1/2	241.3	437G、447G、517G、537G、547G
9 7/8	250.8	437G、517G
10 1/2	266.7	517G、537GK、547GK
10 5/8	269.9	517G
12	304.8	517G、537GK、547GK

12 1/4	311.2	417G、437G、447G、517G、537G
13 1/2	342.9	517G、537GK、547GK
14 3/4	374.7	517G、537GK、547GK
17 1/2	444.5	517G、527G
18 7/8	479.4	517G、537G

GJ/GJT metal sealed bit with roller bearing



J/GJT series bit adopts metal seal with roller bearing, which can drill stably with middle to low WOB and middle to high RPM, it's the ideal choice for higher part of well section.

-The size range of GJ/GJT series bit is 12 1/4-17 1/2 inch and its IADC code is 114-545.

Main structure features:

-Sizes of bearing journal and rollers are made larger by arranging the rollers in recesses in cone body.

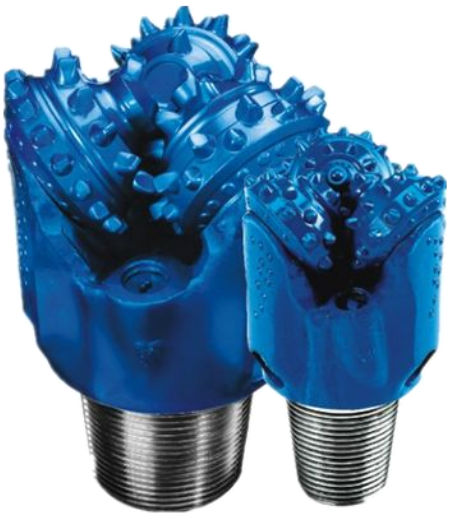
-All rubber compensator is used which can limit pressure differential and prevent drilling fluid from entering the lubrication system and this provides the bearing system with good assurance of lubrication.

-Shirttail and head OD are hardfaced for enhanced gage protection. Center nozzle is equipped for bits of larger sizes.

-A row of inserts is added between gage row and heel row to trim borehole wall and protect cone shell to form the special GJT series bit.

Bit size		IADC code
Inch	mm	
12 1/4	311.2	115C、115C、125C、135G、415G、435G、445G
16	406.4	435G、515C、515G、515GC、535G、535G
17 1/2	444.5	115C、GJ135G、GJT415G、GJ435G、GJT445G、GJ515G、GJT525G、GJ535G

HA/HAT rubber sealed bit with journal bearing



HA/HAT series bit adopts rubber seal with journal bearing,which can sustain higher WOB under normal rotary speed and is suitable for drilling in formations from very soft to middle hard properly selecting different cutting structure.

-The size range of HA/HAT series bit is 3 3/4-12 1/4 inch and its IADC code is 116-547.

Main structure features:

-Journal bearing.Hardfaced head bearing surface. Inner hole of cone is sliver-plated. The load capacity and seizure resistance of the bearing is greatly improved.

-O ring seal is made of the more wear resistance high saturated buna-N with the increased seal section and precisely designed sealing flange in the cone sealing area increased the reliability of the seal.

-All rubber compensator is used which can limit pressure differential and prevent drilling fluid from entering the lubrication system and this provides the bearing system with good assurance of lubrication.

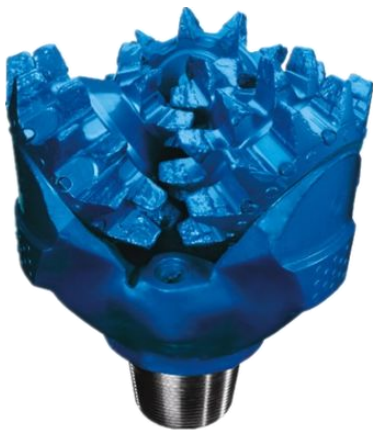
-High wear resistance and excellent cutting ability of the insert bit are given full play by using carbide combination with optimized compact numbers and rows,the exposure height and special shaped compacts.For steel tooth bit,the tooth surface is hardfaced with new type of wear resistant material and thus extended working life of the cutting structure while still maintaining high ROP.

-A row of inserts is added between gage row and heel row of HA bit to trim

borehole wall and protect cone shell and consequently,the special HAT series bit is formed.

