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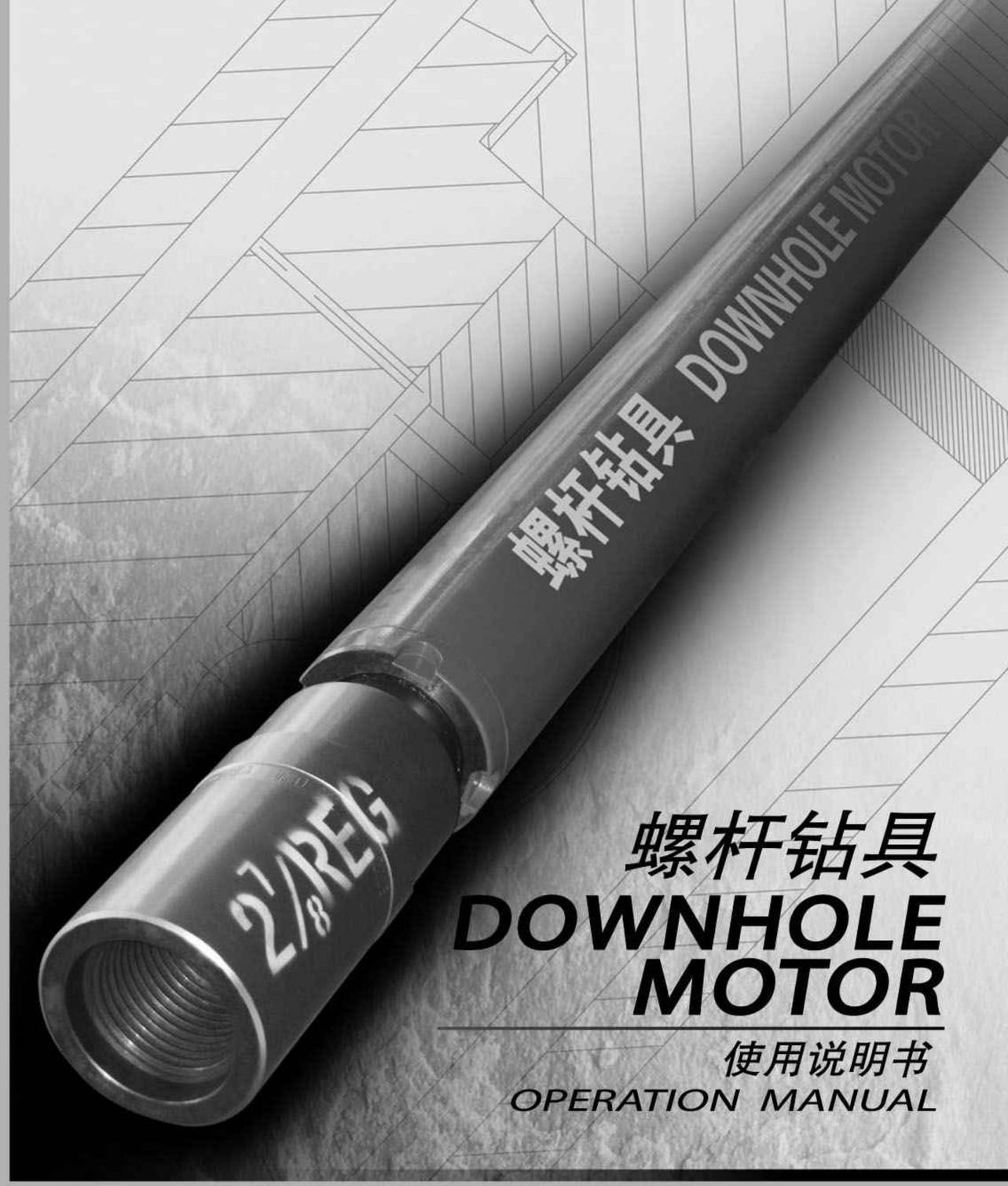

螺杆钻具
DOWNHOLE MOTOR

使用说明书
OPERATION MANUAL

立林石油机械有限公司
Lilin Petroleum Machinery Co., Ltd.

