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Tools to reach sources of energy underground.  
 Tools to reach water underground.  
 Tools to install pipelines underground.  
 Tools to drill foundation hole for constructions.  
 Who we are:  
 We are one of people who makes above things easier.  
 Let's work together and enjoy this job.

石油、天然气、地热能源、地质勘查、地下水开采  
 地下管网建设  
 建筑桥梁基桩  
 我们的目标是让以上工作变得更容易.....

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# 资质证书 Certificates

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API Spec 7-1-1242



ISO9001:2015



ISO9001:2015



Business Licence



**牙轮钻头**  
**Section of Tricone Bits**

# 牙轮钻头选型指南

## Guidance of Choosing Tricone Bit

# IADC 说明

## IADC Specification

牙轮钻头 ROLLER CONE BITS(IADC)	牙轮钻头机械钻速 m/h ROLLER CONE ( m/h)		地层硬度 FORMATION HARDNESS	地层 FORMATION	岩石类型 ROCK TYPE	抗压强度 COMPRESSIVE STRENGTH
	水基 WBM	油基 OBM				
111/124	15-30	18-33	很软 Very soft	抗压强度低的粘性软地层 Soft formation with sticky layers and low compressive strength.	粘土 粉砂岩 砂岩 Clay Silts Sands	<25MPa
116/137 437	9-15	12-18	软 Soft	抗压强度低和可钻性高的软地层 Soft formation with low compressive strength and high drillability	粘土岩 泥灰岩 褐煤 砂岩 凝灰岩 Claystone Marl Lignite Sandstone Tuff	25-50MPa
130/137 517/527	4.5-9	6-12	中软 Medium Soft	抗压强度低且带有夹层的软至中等地层 Soft to medium formation with low compressive strength interbed with hard layers	粘土岩 泥灰岩 褐煤 砂岩 粉砂岩 硬石膏 凝灰岩 Claystone Marl Lignite Sandstone Siltstone Anhydrites Tuff	50-75MPa
211/217 517/537	2.5-6	3-6	中等 Medium	抗压强度高, 研磨性薄夹层的中等至硬地层 Medium to hard formation with high compressive strength and small abrasive layers	泥岩 灰岩 硬石膏 砂岩 (钙质) Mudstone Limestone Anhydrites Sandstone (Calcareous)	75-100MPa
211/236 537/617	1.5-2.5	1.5-3	中硬 Medium Hard	抗压强度很高, 非研磨性的硬和致密地层 Hard and dense formation with very high compressive strength but non abrasive	灰岩 硬石膏 白云岩 Limestone Anhydrites Dolomite	100-120MPa
311/347 627/637	1-1.5	1-1.5	硬 Hard	抗压强度很高, 有一些研磨性夹层的硬和致密地层 Hard and dense formation with very high compressive strength and some abrasive layer	頁岩 (钙质) 砂岩 (硅质) 粉砂岩 Shale(Calcareous) Sandstone (Siliceous) Siltstone	100-200MPa
637,737,837	1	1	极硬 Very Hard	极硬和研磨性很强的地层 Extremely hard and abrasive formations	石英岩 火成岩 Quartzite Igneous rocks	>200MPa

### First Digit 第一位数字(a):

1,2 and 3 designate STEEL TOOTH BITS with 1 for soft, 2 for medium and 3 for hard formations.

4,5,6,7 and 8 designate TUNGSTEN CARBIDE INSERT BITS for varying formation hardness with 4 being the softest and 8 the hardest.

1、2、3为钢齿牙轮钻头, 1用于软岩层, 2用于中等硬度岩层, 3用于硬岩层;

4-8为镶齿牙轮钻头, 由4到8地质岩层逐步变硬。

### Second Digit 第二位数字(b):

1,2,3 and 4 are further breakdown of formation with 1 being the softest and 4 the hardest.

1、2、3、4表明钻头深度粉碎能力, 1最软, 4最硬。

### Third Digit 第三位数字(c):

1.Standard open bearing roller bit 标准开放式轴承;

2.Standard open bearing roller bit, air-cooled 标准开放式风冷轴承;

3.Standard open bearing roller bit with gauge protection which is defined as carbide inserts in the heel of the cone 带有保径的标准开放式轴承;

4.Sealed roller bearing bit 密封滚动轴承;

5.Sealed roller bearing bit with gauge protection 带有保径的密封滚动轴承;

6.Sealed journal bearing bit 密封径向轴承;

7.Sealed journal bearing bit with gauge protection 带有保径的密封径向轴承;

### Feature Code 特征代码(d) :

The following letter codes are used in the fourth digit position to indicate additional features:

A. Air Application 空气钻机循环;

E. Extended Jet 加长喷嘴;

R. Reinforced Welds 加强型焊接;

Y. Conical Insert 锥形齿;

C. Center Jet 中心喷嘴;

G. Extra Gage Protection 掌背护径齿;

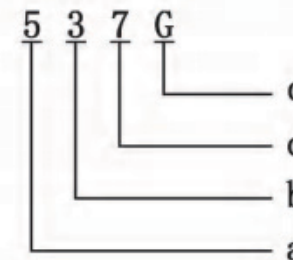
S. Standard Steel Tooth 标准型钢齿;

Z. Other Insert Shape 其他镶嵌形态;

D. Deviation Control 偏差控制;

J. Jet Deflection 喷嘴偏射;

X. Chisel Insert 楔形齿;



钢齿 Steel Tooth    勺形齿 Spoon inserts    楔形齿 Chisel inserts    锥形齿 Conical inserts    球形齿 Spherical inserts

## KJ Series Metal-face Sealed Bearing Tricone Rock Bit

### Cutting Structure

The durability of premium tungsten carbide inserts is improved with new formulas and new techniques for insert bit.

### Gauge Structure

Multiple gauge protection with gauge trimmers on heel and gauge inserts on the gauge surface of the cone, tungsten carbide inserts and hardfacing on the shirrtail increases gauge holding capability and bearing life.

### Bearing Structure

High precision bearing with two thrust faces. Balls lock the cone. Hardface head bearing surface. Cone bearing inlaid with friction-reducing alloy and then silver-plated. Abrasion resistance and seizure resistance of the bearing are improved and suitable for high rotary speed.

### Seal and Lubrication

The advanced metal seal package consists of two metal seats and two elastic energizers. Compressed energizers ensure good contact being kept on two sealing surfaces of metal rings by elastic force, and achieve the bearing seal. In the drilling, metal seal are relatively dynamic, and the energizers are static. This will improve the reliability and durability of bearing seal. The pressure compensator system and advanced grease can greatly increase the lubricating reliability.

### Product Application

It is suitable for downhole motor and high speed applications.

### Recommended Drilling Parameter

IADC	WOB (KN/mm)	RPM (r/min)	Applicable Formations
437/447/435	0.35~0.9	240~70	Very soft formations with low compressive strength and high drillability, such as clay, mudstone, chalk, gypsum, salt, soft limestone, etc.
517/527/515	0.35~1.0	220~60	Soft formations with low compressive strength and high drillability, such as mudstone, gypsum, salt, soft limestone, etc.
537/547/535	0.45~1.0	220~50	Soft to medium formations with low compressive strength, such as medium, soft shale, medium soft limestone, medium soft sandstone, medium formation with harder and abrasive interbeds, etc.
617/615	0.45~1.1	200~50	Medium hard formation with high compress strength, such as hard shale, limestone, sandstone, dolomite, etc.
637/635	0.5~1.1	180~40	Hard formations with high compressive strength, such as sandstone, limestone, dolomite, hard gypsum, marble, etc.

Note: The upper limits of WOB and RPM in above table should not be used simultaneously.

## KJ系列金属密封轴承镶齿三牙轮钻头

### 切削结构

镶齿钻头采用新配方新工艺的优质硬质合金齿，提高切削齿的综合机械性能。

### 保径结构

采用多重保径结构：牙轮外排镶修边齿，轮背、爪背镶硬质合金齿，爪尖及前侧堆焊耐磨合金，提高钻头的保径能力。

### 轴承结构

采用高精度配合的滑动、滚动轴承，钢球锁紧。牙爪轴径焊有耐磨合金，牙轮内孔焊特殊合金并镀银，增强轴承副的耐磨性和抗咬合能力，提高轴承适应高转速的能力。

### 密封润滑

采用先进的金属密封。金属密封结构由两个金属环和两个弹性橡胶功能圈组成，功能圈收到压缩后产生的弹力使两个金属环的密封面贴合在一起，从而实现轴承密封。在钻井进程中，金属密封面相对运动，而功能圈则分别相对牙爪轴径和牙轮密封槽静止，显著提高轴承密封的可靠性和寿命。可限制压差式储油补偿系统提高了轴承润滑的可靠性。采用高性能钻头专用润滑油。

### 产品适用

金属密封钻头密封可靠性高，适合井下动力钻具和高转速转盘钻井。

### 推荐钻头使用参数

IADC	钻压 (KN/mm)	转速 (r/min)	应用地层
437/447/435	0.35~0.9	240~70	低抗压强度高可钻性的极软地层，如粘土、泥岩、白垩、泥岩、石膏、盐岩、软页岩、软石灰岩等。
517/527/515	0.35~1.0	220~60	低抗压强度的软地层，如泥岩、石膏、盐岩、软页岩、软石灰岩等。
537/547/535	0.45~1.0	220~50	低抗压强度的软到中等地层，如中软页岩、中软石灰岩、中软砂岩和有较硬研磨性夹层的中等地层。
617/615	0.45~1.1	200~50	高抗压强度的中硬地层，如硬页岩、石灰岩、砂岩、白云岩等。
637/635	0.5~1.1	180~40	高抗压强度的硬地层，如砂岩、石灰岩、白云岩和硬石膏、大理石等。

注：表中推荐的钻压和转速不可同时使用上限。



## KA Series Elastomer Sealed Bearing Tricone Rock Bit

### Cutting Structure

The durability of premium tungsten carbide insert is improved with new formulas and new techniques for insert bit.