Bit size		IADC code
Inch	mm	
3 3/4	95.3	137G、217G、517G、527G、537G
3 7/8	98.4	137G、217G、517G、527G、537G
4	101.6	137G、217G、517G、527G、537G
4 1/8	104.8	137G、217G、517G、527G、537G
4 1/2	114.3	137G、217G、517G、527G、537G
4 5/8	117.5	137G、217G、517G、527G、537G
4 3/4	120.7	137G、217G、517G、527G、537G
4 7/8	123.8	137G、217G、517G、527G、537G
5 1/2	139.7	137G、217G、517G、527G、537G
5 5/8	142.9	117G、127G、137G、217G
5 7/8	149.2	117G、127G、137G、217G
6	152.4	117G、127G、137G、217G
6 1/8	155.6	117G、127G、137G、217G
6 1/2	165.1	117G、127G、137G、217G
8 3/8	212.7	117G、127G、137G、217G

GA/GAT rubber sealed bit with roller bearing



GA/GAT series bit adopts rubber seal with roller bearing, which is the ideal and economical tool for drilling applications where middle to low WOB and high RPM are required.

-The size range of GA/GAT series bit is 12 1/4-17 1/2 inch and its IADC code is 114-545.

Main structure features:

-Sealed roller bearing structure. With rollers arranged in grooves recessed in the cone body, the size of the bearing journal is increased, therefore, with the

ability of enduring high WOB and applying for high RPM.
-Thrust bearing surfaces are hardfaced and treated with friction reducing technology.
-All rubber compensator is used which can limit pressure differential and prevent drilling fluid from entering the lubrication system and this provides the bearing system with good assurance of lubrication.

Bit size		IADC code
Inch	mm	
12 1/4	311.2	114G、T115、124、135G、215G、415G、425、435G、535G、545G
13 1/2	342.9	114G、115G、135、415G、535G
13 3/4	349.3	114、115G、115G、125G、415G、435G、515G、515G
14 3/4	374.7	114G、115G、115、124、125G、435GC、515G、535G、545C
16	406.4	114、115、115、134G、415GC、435G、515G、535G
17 1/2	444.5	114G、115G、115G、125G、135G、215G、415G、435G、445G、515G、525G、535G、545GY

YC Series single cone bit

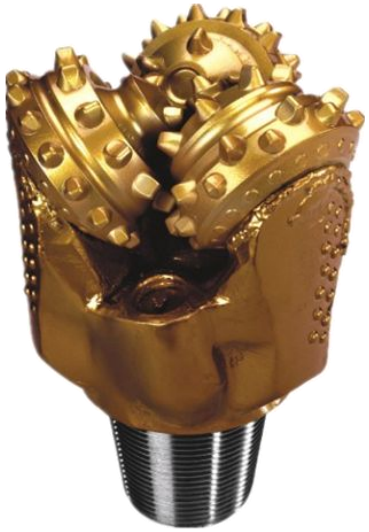
This size range of YC series bit is 3 1/2-6 1/2 inch and its IADC code is 437-637

Main structure features:
-With particular structure of the cone,equal worn of the compacts in permanent contact area and alternative contact area of the bit is realized.
-Wear resistance of the cutting structure is enhanced by setting PDC cutters in the permanent contact area of the cone where compacts are most severely worn.
-Optimized hydraulics structure improved the cleaning ability of hydraulic system on cone and bottom hole,and assure higher ROP.

-The bit has excellent gage protection and up reaming abilities by setting active cutting conical spherical gage compacts on head body.

Bit size		IADC code
Inch	mm	
3 3/4	95.3	537、617
4 1/8	104.8	517、527、537、617
4 1/2	114.3	517、527、537
4 5/8	117.5	427、437、517、527、537
4 3/4	120.7	437、517、537
5 1/2	139.7	517、537、617、637
5 7/8	149.2	517、537、617、637
6	152.4	517、537、617、637
6 1/8	155.6	517、537、617、637
6 1/2	165.1	517、537、617、637

SKF rubber sealed bit with floating bearing



SKF series bit is a king of high efficiency bit for vertical and directional drilling applications, especially suitable for these kinds of drilling applications in relatively homogenous formation with good drillability.

This bit is designed with floating bearing and rubber ‘O’ ring seal, and also utilizes optimized cutting structure and enhanced gage protection technology and therefore, it can achieve longer footage and higher ROP.

-The size range of SKF series bit is 8 1/2-12 1/4 inch and its IADC code is 117-537.