螺杆钻具说明书
DOWNHOLE MOTOR MANUAL

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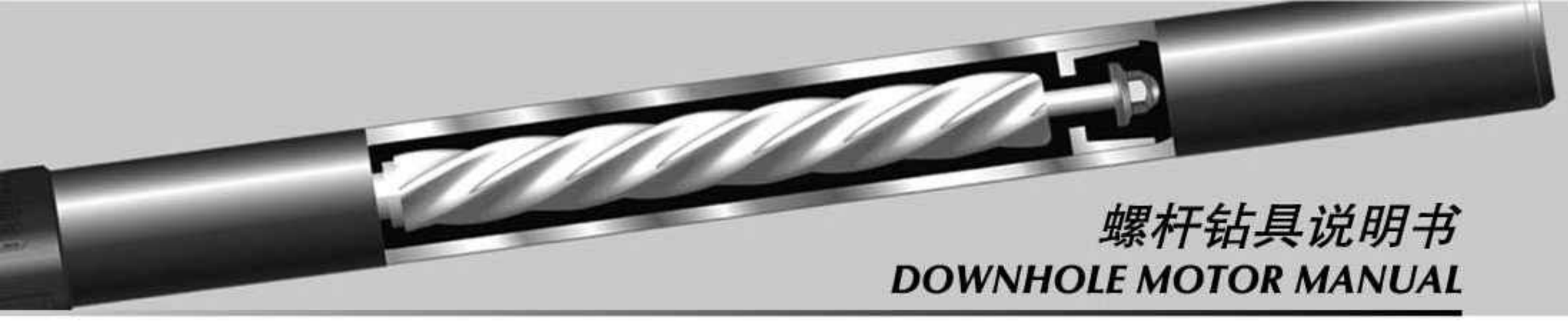


螺杆钻具说明书
DOWNHOLE MOTOR MANUAL

1. 前言

本手册主要介绍螺杆钻具的性能和使用要求以及注意事项，便于用户更好地了解螺杆钻具，结合钻井的需要，选好、用好、维护好钻具，发挥其应有的技术性能，提高钻井经济效益。

2. 螺杆钻具工作原理

螺杆钻具是以泥浆为动力的一种井下动力钻具。泥浆泵泵出的泥浆液流经旁通阀进入马达，在马达进出口处形成一定压差推动马达的转子旋转，并将扭矩和转速通过万向轴和传动轴传递给钻头。螺杆钻具的性能主要取决于螺杆马达的性能参数。

3. 螺杆钻具的组成

螺杆钻具由旁通阀、马达、万向轴和传动轴四大总成组成。（如图1）

1. Introduction

This manual mainly introduces downhole motor property, application and cautions, so as for the customers to know well our downhole motors, and to do better selection, application, repair and maintenance of downhole motor according to drilling demand. As a result, our downhole motor may play its reliable technical function, to enhance drilling economic efficiency.

2. Principle

Downhole motor is a kind of downhole dynamic drilling tool upon the power of drilling mud. Mud stream from the outlet of mud pump flows through a by-pass valve into the motor. This stream produces pressure loss between inlet and outlet of the pump, to push the rotor into rotating, and to transmit the torque and speed to the bit. The downhole motor property mainly depends upon its property parameters

3. Constitution

Downhole motor is composed of four assemblies of by-pass valve, motor, cardan shaft and drive shaft (Fig. 1) .