### Gauge Structure

Multiple gauge protection with gauge trimmers on the heel of cone, tungsten carbide inserts and hardfacing on the shirrtail increases gauge holding capability and bearing life.

### Bearing Structure

High precision bearing with two thrust faces. Ball lock the cone. Hardfaced head bearing surface. Cone bearing inlaid with friction-reducing alloy and then silver-plated. Abrasion resistance and seizure resistance of the bearing are improved.

### Seal and Lubrication

Premium O-ring, Optimal seal compression and curved seal structure can enhance the seal performance. The pressure compensator system and advanced grease can greatly increase the lubricating reliability.

### Product Application

It can receive high WOB in the conventional drilling. It is suitable for various formations by matching cutting structure with different tooth shape, tooth density and tooth exposure height.

### Recommended Drilling Parameter

IADC	WOB (KN/mm)	RPM (r/min)	Applicable Formations
417/437/ 447/415/435	0.35~0.9	150~70	Very soft formations with low compressive strength and high drillability, such as clay, mudstone, chalk, gypsum, salt, soft limestone, etc.
517/527/515	0.35~1.0	140~60	Soft formations with low compressive strength and high drillability, such as mudstone, gypsum, salt, soft limestone, etc.
537/547/535	0.45~1.0	120~50	Soft to medium formations with low compressive strength, such as medium, soft shale, medium soft limestone, medium soft sandstone, medium formation with harder and abrasive interbeds, etc.
617/615	0.45~1.1	90~50	Medium hard formation with high compress strength, such as hard shale, limestone, sandstone, dolomite, etc.
637/635	0.5~1.2	80~40	Hard formations with high compressive strength, such as sandstone, limestone, dolomite, hard gypsum, marble, etc.

Note: The upper limits of WOB and RPM in above table should not be used simultaneously.

## KA系列橡胶密封轴承镶齿三牙轮钻头

### 切削结构

镶齿钻头采用新配方新工艺的优质硬质合金齿，提高切削齿的综合机械性能。

### 保径结构

采用多重保径结构：牙轮外排镶修边齿，轮背、镶硬质合金齿，爪尖及前侧堆焊耐磨合金，提高钻头的保径能力。

### 轴承结构

采用高精度配合的滑动、滚动轴承，钢球锁紧。牙爪轴径焊有耐磨合金，牙轮内孔焊特殊合金并镀银，提高钻头承受轴向载荷和止挂面抗咬合的能力。

### 密封润滑

轴承密封选用高性能O形密封圈，最佳密封压缩量，弧形密封结构，有效地提高轴承密封的性能。高性能钻头专用润滑油。

### 产品适用

在常规转速下能承受较高的钻压，配合不同的齿形、齿数和出刃高度的切削结构，可适合各种地层钻进。

### 推荐钻头使用参数

IADC	钻压 (KN/mm)	转速 (r/min)	应用地层
417/437/ 447/415/435	0.35~0.9	150~70	低抗压强度高可钻性的极软地层，如粘土、泥岩、白垩、泥岩、石膏、盐岩、软页岩、软石灰岩等。
517/527/515	0.35~1.0	140~60	低抗压强度的软地层，如泥岩、石膏、盐岩、软页岩、软石灰岩等。
537/547/535	0.45~1.0	120~50	低抗压强度的软到中等地层，如中软页岩、中软石灰岩、中软砂岩和有较硬研磨性夹层的中等地层。
617/615	0.45~1.1	90~50	高抗压强度的中硬地层，如硬页岩、石灰岩、砂岩、白云岩等。
637/635	0.5~1.2	80~40	高抗压强度的硬地层，如砂岩、石灰岩、白云岩和硬石膏、大理石等。

注：表中推荐的钻压和转速不可同时使用上限。



## KE Series Elastomer Sealed Bearing Tricone Rock Bit

### Cutting Structure

The wear-resistance of teeth is enhanced with premium tungsten carbide hardfacing on the tooth surfaces for steel tooth bit.

### Gauge Structure

Multiple gauge protection with gauge trimmers on the heel and gauge inserts on the gauge surface of the cone, tungsten carbide inserts and hardfacing on the shirrtail increases gauge holding capability and bearing life.

### Bearing Structure

High precision roller bearing with two thrust faces. Ball lock the cone. Thrust faces hardface with wear resistant alloy. Abrasion resistance and seizure resistance of the bearing are improved.

### Seal and Lubrication

Premium O-ring, Optimal seal compression and curved seal structure can enhance the seal performance. The pressure compensator system and advanced grease can greatly increase the lubricating reliability.

### Product Application

It is suitable for various formations, and achieves high RPM under low to medium WOB application

### Recommended Drilling Parameter

IADC	WOB (KN/mm)	RPM (r/min)	Applicable Formations
114/115/117	0.35-0.9	150-70	Very soft formations with low compressive strength and high drillability, such as clay, mudstone, chalk, etc.
124/125/127	0.3-0.85	180-60	Soft formations with low compressive strength and high drillability, such as mudstone, gypsum, salt, soft limestone, etc.
134/136	0.3-0.95	150-60	Soft to medium formations with low compressive strength and high drillability, such as medium, soft shale, medium soft limestone, medium soft sandstone, soft formation with harder interbeds, etc.
214/215/217	0.35-0.95	150-60	Medium formation with high compress strength, such as medium soft shale, hard gypsum, medium soft limestone, medium soft sandstone, soft formation with harder interbeds, etc.
227/225	0.35-0.95	150-50	Medium hard formations with high compressive strength, such as abrasive shale, limestone, sandstone, dolomite, hard gypsum, marble, etc.

Note: The upper limits of WOB and RPM in above table should not be used simultaneously.

## KE系列橡胶密封轴承钢齿三牙轮钻头

### 切削结构

钢齿钻头齿面敷焊新型耐磨合金，增强切削齿耐磨性。

### 保径结构

采用多重保径结构：牙轮外排镶修边齿，轮背、爪背镶硬质合金齿，爪尖及前侧地埋耐磨合金，提高钻头的保径能力。

### 轴承结构

采用高精度配合的径向、滚动轴承，钢球锁紧。止推轴承表面堆焊耐磨合金和减磨处理，提高钻头承受轴向载荷和止推面抗咬合的能力。

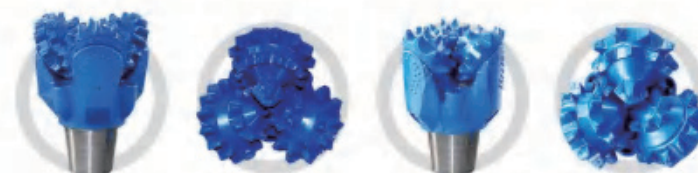
### 密封润滑

轴承密封选用高性能O形密封圈，最佳密封压缩量，弧形密封结构，有效地提高轴承密封的性能。采用高性能钻头专用润滑油。

### 推荐钻头使用参数

IADC	钻压 (KN/mm)	转速 (r/min)	应用地层
114/115/117	0.3-0.75	180-60	低抗压强度高可钻性的极软地层，如粘土、泥岩、白垩等。
124/125/127	0.3-0.85	180-60	低抗压强度的软地层，如泥岩、石膏、盐岩、软页岩、软石灰岩等。
134/136	0.3-0.95	150-60	低抗压强度的软到中等地层，如中软页岩、中软石灰岩、中软砂岩和有较硬研磨性夹层的中等地层。
214/215/217	0.35-0.95	150-60	高抗压强度的中等地层，如中软页岩、硬石膏、中软石灰岩、中软砂岩和有硬夹层的软地层。
227/225	0.35-0.95	150-50	高抗压强度的硬地层，如研磨性页岩、石灰岩、砂岩、白云岩和硬石膏、大理石等。

注：表中推荐的钻压和转速不可同时使用上限。





## KK Series Air Cooling Roller Bearing Bit

### Cutting Structure

The durability of premium tungsten carbide insert is improved with new formulas and new techniques.

### Gauge Structure

Gauge protection with gauge inserts on the gauge surface of the cone, tungsten carbide inserts and hardfacing on the shirrtail increases gauge holding capability.

### Bearing Structure

Air cooling roller bearing package. Balls lock the cone, which reduces the probability of cone-dropping to minimum.

### Product Application

It is suitable for mining applications.