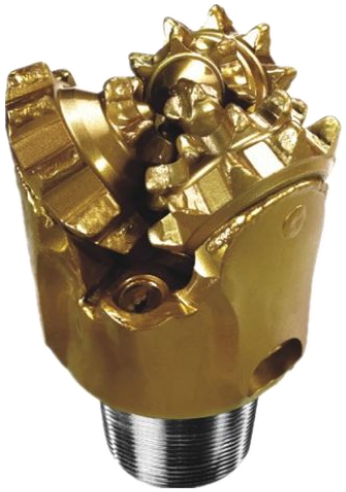
Main structure features:

-This series bit adopt the bearing and seal system with the feature of low

relative linear velocity of bearing couple and low temperature of friction surface. Applying of new type of synthetic grease enhance the ability of resisting high temperature, wear and extreme pressure of bearing, which can get longer service lift and higher reliability in vertical well and directional well.
-Optimize cutting structure of insert bits, choose offset crested scoop compacts with strong attacking ability as main cutting compacts, so as to make the bit with the feature of longer footage and higher ROP.
-Properly arrange compacts on Head OD to enhance the security of bit in directional well. As well as improve the drilling operation in reducing well section or under the situation of up-reaming.

Bit size		IADC code
Inch	mm	
8 1/2	215.9	117G、127G、137G、437G、447G、517G、537G
9 1/2	241.3	117G、127G、137G、437G、447G、517G、537G
12 1/4	311.2	117G、127G、137G、437G、447G、517G、537G

SKH rubber sealed bit with journal bearing



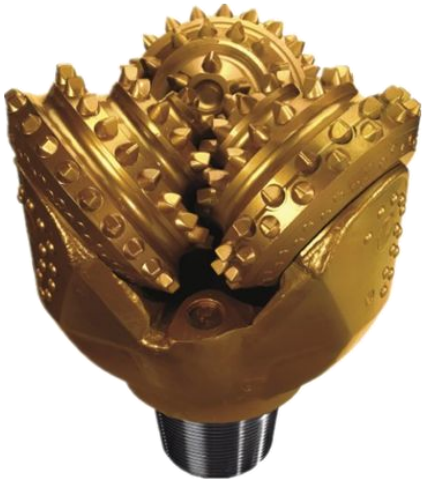
SKH series bit adopts journal bearing rubber O-ring seal along with more aggressive cutting structure.This bit is with the features of longer footage and higher ROP and is the ideal choice for drilling applications in upper homogenous formations.
The size range of SKH series bit is 8 1/2-17 1/2 inch and its IADC code is 116-537.
Main structure features:
-Hardfaced head bearing surface,Inner hole of cone is silver-plated.
The load capacity and seizure resistance of the bearing is greatly improved.
-'O' ring seal is made of the more wear resistance high saturated buna-N with

the increased seal section and precisely designed sealing flange in the cone sealing area increased the reliability of the seal.

-High wear resistance and excellent cutting ability of the insert bit are given full play by using carbide compacts number and rows,the exposure height and special shaped compacts.For steel tooth bit,the tooth surface is hardfaced with new type of wear resistant material and thus extended working life of the cutting structure while still maintaining high ROP.

Bit size		IADC code
Inch	mm	
8 1/2	215.9	116、126、136、216G、、137、217G、 437G、447G、517G、537G、547G
8 3/4	222.2	116、126、136、216G、、137、217G、 437G、447G、517G、537G、547G
9 1/2	241.3	116、126、136、216G、、137、217G、 437G、447G、517G、537G、547G
9 5/8	244.5	116、126、136、216G、、137、217G、 437G、447G、517G、537G、547G
9 7/8	250.8	116、126、136、216G、437G、517G、537G
10 5/8	269.9	437G、517G、537G
11 5/8	295.3	116、117、127、137、217G、227G、237G、317G、 417G、437G、517G、537G、547G、617G、627G、637G
12 1/4	311.2	116、126、136、216、437G、517G、537G
13 5/8	346.1	117、127、437G、517G、537G
14 3/4	374.7	117、127、437G、517G、537G
15 1/2	393.7	117、127、437G、517G、537G
16	406.5	117、127、437G、517G、537G
17 1/2	444.5	117、127、437G、517G、537G

SKG rubber sealed bit with roller bearing



SKG series bit is designed with roller bearing and rubber O-ring seal.This bit can achieve longer footage and higher ROP when drilling under medium to low WOB and high RPM.