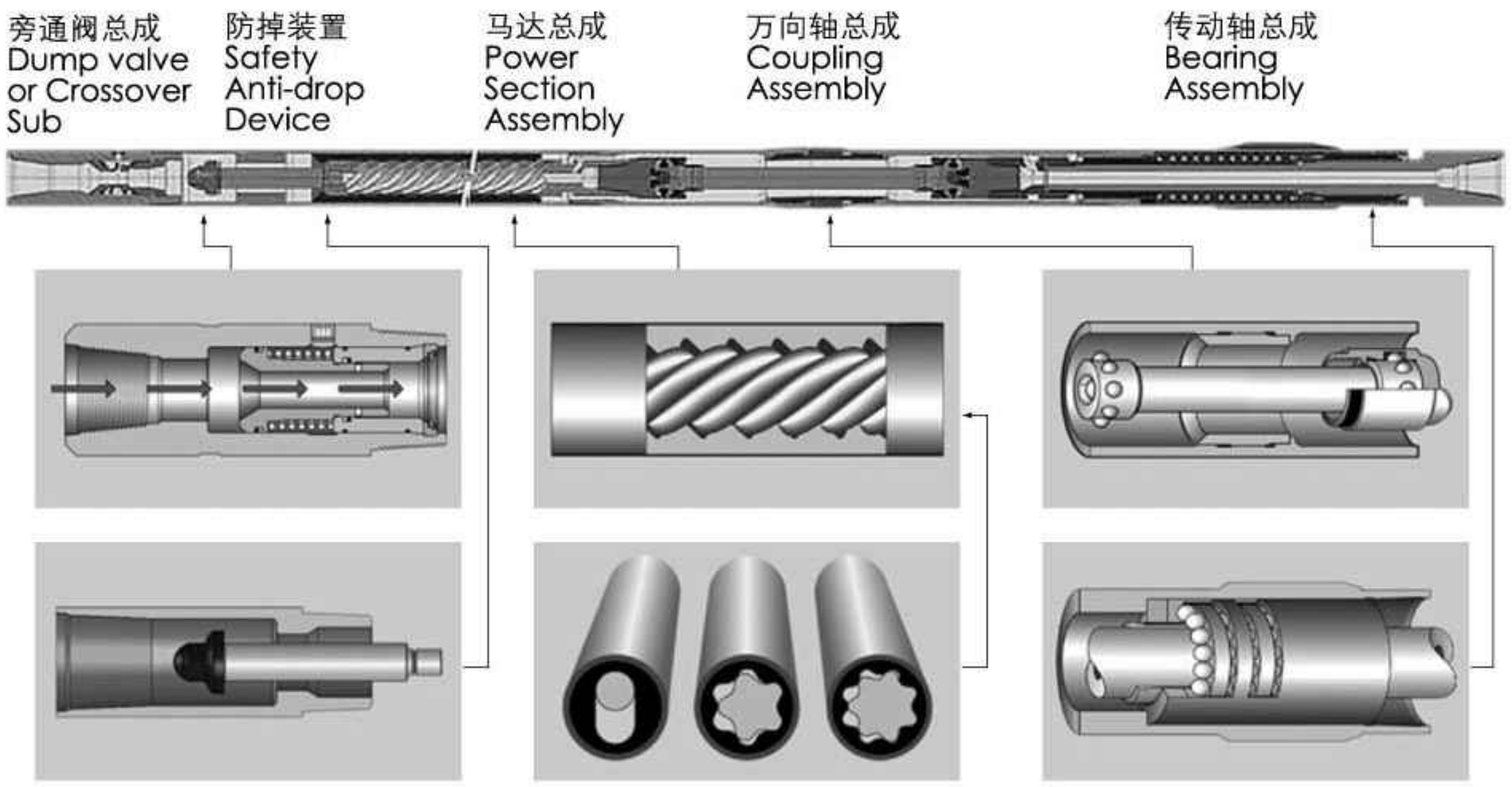


图1 (Fig.1)

3.1 旁通阀总成

它有旁通和关闭两个位置（如图2），在起下钻作业过程中处于旁通位置，使钻柱中泥浆循环绕过不工作马达进入环空，这样起下钻时泥浆不溢于井台上。当泥浆流量和压力达到标准设定值时，阀芯下移，关闭旁通阀孔，此时泥浆流经马达，把压力能转变成机械能。当泥浆流量值过小或停泵时，所产生的压力不足以克服弹簧力和静摩擦力时，弹簧把阀芯顶起，旁通阀孔又处于开启位置。一般情况下，深井、大斜度井、水平井以及使用中空转子时多采用代用接头。（如图2–1）