### Recommended Drilling Parameter

IADC	WOB (KN/mm)	RPM (r/min)	Applicable Formations
412/415	0.18~0.35	60~100	Very soft rock with low compressive strengths and high drillability.
432/435	0.18~0.71	60~100	Very soft rock with low compressive strengths and high drillability.
542/545	0.35~0.9	60~100	Medium-soft rock with low compressive strengths.
612/615	0.53~0.9	60~100	Medium-hard rock with high compressive strengths.
632/635	0.53~1.07	60~100	Medium-hard and abrasive rock with high compressive strengths.
642/645	0.53~1.07	60~100	Medium-hard and abrasive rock with high compressive strengths.
712/715	0.71~1.07	60~90	Hard and abrasive rock with high compressive strengths.
732/735	0.71~1.15	60~90	Hard and abrasive rock with high compressive strengths.
742/745	0.71~1.19	60~90	Hard and abrasive rock with high compressive strengths.
822/825	0.8~1.29	60~90	Hard and abrasive rock with high compressive strengths.
842/845	0.89~1.39	60~90	Hard and abrasive rock with high compressive strengths.

Note: The upper limits of WOB and RPM in above table should not be used simultaneously.

## KK系列矿用钻头

### 切削结构

采用新配方新工艺的优质硬质合金齿，提高切削齿的综合机械性能。

### 保径结构

轮背、爪背镶硬质合金齿或堆焊耐磨合金，强化爪尖和前侧堆焊耐磨合金，提高钻头的保径能力。

### 密封结构

空气冷却滚动轴承结构，钢球锁紧牙轮，优化牙爪、牙轮与钢球的配合间隙，将井下掉牙轮的几率降至最低。

### 产品适用

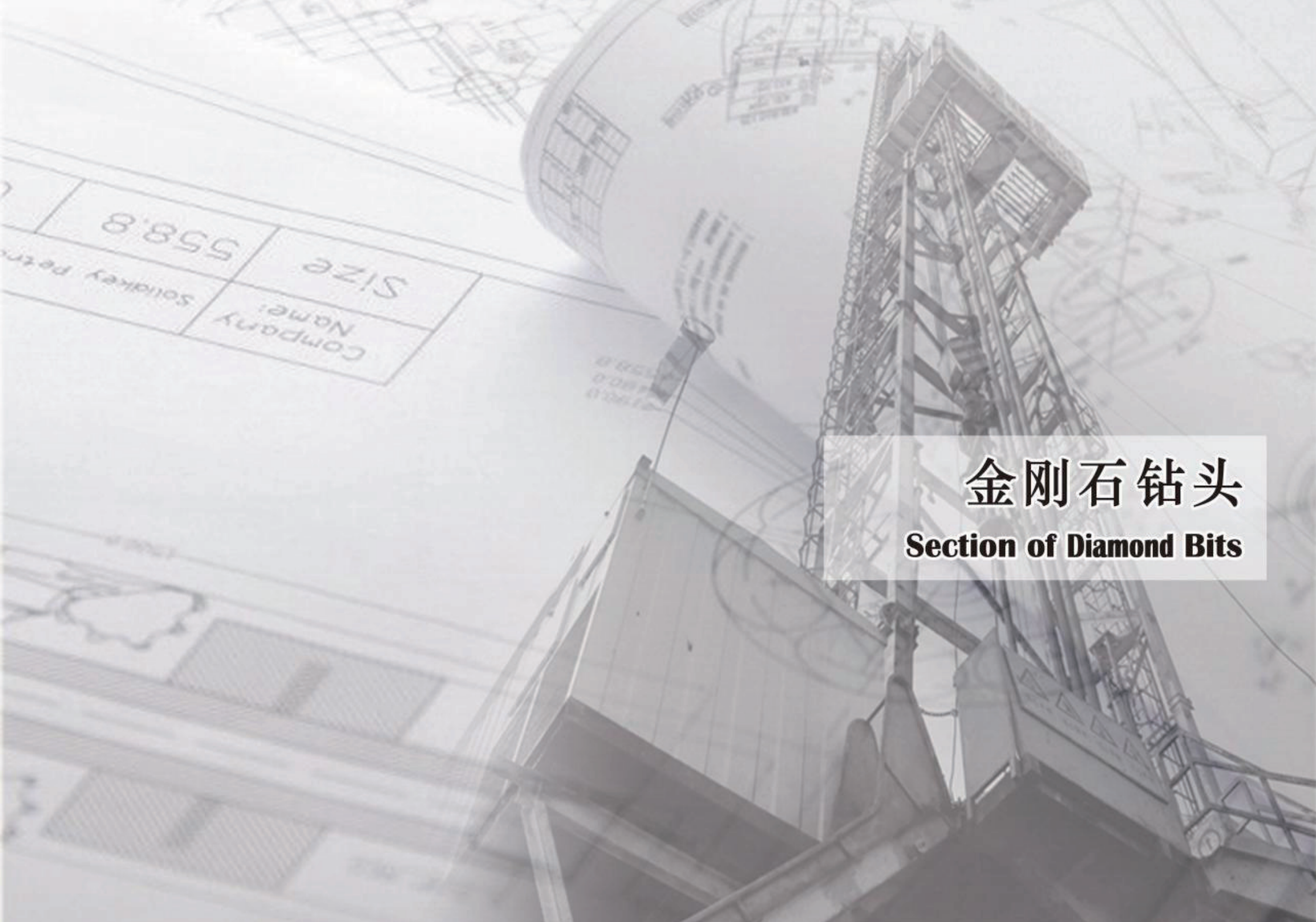
适合矿山钻井。

### 推荐钻头使用参数

IADC	钻压 (KN/mm)	转速 (r/min)	应用地层
412/415	0.18~0.35	60~100	低抗压强度高可钻性的软地层
432/435	0.18~0.71	60~100	低抗压强度高可钻性的软地层
542/545	0.35~0.9	60~100	低抗压强度的中软地层
612/615	0.53~0.9	60~100	低抗压强度的中软地层
632/635	0.53~1.07	60~100	高抗压强度，有较硬研磨性夹层的中硬地层
642/645	0.53~1.07	60~100	高抗压强度，有较硬研磨性夹层的中硬地层
712/715	0.71~1.07	60~90	高抗压强度，有较硬研磨性夹层的硬地层
732/735	0.71~1.15	60~90	高抗压强度，有较硬研磨性夹层的硬地层
742/745	0.71~1.19	60~90	高抗压强度，有较硬研磨性夹层的硬地层
822/825	0.8~1.29	60~90	高抗压强度，有较硬研磨性夹层的硬地层
842/845	0.89~1.39	60~90	高抗压强度，有较硬研磨性夹层的硬地层

注：表中推荐的钻压和转速不可同时使用上限。



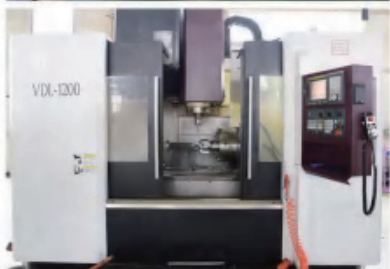


Company Name:	Size
Solidkey petro	558.8

**金刚石钻头**  
**Section of Diamond Bits**

设备

Equipment



## 金刚石钻头分类 Diamond Bit Classification

## 地层硬度分级及钻头选型 Hardness Grading and Guidance of Choosing PDC Bit

**Drill Bit**  
全面钻头

8-1/2" SK	16	05	GR
钻头尺寸: 3"-26" Bit Size: 3"-26"	切削齿大小 Cutter Sizes	刀翼数: 03-16 Blades Quantity: 03-16	特征代码 Feature Code
SKM 胎体式PDC全面钻头 Matrix Body PDC Bit	08 $\phi$ 8mm 主切削齿 $\phi$ 8mm Primary Cutters	A 减震齿 R 倒划眼齿 D 双排齿 S 螺旋刀翼 G 螺旋保径 T 特殊保径	Vibration absorber Back-reaming Double rows cutters Spiral blades Spiral gauge protection Special gauge protection
SKS 钢体式PDC全面钻头 Steel Body PDC Bit	10 $\phi$ 10mm 主切削齿 $\phi$ 10mm Primary Cutters	M 主切削齿规格不同 L 加长规径 I 孕镶齿	Mixed primary cutters Lengthening gauge Impregnated
SKN 天然金刚石全面钻头 Natural Diamond Bit	13 $\phi$ 13mm 主切削齿 $\phi$ 13mm Primary Cutters		
SKP 热稳定聚晶全面钻头 TSP Diamond Bit	16 $\phi$ 16mm 主切削齿 $\phi$ 16mm Primary Cutters		
SKI 孕镶金刚石全面钻头 Impregnated Diamond Bit	19 $\phi$ 19mm 主切削齿 $\phi$ 19mm Primary Cutters		
	25 $\phi$ 25mm 主切削齿 $\phi$ 25mm Primary Cutters		