The size range of SKG series bit is 10 5/8-26 inch and its IADC code is 114-535.

Main structure features:

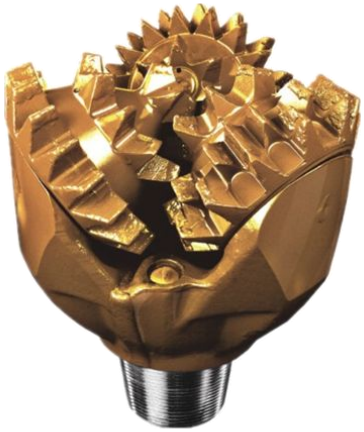
-Roller bearing structure.With rollers arranged in grooves recessed in the cone body,the size of the bearing journal is increased,therefore,with the ability of enduring high WOB and applying for high RPM.

-All rubber compensator is used which can limit pressure differential and prevent drilling fluid from entering the lubrication system and this provides the bearing system with good assurance of lubrication.

Bit size		IADC code
Inch	mm	
10 5/8	269.9	SKG124、SKG135、SKG425G、SKG535G、SKG545G
11 5/8	295.3	SKG114、SKG115、SKG125、SKG135、SKG124、SKG134、SKG214、SKG215、SKG225
12 1/4	311.2	SKG114、SKG115、SKG124、SKG134、SKG214、SKG225、SKG415G、SKG435G、SKG515G、SKG545G
13 5/8	346.1	SKG114、SKG124、SKG125、SKG134、SKG214
13 3/4	349.3	SKG115、SKG124、SKG435
14 3/4	374.7	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G
15 1/2	393.7	SKG115、SKG124、SKG134、SKG135、SKG215
16	406.4	SKG114、SKG124、SKG134、SKG435G、SKG515G、SKG535G
17 1/2	444.5	SKG114、SKG115、SKG125、SKG135、SKG124、SKG134、

		SKG214、SKG215、SKG225、SKG435G、SKG515G、SKG535G
18 7/8	479.4	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G
20	508.0	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G
22	558.8	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G
24	609.6	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G
26	660.4	SKG114、SKG124、SKG134、SKG435、SKG515G、SKG535G

SKW Non-sealed Bits



SKW series bit non-sealed roller bearing bit.This bits is suitable for surface hole drilling for every kind of well and upper sections with good drillability. It's advantages including low cost and high ROP,etc.

The size range of SKW series bit is 14 3/4 -26 inch and its IADC code is 111-241.

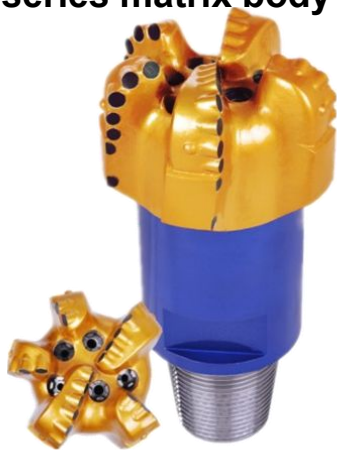
Main structure feature:

The drilling fluid can flow into bearing cavity directly to cool due to no seal.

For the bit,bearing structure of roll-ball-thrust is utilized.

Bit size		IADC code
Inch	mm	
14 3/4	374.7	SKW111、SKW121、SKW131、SKW211、SKW241
15	381.0	SKW121、
15 1/2	393.7	SKW111、SKW121、SKW131、SKW211、SKW241
16	406.4	SKW111、SKW121、SKW131、SKW211、SKW241
17 1/2	444.5	SKW111、SKW121、SKW131、SKW211、SKW241
20	508.0	SKW111、SKW121、SKW131、SKW211、SKW241
22	558.8	SKW111、SKW121、SKW131、SKW211、SKW241
24	609.6	SKW111、SKW121、SKW131、SKW211、SKW241
26	660.4	SKW111、SKW121、SKW131、SKW211、SKW241

KM series matrix body PDC bit



Characteristics of KM series bits:

-PDC cutters of different features are selected and bit profile design is optimized to suit different drilling applications in different formations to satisfy different requirements when drilling soft to medium hard formations.

-Cutting structure is force balanced, non-symmetrical blade and wide gage are designed so that the bit drills more stable and resulting longer working life of the bit.