3.2 防掉装置

作用：由于异常原因造成壳体断裂、脱扣时，起到防掉的作用；同时使泵压升高，使地面及时发现问题，禁止开转盘（顶驱）防止防掉螺母倒扣，避免造成事故。（如图2–2）

3.3 马达总成

它由定子和转子组成。定子是在钢管内壁上压注橡胶衬套而成。橡胶内孔是具有一定几何参数的螺旋。转子是一根有镀铬硬层的螺杆。

转子与定子相互啮合，是用两者的导程差而形成的螺旋密封线，同时形成密封腔。随着转子在定子中的转动，密封腔沿着轴向移动，不断的生成与消失，完成其能量转换，这就是螺杆马达的基本工作原理。

马达转子的螺旋线有单头和多头之分（定子的螺旋线头数比转子多1）。转子的头数越少，转速越高，扭矩越小；头数越多，转速越低，扭矩越大。（如图3）是几种典型马达配合的截面轮廓：

3.1 By-pass Valve Assembly

It has two positions of by-pass and close (Fig.2). It is in by-pass position during trip operation, circulates mud fluid in the drill string into the annular space by-passing the idle motor, so that no mud may spray out onto the platform during the trip operation. When mud flow rate and pressure reach the setting value, the valve stem moves down and closes the valve. Meanwhile, mud stream flows through the motor, and converts the pressure energy into mechanical energy. As mud flow rate is too low, or mud pump stops, and as the created pressure is not enough to overcome spring force and static friction force, the spring presses the stem upward, and by-pass is in open position. In general, The cross-over sub are used in deep well and large angle well horizontal well or hollow rotor selected (Fig.2-1).

3.2 Anti-Drop-Device

Function: As an exception causes the shell fracture, tripping time, played the role of anti-drop; while rise the pump pressure and make the ground to find problems, prohibiting the opening of rotary table (top drive) to prevent anti-drop nut upside down to avoid accident. (Fig.2-2)

3.3 Power Section Assembly

It consists of stator and rotor. Stator is made by squeezing rubber sleeve on the wall of steel tube. There forms spiral structure with a certain geometric parameter. Rotor is a crome-plated screw rod.

Stator and rotor matches with each other, to form spiral line and seal cavity through their guide rail difference. With rotor running in the stator, the seal cavity is moving along its axial direction, continuously forms and disappears to complete its energy conversion. This is the basic principle of downhole motor.

Spiral seal line on rotor is divided into single end and multi-end (stator with one more end than rotor). The less ends the motor has, the higher speed and the lower torque is. The more ends it has, the lower speed and the higher torque is (Fig.3) shows the sectional profile of several typical motors.

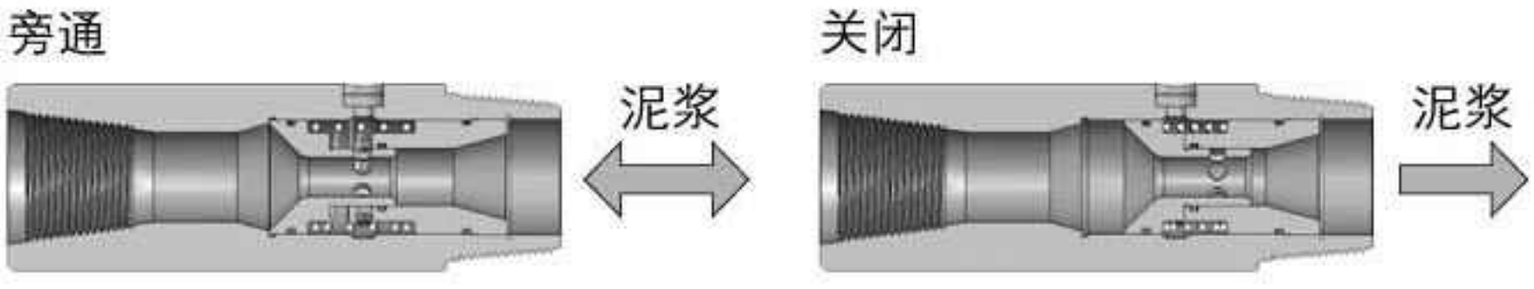


图2 (Fig.2) 旁通阀 (Bypass-Valve)