**Diamond Reamer**  
扩眼钻头

12-1/4" SKSR	16	05	GR
扩眼尺寸 Reaming size	切削齿大小 Cutter Sizes	刀翼数: 03-16 Blades Quantity: 03-16	特征代码 Feature Code
SKMB 胎体式偏心扩孔钻头 Matrix body Bi-Center bit	08 $\phi$ 8mm 主切削齿 $\phi$ 8mm Primary Cutters	A 减震齿 R 倒划眼齿 D 双排齿 S 螺旋刀翼 G 螺旋保径 T 特殊保径	Vibration absorber Back-reaming Double rows cutters Spiral blades Spiral gauge protection Special gauge protection
SKSB 钢体式偏心扩孔钻头 Steel body Bi-Center bit	10 $\phi$ 10mm 主切削齿 $\phi$ 10mm Primary Cutters	M 主切削齿规格不同 L 加长规径 I 孕镶齿	Mixed primary cutters Lengthening gauge Impregnated
SKMR 胎体扩孔钻头 Matrix body reaming bit	13 $\phi$ 13mm 主切削齿 $\phi$ 13mm Primary Cutters		
SKSR 钢体扩孔钻头 Steel body reaming bit	16 $\phi$ 16mm 主切削齿 $\phi$ 16mm Primary Cutters		
	19 $\phi$ 19mm 主切削齿 $\phi$ 19mm Primary Cutters		
	25 $\phi$ 25mm 主切削齿 $\phi$ 25mm Primary Cutters		

**Core Bit**  
取芯钻头

8-1/2" x 4" SKC	13	12
钻头外径尺寸 钻头内径尺寸 OD ID	刀翼数: 03-16 Blades Quantity: 03-16	切削齿大小 Cutter Sizes
SKC PDC取芯钻头 PDC core bit	08 $\phi$ 8mm 主切削齿 $\phi$ 8mm Primary Cutters	$\phi$ 8mm Primary Cutters
SKCN 天然金刚石取芯钻头 Natural diamond core bit	10 $\phi$ 10mm 主切削齿 $\phi$ 10mm Primary Cutters	$\phi$ 10mm Primary Cutters
SKCP TSP金刚石取芯钻头 TSP diamond core bit	13 $\phi$ 13mm 主切削齿 $\phi$ 13mm Primary Cutters	$\phi$ 13mm Primary Cutters
SKCI 孕镶金刚石取芯钻头 Impregnated diamond core bit	16 $\phi$ 16mm 主切削齿 $\phi$ 16mm Primary Cutters	$\phi$ 16mm Primary Cutters
	19 $\phi$ 19mm 主切削齿 $\phi$ 19mm Primary Cutters	$\phi$ 19mm Primary Cutters
	25 $\phi$ 25mm 主切削齿 $\phi$ 25mm Primary Cutters	$\phi$ 25mm Primary Cutters

地层分级 Formations Grading	抗压强度 compressive strength	地层描述 Formations Description	岩石类型 Rock Type	金刚石钻头IADC编码 IADC code for Diamond bit	推荐的标准金刚石钻头 Recommended standard Diamond bit
1	<4000PSI	抗压强度低的粘性软地层 Viscous soft formations with low compressive strength	粘土、粉砂岩、砂岩 Clay, siltstone, sandstone	M/S112-M/S223	SKS1904R, SKS1905R SKM1904R, SKM1905R
2	<8000PSI	抗压强度低和可钻性好的软地层 Soft formations with low compressive strength and high drillability	粉土岩、泥灰岩、褐煤、砂岩、粉砂岩、硬石膏、凝灰岩 silt rock, marl, lignite, sandstone, siltstone, hard gypsum, tuff	M/S222-M333	SKS1904R, SKS1905R SKS1906R, SKS1605R SKM1606R, SKM1904R SKM1905R, SKM1906R SKM1605R, SKM1606R
3	<12000PSI	抗压强度低, 且带有夹层的软至中等硬度地层 Viscous soft formations with low compressive strength	粉土岩、泥灰岩、褐煤、粉砂岩、硬石膏、凝灰岩 silt rock, marl, lignite, siltstone, hard gypsum, tuff	M/S323-M434	SKS1906DR, SKS1605DR SKS1606DR, SKS1607DR SKS1605DR, SKS1606DR SKM1607DR, SKM1305DR SKM1306DR, SKM1307DR
4	<16000PSI	抗压强度高, 含研磨性薄夹层的中等硬度到硬地层 Medium hard to hard formations with high compressive strength and abrasive thin interbeds	泥岩、灰岩、硬石膏、砂岩(钙质) mudstone, limestone, hard gypsum, sandstone(calcium)	M333-M434	SKM1607DR, SKM1306DR, SKM1307DR, SKM1308DR, SKM0805DR, SKM0806DR
5	<24000PSI	抗压强度很高, 非研磨性的硬和致密地层 Hard and tight formations with very high compressive strength	灰岩、硬石膏、白云岩、白云岩 limestone, hard gypsum, dolomite	M434-M634	SKP225
6	<32000PSI	抗压强度很高, 有一些研磨性夹层的硬和致密地层 Hard formations with very high compressive strength and some abrasive interbeds	钙质页岩、硅质砂岩、粉砂岩 calcareous shale, siliceous sandstone, siltstone	M613-M844	SKN24, SKP225, SKP248, SKP278, SKCI279, SKCI281
7	>32000PSI	极硬和研磨性极强的地层 Very hard and high abrasive strength formations	石英岩、火成岩 quartzite, igneous rock	M713-M844	SKCI281

天然金刚石钻头 Natural Diamond Bit



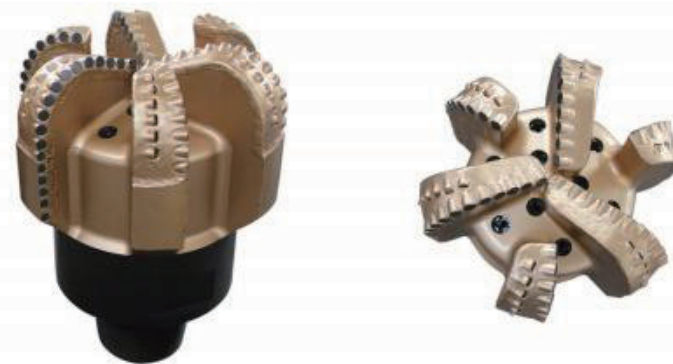
刀翼式孕镶钻头 Blades Type Impregnated Diamond Bit



TSP钻头 TSP Diamond Bit



PDC钻头 PDC Bit



扩孔钻头 PDC Reamer



# 钢体PDC钻头

# Steel Body PDC Bit

## S1305



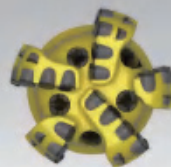
钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
5-1/2"	5	13mm	5	1-1.8"	3-1/2 REG	60-300	20-80	10-25

## S1605



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
8-1/2"	5	16mm	7	2-3.5"	4-1/2 REG	60-300	20-110	21-35

## S1605



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
6"	5	16mm	5	1.5-2"	3-1/2 REG	60-300	20-80	10-25

## S1905



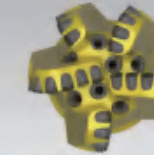
钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
8-1/2"	5	19mm	7	2-3.5"	4-1/2 REG	60-300	20-110	21-35

## S1306



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
6-3/4"	6	13mm	6	1.5-2"	3-1/2 REG	60-300	20-80	10-25

## S1905



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
8-3/4"	5	19mm	7	2-3.5"	4-1/2 REG	60-300	20-110	21-35

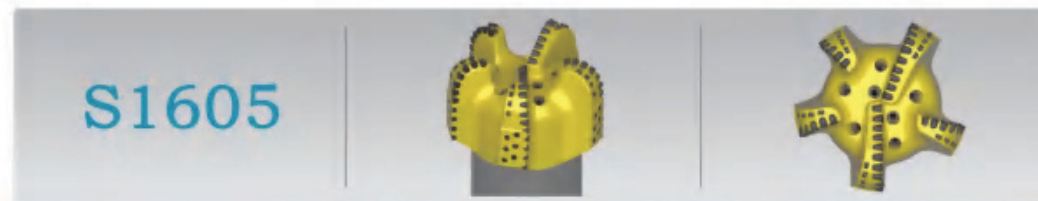
# 钢体PDC钻头

# Steel Body PDC Bit



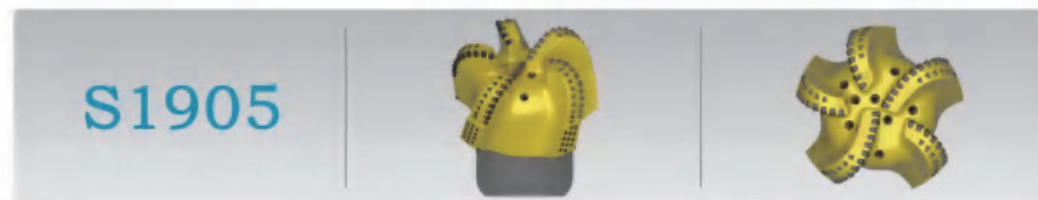
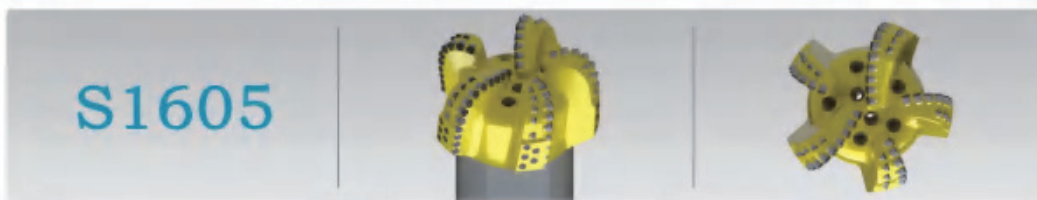
钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
9-1/2"	5	19mm	7	2-3.5"	6-5/8 REG	60-260	20-110	25-45

钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
12-1/4"	5	19mm	7	2.5-4"	6-5/8 REG	60-260	20-160	38-62



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
11-5/8"	5	16mm	7	2.5-4"	6-5/8 REG	60-260	20-140	30-60

钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
13-5/8"	5	16mm	7	2.5-4"	6-5/8 REG	60-250	30-160	40-55



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
12-1/4"	5	16mm	7	2.5-4"	6-5/8 REG	60-260	20-160	38-62

钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
17-1/2"	5	19mm	8	3.5-4"	7-5/8 REG	60-220	20-210	45-80

## 胎体PDC钻头

## Matrix Body PDC Bit

### M1307



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
6"	7	13mm	6	2"	3-1/2 REG	60-300	20-80	10-25

### M1606



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
8-1/2"	6	16mm	6	2.2"	4-1/2 REG	60-300	20-110	21-35

### M1307



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
8-1/2"	7	13mm	6	2"	4-1/2 REG	60-300	20-110	21-35

### M1906



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
12-1/4"	6	19mm	6	3"	6-5/8 REG	60-260	20-160	38-62

### M1606



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
12-1/4"	6	16mm	7	3"	6-5/8 REG	60-260	20-160	38-62

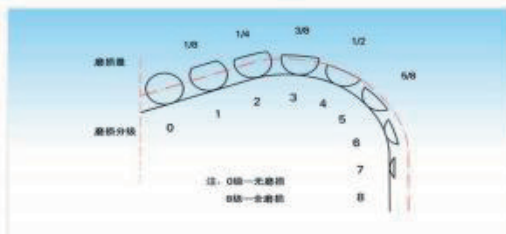
### M1607



钻头 BIT	钻头参数 SPECIFICATIONS					推荐钻井参数 RECOMMENDED OPERATING PARAMETERS		
尺寸 Size	刀翼数 Number of Blades	主切削齿规格 Primary Cutter Size	喷嘴数 Nozzle Qty	保径长度 Gauge Length	连接扣型 Connection	转速 Rotary Speed (RPM)	钻压 Weight on Bit (KN)	排量 Flow Rate(gps)
12-1/4"	7	16mm	9	3"	6-5/8 REG	60-260	20-160	38-62



金刚石钻头切削齿磨损等级  
Wear Grades of Cutters



PDC钻头喷嘴面积表(mm<sup>2</sup>)  
PDC Bit Nozzle Flow Area Chart

喷嘴代码 Nozzle Code	喷嘴直径 Nozzle Diameter (mm)	喷嘴数量 Number of Nozzles									
		1	2	3	4	5	6	7	8	9	10
6	4.76	17.8	35.60	53.40	71.20	89.00	160.50	124.60	142.40	160.20	178.00
7	5.56	24.28	48.56	72.84	97.12	121.40	145.68	169.96	192.24	218.52	242.80
8	6.35	31.67	63.34	95.01	126.68	158.35	190.02	221.69	253.36	285.03	316.70
9	7.14	40.04	80.08	120.12	160.16	200.20	240.24	280.28	320.36	360.36	400.40
10	7.94	49.51	99.02	148.53	198.04	247.55	297.06	346.57	445.59	445.59	495.10
11	8.73	59.86	119.72	179.58	239.44	299.30	359.16	419.02	478.88	538.74	598.60
12	9.53	71.33	142.66	213.99	285.32	356.65	427.98	499.31	570.64	641.97	713.30
13	10.32	83.65	167.30	250.95	334.60	418.25	501.90	585.55	669.20	752.85	836.50
14	11.11	96.95	193.90	290.85	387.80	484.75	581.76	678.65	775.60	872.55	969.50
15	11.91	111.41	222.82	334.23	445.64	557.05	668.46	779.87	891.28	1002.69	1114.10
16	12.7	126.68	253.36	380.04	506.72	633.40	760.08	886.76	1013.44	1140.12	1266.80
17	13.49	142.93	285.86	428.79	571.72	714.65	857.58	1000.51	1143.44	1286.37	1429.30
18	14.29	160.38	320.76	481.14	641.52	801.90	962.28	1122.66	1283.04	1443.42	1603.80
19	15.08	178.60	357.20	535.80	714.40	897.00	1071.60	1250.2	1428.80	1604.40	1786.00
20	15.88	198.06	396.12	594.18	792.24	990.30	1188.26	1386.42	1584.48	1782.54	1980.50
21	16.67	218.25	436.50	654.75	873.00	1091.25	1309.50	1527.75	1746.00	1964.25	2182.80
22	17.46	239.43	478.86	718.29	957.72	1197.15	1436.58	1676.01	1915.44	2154.81	2394.30

金刚石钻头外径尺寸公差  
Bit Diameter Tolerances

钻头公称尺寸mm(in) Nominal Size of The Bit(in)	外径公差mm OD Tolerances mm
Φ: ≤171.45 ( 6-3/4 )	+0,-0.38
Φ: 172.24 ( 6-25/32 ) ~228.60 ( 9.0 )	+0,-0.51
Φ: 229.39 ( 9-1/32 ) ~349.25 ( 13 3/4 )	+0,-0.76
Φ: 350.04 ( 13-25/32 ) ~444.50 ( 17 1/2 )	+0,-1.14
Φ: ≥445.29 ( 17-17/32 )	+0,-1.60

上扣扭矩推荐  
The Make-up Torque Recommended

Bit Size (in)	Pinconnection (in)	Make-up Torque	
		Kft. lbs	kN.m
3 1/4" -4 1/2"	2 3/8" REG	1.8-3.1	2.4-3.7
4 11/32" -5"	2 7/8" REG	3.2-4.8	4.2-6.9
5 1/32" -7 1/8"	3 1/2" REG	5.2-8.0	7.1-11.5
7 11/32" -9 3/8"	4 1/2" REG	12.6-18.2	17.0-26.4
9 15/32" -14 1/2"	6 1/8" REG	37.1-39.1	50.3-57.5
14 7/16" -18 1/2"	7 7/8" REG	48.3-60.9	65.5-86.1

# 非开挖工具 HDD Section



8 1/2" IADC 637G



9 1/2" IADC 637G

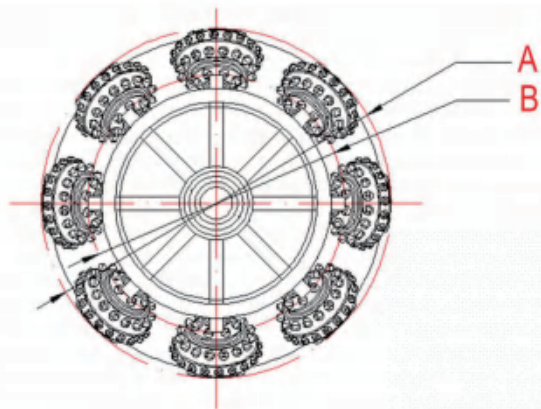
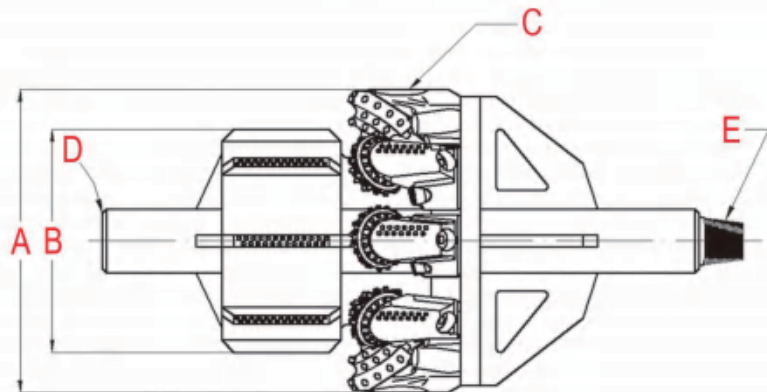