-Better wear resistance and higher strength of the bit are guaranteed in regard to material and structure by using matrix body material with self-owned intellectual property rights and combining FEA analysis technology.

-Hydraulic system of the bit is optimized using dynamic flow pattern simulation technology to enhance cleaning and colling effects of the bit to effectively prevent bit from balling.

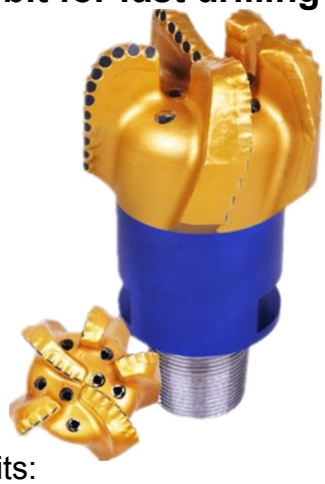
-CNC sintering process uses full automatic control/ Inside and outside temperature of the bit is monitored during all procedures to fully embody material properties as well as ensure uniformity and stability of product quality.

No.	Formation	IADC code	Lithology	Appropriate PDC bit type
1	Very soft	M123	Clay Mudstone Marlite	1944R、KM1952R
2	Soft	M223	Marlite Saline rock Shale	1952R、1952GR、1952AR、1952ARG、 1652AR、1652R、1652AGR
3	Medium	M323	Shale	1652DR、1662、1662GR、1953DGR

	Soft	M324	Sandstone Chalk	
4	Medium	M423 M433	Sandstone Limestone Shale	1665GR、1665ADR、1362、1365D、1375D

KS series

Steel body PDC bit for fast drilling applications



Characteristics of KS series bits:

-PDC cutters different features are selected and bit profile design is optimized to suit different drilling applications in different formations to satisfy different requirements when drilling soft to medium hard formations without sulfureted hydrogen well section.

-Cutting structure is force balanced,non-symmetrical blade and deep junk slots are designed to dramatically improve ROP of the bit.

Matrix material of the bit adopts high quality steel and wear-resistance material with high performance is build-up welded on the surface of blades to prevent material from eroding.

-Hydraulic system of the bit is optimized using dynamic flow pattern simulation technology to enhance cleaning and cooling effects of the bit to effectively prevent bit from balling.

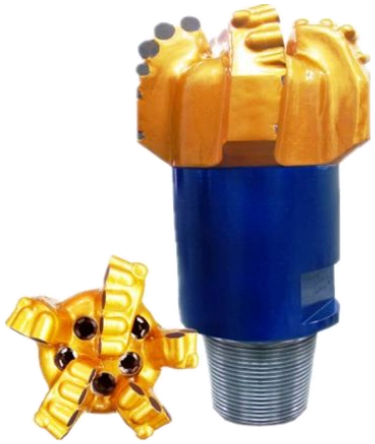
-Machining precision and retention of cutters are ensured by using milling center with high performance five axes and high speed milling technology.

No.	Formation	IADC number	Lithology	Appropriate PDC bit type
1	Very soft	S123	Clay Mudstone Marlite	1944S、1952
2	soft	S223 S233	Marlite Saline	1942D、152GS、1952AGS、 1952A、1652、1362GR

			rock Shale	
3	Medium soft	S323 S324 S334	Shale Sandstone Chalk	1952GRS、1952AGRS、1963AGS、1652S、1653S、1363AGRS、1362GR、1652DGS

KMD/KSD series

matrix/steel body PDC bits suitable for directional drilling



Characteristics of KMD/KSD series bits:

-Shallow cone and short gage design make the bit having better stability to satisfy any demand of directional drilling applications.

-Optimized profile design and denser cutter layout at shoulder area can guarantee higher side cutting ability of the bit.

-Inclined gage design to increase the bit's stability and gage protection in directional drilling applications.

-Enhanced gage design to improve the bit's ability of gage protection.

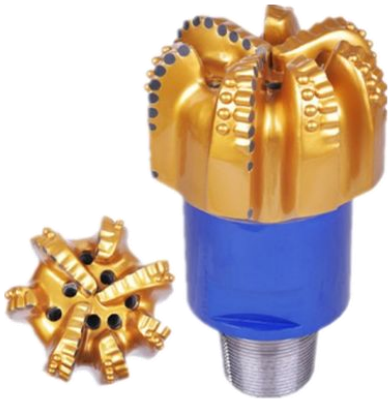
-Optimized hydraulic design for increased cooling and cleaning effects of the bit in horizontal and directional sections and therefore, to prevent bit balling and improve ROP to the bit.