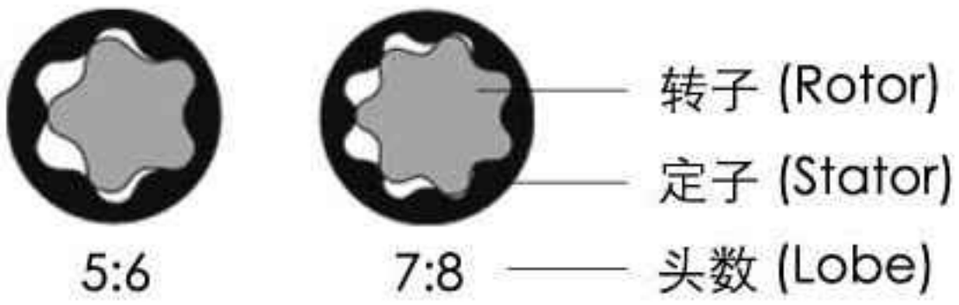


图3 (Fig.3)

马达总成 (Power Section)

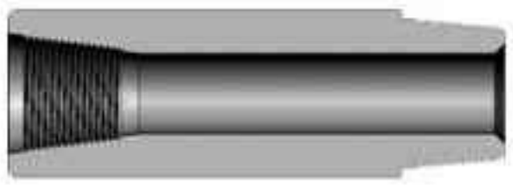


图2-1 (Fig.2-1) 代用接头 (Cross-Over Sub)

图2-2 (Fig.2-2) 防掉装置 (Anti-Drop-Device)

马达定子一个导程组成一个密封腔，也称为一级。每级额定工作压降为0.8Mpa，最大压降为额定工作压力的1.3倍，如四级马达，额定压降应为3.2Mpa，最大压降为4.2Mpa。压降超过此值马达就会产生泄漏，转速很快下降，严重时会完全停止转动，甚至造成马达损坏，用户应特别注意。

为了确保马达的密封效果，转子与定子之间的配合尺寸与不同井深的温度有关，因此在选择钻具时应尽可能准确地提供给厂家钻具应用场所的井温情况，以便推荐使用松紧配合状态适合的马达。现场使用的泥浆流量应在推荐的范围之内，否则将影响马达效率，甚至马达磨损加快。

马达的输出扭矩与马达的压降成正比，输出转速与输入泥浆量成正比，随着负

A guide rail forms a seal cavity in motor stator. This is called one stage. When the rated working pressure of each stage lows down to 0.8 Mpa, the maximum pressure loss will be 1.3 times of the rated pressure. For an example, for 4-stage motor, the rated pressure loss shall be 3.2 Mpa, maximum pressure loss shall be 4.2 Mpa. As the pressure loss is over such value, motor may bring about leakage and speed will quickly slow down. More seriously, it may cause operation into complete stop, even cause the motor to be damaged. This is the caution for the customers.

In order to ensure rotor seal in good condition, the matching size between rotor and stator relates closely to depth temperature. Therefore, correct downhole temperature shall be provided to the manufacturer for reliable selection of appropriate motor. The actual mud flow rate is required in the recommended range. Otherwise incorrect flow rate may affect the motor efficiency, even cause speeding up motor wear.

载的增加，钻具的转速有所降低，因此在地面只要根据压力表控制压力，根据流量计控制泵的流量，就可以控制井下钻具的扭矩和转速。

3.3.1中空转子马达

为了增加钻头的水马力和泥浆的上返速度，将转子加工成为带喷咀的中空转子。此马达的总流量应等于流经马达密封腔流量和流经转子喷咀流量的总和，每种规格的马达都有其推荐的最大和最小流量值。如果流量过大，转子会超速运转，定子和转子会出现提前损坏，如果流量过小，马达将停止转动。因此在选择转子喷咀尺寸时，应确保马达密封腔流量始终保持或高于最小推荐流量值，这样才能使马达正常运转。（如图4）

3.3.2 等壁厚马达 (定子)