12 1/4" IADC 637G



导向钻头 Pilot Bits

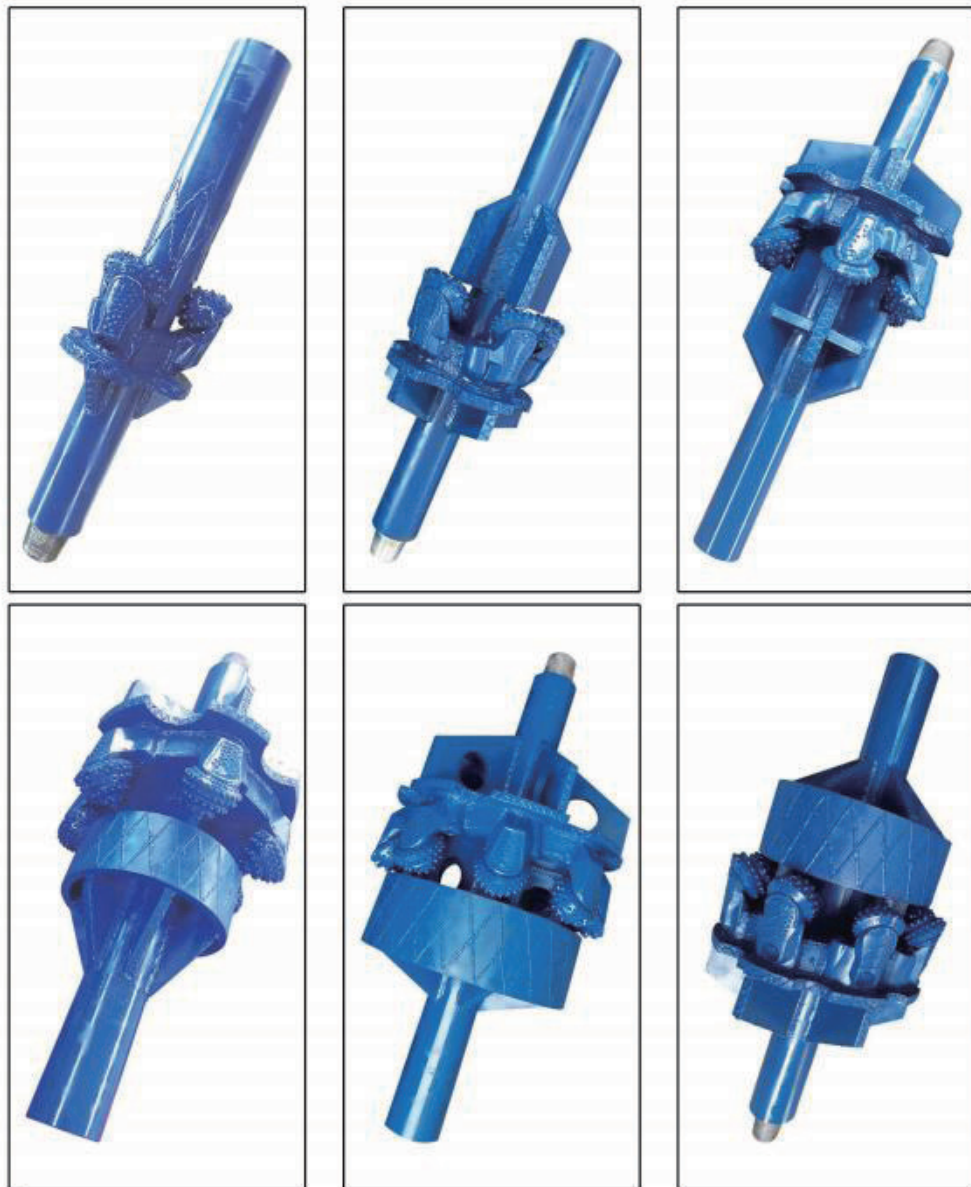




A.扩孔器直径/Diameter of hole opener	
B.稳定器直径/Diameter of stabilizer	
C.牙轮掌型号/Type of roller cones	
D/E.连接螺纹 (前/后)/Thread connection(pulling/trailing)	
扩孔器钻压 (吨) WOB (Ton)	
扩孔器转速 (转/分) RPM (r/min)	
适用地层/Application Formations	
备注/Remarks	

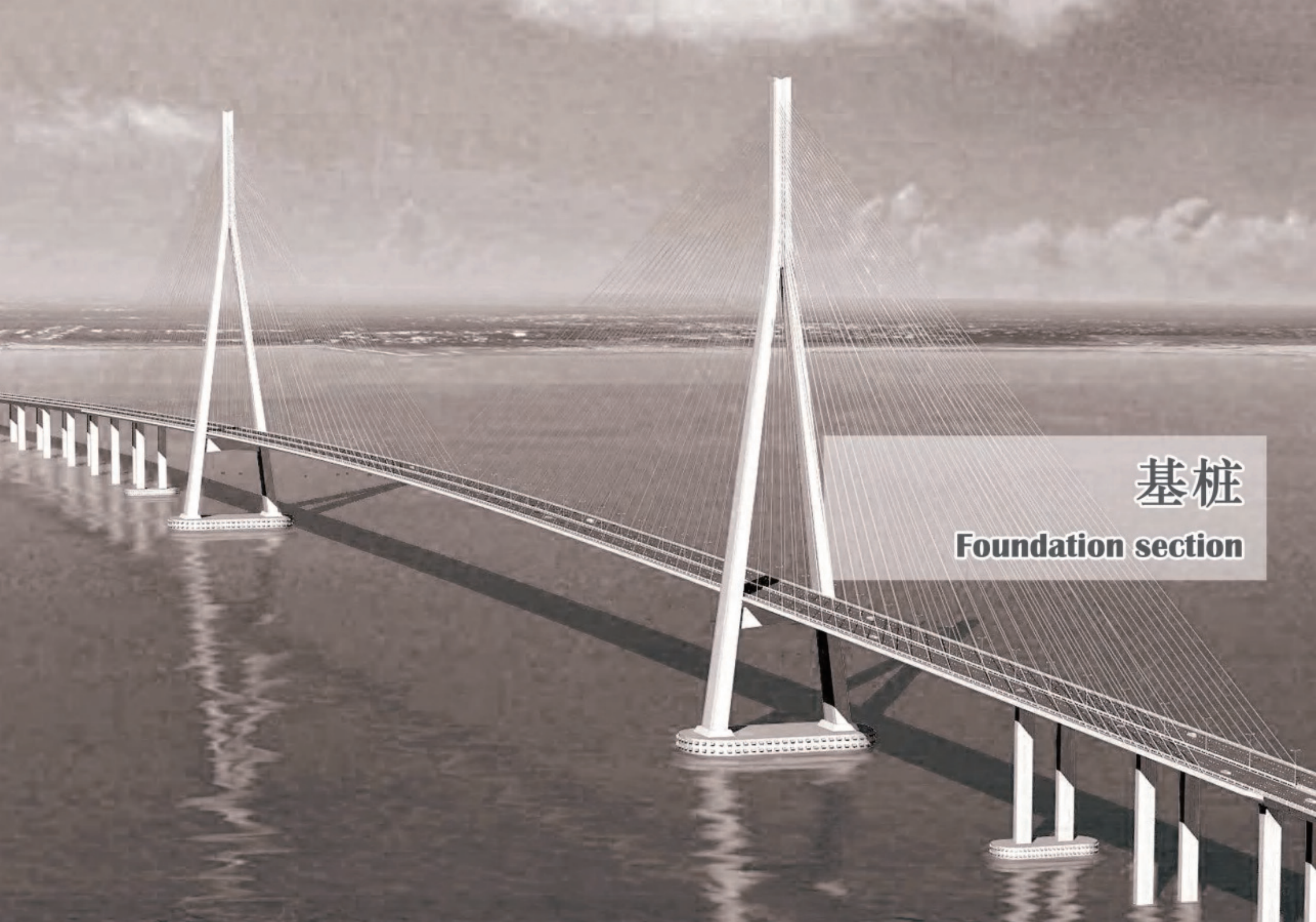
Rock UCS (PSI)	Rock Type	Tungsten Carbide Insert Tricone Bit Series			
0	Claystone, Mudstone	40 Series			
	Chalky Limestone				
4000	Soft Shale	4-1 to 4-4			
	Loose Sandstones				
8000	Limestone, Siltstone		50 Series		
	Solid Sandstones				
12,000	Medium Shales		5-1 to 5-4		
	Tuff, Soft Schist				
16,000	Andesite, Rhyolite				
20,000	Quartzite (Sand, Silt)				
	Limestone, Marble				
	Monzonite, Granite				
24,000	Gneiss				
	Diorite, Diabase		60 Series		
28,000	Hard Shale, Slate				
	Limestone, Dolomite				
32,000	Basalt		6-1 to 6-4		
	Tactite, Skarn				
36,000	Granodiorite				
	Taconite				
40,000	Quartzite				
	Syenite				
44,000	Gabbro				
48,000	Banded Iron Formation				
52,000	Chert				
56,000	Quartzite				
60,000	Amphibolite				
64,000	Hornfels				
68,000	Hematite Ore				
Higher	Lava, Basalt, Biwabac, Quartzite				