No.	Formation	IADC code	Lithology	Suitable PDC bit type
1	Very soft formation	M(S)123	clay mud stone marlite	1944GR
2	Soft formation	M(S)223 M(S)224	marlite salt rock shale	1952GR、1953GR、1652GR
3	Medium soft formation	M(S)323 M(S)324	shale sandstone	1953GR、1653GR、1662GR

			shale	
4	Medium formation	M(S)424 M(S)433	sandstone limestone shale	1663GR、1365GR、D1375GR

High end matrix body PDC bit

suitable for medium and medium hard formations



Characteristics of KMH series bit:

-Specific to characteristics of hard formation and interbeded formation,bit profile is optimized and cutting depth of the bit is controlled to satisfy requirements of drilling medium to medium hard formations.

-Overall performance of PDC cutters is improved by using high performance PDC cutters of better wear resistance,better impact strength and better thermal stability.

-Unique cutter layout and specific force balance analysis plus other related technologies,etc.improved the bit's working life and premature ring type wear of the bit is prevented.

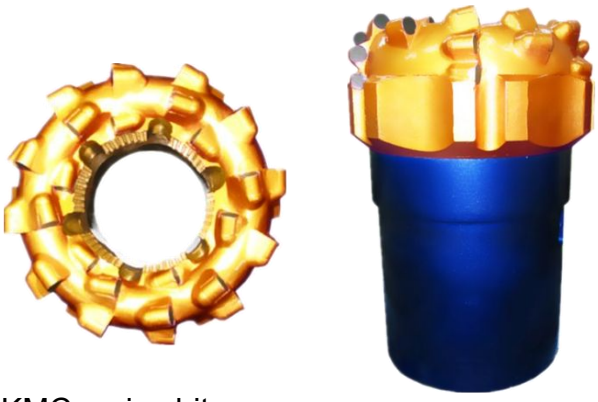
-Optimized hydraulic design can improve the bit's cooling effect and therefore,prevent PDC cutter failure caused by high temperature.

-Bit diameter shrinkage is effectively prevented by enhanced gage protection design.

No.	Formation	IADC code	Lithology	Suitable PDC bit type
1	Medium Hard formation	M423 M424 M433	Shale Sandstone Limestone Anhydrite	1363AR、1363ADR、1385 1663ADR、1653ADR、1673ADR 1375AR、1063、1073、1083

			dolomite	

KMC series high performance PDC core bits



Characteristics of KMC series bit:

-Arc type crown design and blade type cutter layout result in high ROP, high core recovery reate and long working life of bit, etc.

-Use both PDC cutters and diamonds for gage protection for extended bit life.

-Dynamic flow simulation technology is employed to optimize hydraulic design of the bit and enhance the bit's cleaning and cooling abilities.

-Inner and outer diamond gage protection. The water course is located at inner gage protection and consequently, cutting elements can receive sufficient cooling and cleaning.

-Force-balance technology is used to improve stability of the bit and prevent the bit from balling up.

IADE CODE REFERENCE

1	**1**	**1**	**A**
1st digit	2nd digit	3rd digit	letter

4 character code, first 3 characters are numbers, the last is a letter

1st number is the series. 1 to 3 represent a milled tooth tri cones, 4 – 8 represent TCI tri cones. The higher the series number the harder more abrasive the rock formation is.

2nd number is the relative degree of hardness within a series. The number ranges from 1 – 4, the higher the number the harder the formation

3rd number represents bearing design and gauge protection

1)Open bearing

2)Roller bearing air cooled

3)Open bearing gauge protected

4)Sealed roller bearing

5)Sealed roller bearing gauge protected

6)Sealed friction bearing

7)Sealed friction bearing gauge protected

4th character is a letter and describes optional features.

There are 16 alphabetic character's, each representing the Tricones most significant Feature:

A - Air Application
B - Special Bearing Seal
C - Center Jet
D - Deviation control
E - Extended Jets
G - Extra gauge protection
H - horizontal Application
J - Jet Deflection
L - Lug Pads
M - Motor Application
R - Reinforced Welds
S - Standard Tooth Bit
T - Two Cone Bits
W - Enhanced Cutting Structure
X - Chisel Insert
Y - Conical Insert
Z - Other Insert Shape