牙轮扩孔器 · HDD hole opener



PDC扩孔器 · PDC hole opener





基桩

Foundation section

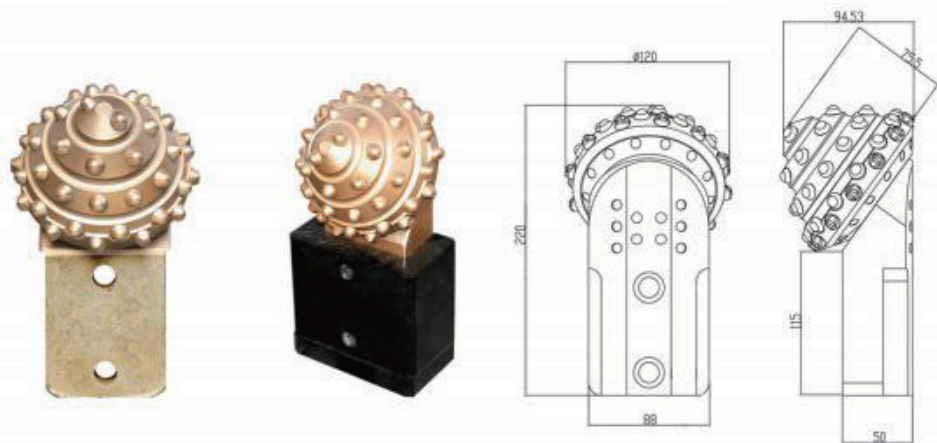
C120系列焊接式 · C120 Series Weld Type



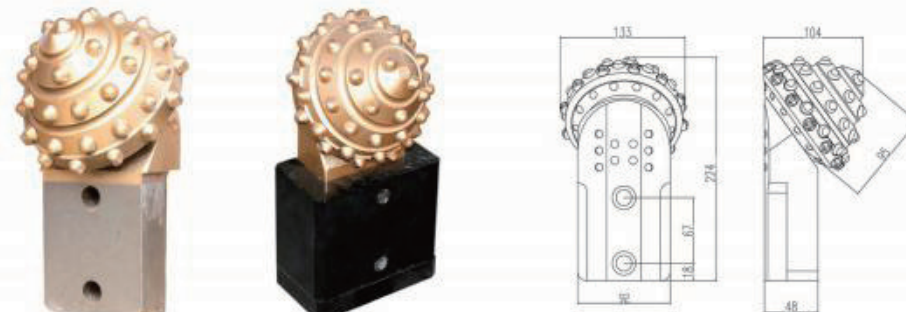
C133系列焊接式 · C133 Series Weld Type



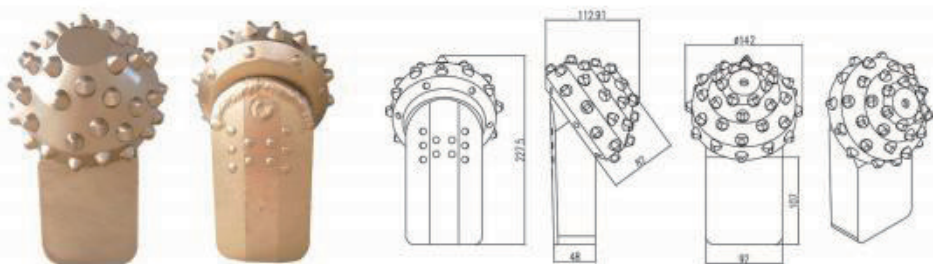
C120系列可更换式 · C120 Series Replaceable Type



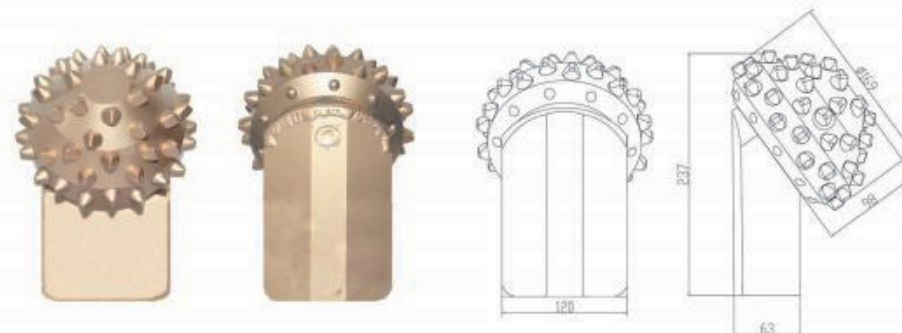
C133系列可更换式 · C133 Series Replaceable Type



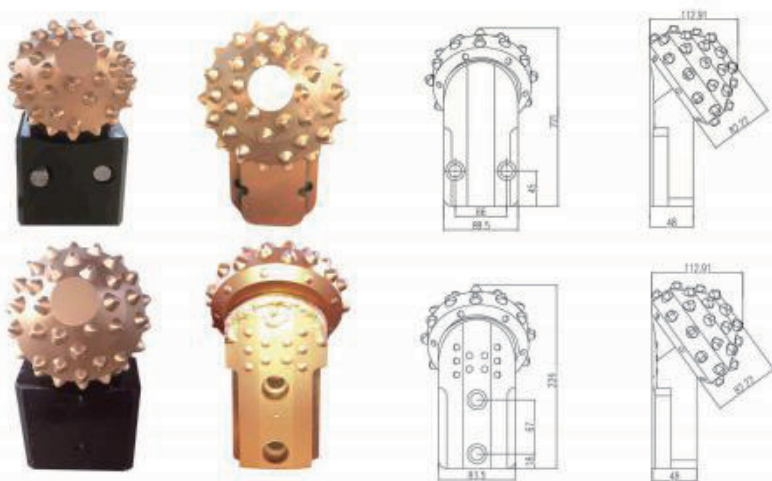
C142系列焊接式 · C142 Series Weld Type



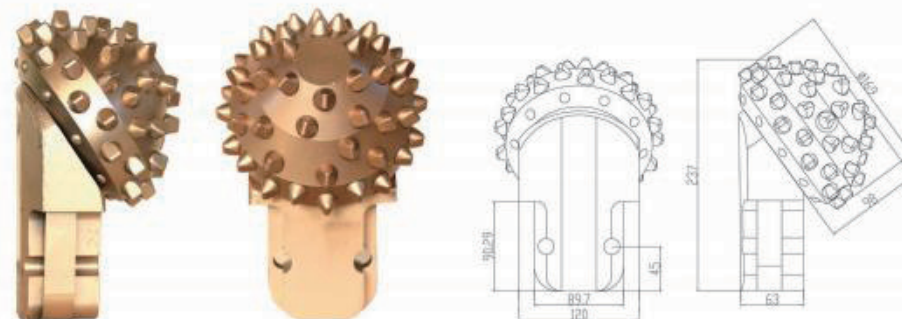
C169系列焊接式 · C169 Series Weld Type



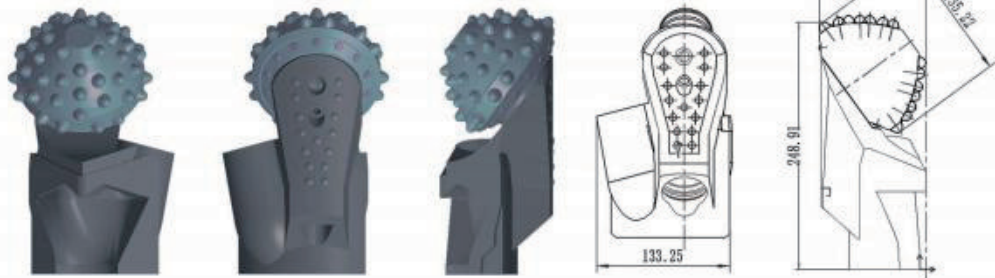
C142系列可更换式 · C142 Series Replaceable Type



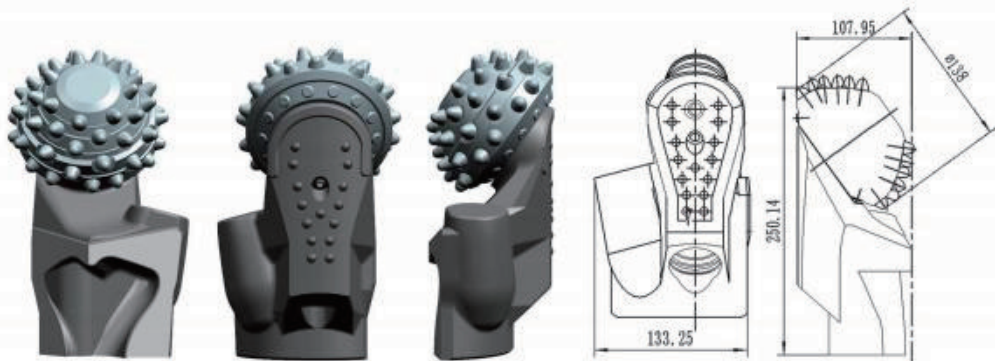
C169系列可更换式 · C169 Series Replaceable Type



新二代 New G2



新三代 New G3



两种底座 Two Types of Holders



竖排底座 Vertical Bolts Holder



横排底座 Horizontal Fixed Holder

名称 Name	竖排底座 Vertical Bolts Holder	横排底座 Horizontal Fixed Holder
结构 Structure	分体：底部螺栓固定后焊接成型 Bottom is a welding parts after fixed	一体成型 Integral body
锁紧方式 Fix Types	螺栓 Bolts	铆钉 Rivet Bolts
插槽结构 Slot Structure	单边插槽 Single Slot	双边插槽 Double Slot



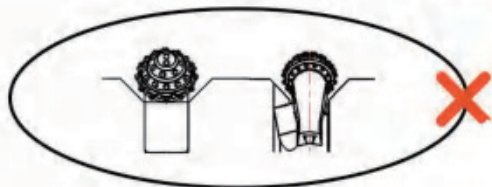
## 牙轮掌焊接注意事项

- 筒壁开口宽度以刚刚放入牙掌或者底座为宜，不要留过大间隙；筒壁开口深度应保证焊接后的牙轮露出筒壁约1/2轮高为宜；牙轮两侧筒壁顶端开八字倒角。（参考示意图）
- 不要混用不同规格牙轮；牙轮安装顺序，最大可能遵循正反交替的原则。
- 保证牙轮水平高度一致；向外倾斜牙轮边齿切削直径一致；向内倾斜牙轮边齿切削直径一致；无论高度还是水平方向，突出的会提前损坏；筒壁定位法需测量边齿圆心距，减去筒椭圆造成的误差。尽可能保持最小破碎环面，不小于推荐值，不大于120mm。
- 焊接时遵循牙轮向掌背一侧倾斜的原则，不可向轮顶一侧倾斜，避免掌尖过早磨损。
- 焊接时应尽量将牙轮掌浸入水中，点焊定位后轮流焊接加固，工地焊接可以通过流动水和湿布包裹结合方式冷却，重点冷却牙掌与牙轮结合处，避免高温造成密封圈或者轴承润滑系统失效。

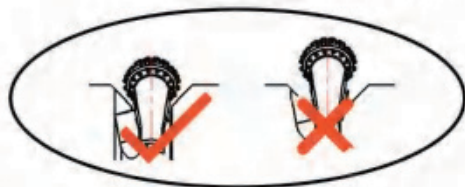


## 焊接示意图

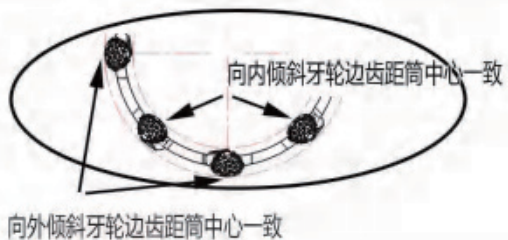
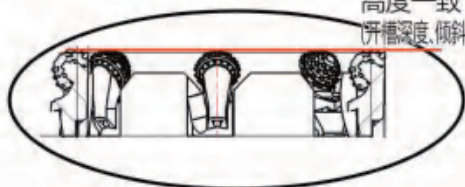
不推荐混用不同规格牙轮



约半个轮子进入筒端面



高度一致  
(开槽深度、倾斜一致)



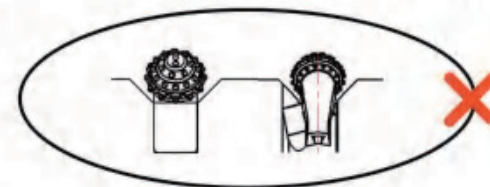
## Welding Notes

- All gaps must be same width & depth; Cone should be 1/2 or 2/3 out of bucket edge; Gap should not be too big.
- All cones in one bucket should be same model.
- All the Arm-top of cones should be same distance to Circle-Center. All the height should be same.
- Rock breaking ring width should not be smaller than advised minimum breaking-ring-width, and it should not be bigger than 120mm.
- Cool the cones by water when welding; Welding each cones in turns to lower temperature of cones.

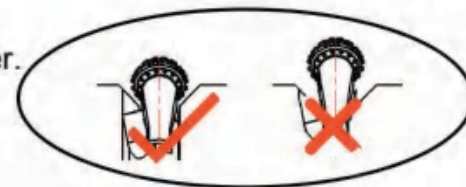


## Referenced Drawings

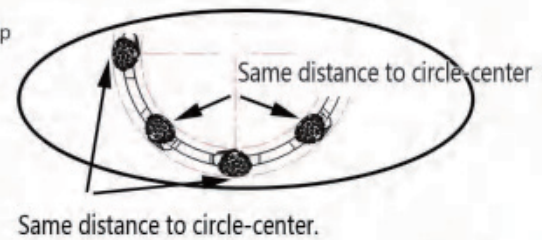
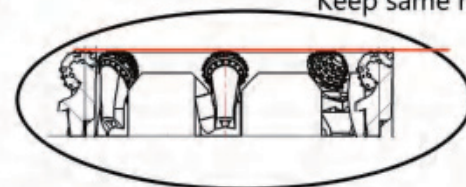
Different cones



Half cone inside is right



Keep same height



## 牙轮桶钻使用建议

- 1. 下钻前清孔底**  
下钻前确保孔底清洁无异物。若有异物，打捞清理后再下钻；每次起钻需要观察是否有部件脱落，脱落应及时打捞。
- 2. 下钻速度不宜过快**  
下钻速度不要过快，钻头要缓慢接触孔底，避免孔底斜面或者压到孤石，瞬间压力过大损坏轴承；接触孔底前，钻头即处于低转速旋转状态。
- 3. 破碎面稳定后再加压**  
钻头接触孔底后，低转速、低钻压工作，待平整的破碎环面形成后，转速逐渐由缓慢提升到正常；牙轮桶钻压力逐渐从自重加压到点动加压。
- 4. 承压范围和加压方式**  
牙轮桶钻不可钻压过高，只能点动加压，每个牙轮荷载3-5吨；机器操作员可计算钻杆、钻头自重等总重量，根据牙轮个数判断加压范围。
- 5. 提钻后冲洗观察磨损情况**  
**不该磨损的地方不能磨：**  
每次提钻需要观察每个牙轮母体，特别是掌尖、轮顶是否有异常磨损，如有异常或过快磨损。  
**该磨损的地方对比磨损速度：**  
每次提钻需要观察不同牙轮同一部位的牙齿磨损程度是否相同，如某个轮子较其他轮子磨损过快，检查此轮是否过高或过于突出。
- 6. 故障及处理**  
**崩齿：**  
孔底异物、钻压过大、合金材质差、合金牌号选型错误等会导致崩齿，清孔底、降钻压后仍崩齿，与牙轮厂家联系。  
**偏磨：**  
确保孔底有水降温；排除焊接时破碎环面过宽或过窄；排除钝钻；排除掌尖磨损造成轴承密封失效；偏磨后应停止使用，避免掉轮。  
**掉轮：**  
轴承质量问题、使用不当、过度使用都有可能造成掉轮，每次提钻观察，及早发现问题避免掉轮，掉轮后需要及时打捞。
- 7. 牙轮桶钻每分钟转速**

桶钻转速表 (转/分钟)

桶钻直径 (厘米)	每分钟转动圈数 (下限)	每分钟转动圈数 (上限)
800	13	27
1000	10	21
1200	9	18
1400	7	15
1600	6	13
1800	6	12
2000	5	10

备注：  
1>上表桶钻转速，是按照216mm三牙轮钻头每分钟转速50-100计算的。  
2>每个轮子荷载承重3-5吨，最高钻压和转速不能同时使用。

## Suggestion of Rock Bucket Operation

- 1. Clear Hole Bottom**  
Clear hole bottom before putting rock bucket into hole. Hard materials like iron may break the Tungsten Carbide Inserts(teeth) .
- 2. Lower slowly**  
Lower slowly before bucket touching bottom, because the bottom may not flat. If all weight is loaded by part of cutters, arms or bearing may be broken. Rotating bucket before touching bottom.
- 3. Pressure**  
Not press bucket after touching rocks. Keep low rotating speed after touching rocks. Rotating at normal speed after breaking-ring is established stably. Increase load on bucket by impuls type pressing. Make sure not overload.
- 4. Load of Roller Cones**  
Load range of 133mm roller cone bits is 3-5 tons. Operators could calculate according to quantity of roller cones, then considering weight of kelly bar and other heavy parts loading on roller cones bits. Press bucket by impuls type without ouverload.
- 5. Check after each lifting**  
**Check the Cone-Top, Arm-Top and teeth at initial stage.**  
The primary teeth should wear earlier than cone body, arm-top, cone-top. Arm-top and Cone-top should not wear at initial stage. Welding problem makes wear unusual.  
**Check and compare wear speed of each cones.**  
Wear faster means the position higher/outer/inner. Welding problem makes unusual.
- 6. Failure handling-Teeth Fracture**  
Hard materials at bottom. Overload. Low grade tungsten carbide. Teeth too long.  
Solutions: Clear hole bottom, reduce load, change shorter teeth.  
**Failure handling-Bearing Lock**  
Check water cooling at hole bottom. Bearing shock in lowering bucket too fast. Check overload on bucket. Bearing seal broken due to arm-top wear. Rock breaking ring too wide or too narrow. Change new cutters after lock.  
**Failure handling-Cone Drop**  
Change new cutters after worn out. Check the condition of cutters every 3 lifting to find potential failure at earliest time. Fish dropped cutters after loss.
- 7. Rotating speed**

Diameter of Rock Bucket(mm)	Bucket-RPM(Lower Limi®)	Bucket-RPM(Upper Limi®)
800	13	27
1000	10	21
1200	9	18
1400	7	15
1600	6	13
1800	6	12
2000	5	10

Note:  
1> Bucket-RPM is calculated according to RPM of single roller cones. RPM of single roller cones ranges from 50 to 100.  
2> Load of each single roller cones is 3-5tons, upper-load and upper-RPM can not be used at the same time.