为了改善螺杆钻具的使用寿命和运行效率，立林研发了等壁厚定子马达。此种设计具有以下优点：

- 良好的散热特性，提高了定子工作寿命。
- 均匀的橡胶膨胀，提高了定子工作稳定性。
- 单级承压高，提高了系统效率。
- 增加了橡胶与金属粘合面积，增强了粘合强度。（如图4-1）

图4 (Fig.4)
中空转子 (Hollow Rotor)

Motor torque is proportional to its pressure loss, but its outlet speed is inversely proportional to mud flow rate. With load increasing, screw drill speed decreases. Thus, pressure shall be controlled by the pressure gauge and flow rate shall be controlled by the flow rate gauge on the surface. This way may control both torque and speed of downhole screw drill.

3.3.1 Hollow Rotor Motor

To increase hydraulic horsepower and upward speed of mud stream, rotor is manufactured into hollow rotor with nozzles. Thus, motor total flow rate is equal to the sum of the flow rate through seal cavity and rotor. Each type of motor has its own recommended maximum and minimum flow rate value. If flow rate is too high, rotor may be running at an over speed, earlier damage would occur onto stator and rotor. If it is too low, motor will stop operating. Therefore, the flow rate through seal cavity shall be ensured or even higher than the recommended maintenance value, while selecting nozzle size. Only in this way, can motor be kept in normal operation.(see Fig 4)

3.3.2 Even wall power section(Stator)

Even wall power section invented by LILIN will extend running life of downhole motor and improve running efficiency of the motor.The characteristics are:

- Good cooling speciality improves the running life of the stator.
- Working stability is risen by even swell of the rubber.
- System efficiency is rised up by high pressure bear on single stage.
- Conglutinant size is increased by rising up the contact between rubber and the metal.(see Fig 4-1)

图4-1 (Fig.4-1)
等壁厚马达 (定子)
Even wall power section(Stator)

在泥浆密度、喷咀尺寸和马达流量为定量时，流经转子喷咀的流量和流经马达密封腔的流量总是随负载变化而变化的。钻头离开井底，马达负载近似为零，此时流经转子喷咀流量最小，而流经马达密封腔的流量最大。钻头钻进，使马达压差不断增加，使流经转子喷咀流量增加，而此时流经马达密封腔流量减少。

流经马达密封腔的流量为Qm，通过马达喷咀的流量Qz。

即：总流量Q=Qm+Qz

设定马达转速n值计算Qm值

$$QM = \frac{nq}{\eta v \times 60} (L/s)$$

容积效率 ηv 取 0.90

$\therefore$ Qz = Q − Qm (L/s)

喷咀直径

$$d = \sqrt[4]{\frac{898pQ_2^2}{\Delta P}} (mm)$$

Qm—马达密封腔流量 (L/s)

Qz—转子喷咀的流量 (L/s)

Q—中空转子马达的总流量 (L/s)

ηv—容积效率

马达压降△P=△Pst + △Pop

△Pst—马达启动压降(Mpa)

△Pop—马达工作压降(Mpa)

ρ —泥浆比重(kg/L)

计算公式中q为中空转子马达的每转排量(L/r)

其数值参（如表1）。

When mud density, nozzle size and total flow rate is a constant value, the flow rate through nozzle and seal cavity always changes with the load. When bit leaving hole bottom, the load is approximately zero. Whereas, the flow rate becomes the minimum through nozzle on the rotor, but the flow rate becomes maximum through the seal cavity. While the bit dropping down, motor pressure loss will continuously increase, and the flow rate through rotor nozzle will become higher, but the flow rate through the seal cavity will become lower.

Flow rate through seal cavity is Qm, Flow rate through nozzle is Qz.

Then, total flow rate Q = Qm + Qz

Suppose motor speed n, calculate Qm

$$QM = \frac{nq}{\eta v \times 60} (L/s)$$

Volumetric efficiency ηv is 0.90

So Qz = Q - Qm (L/s)

Nozzle diameter

$$d = \sqrt[4]{\frac{898pQ_2^2}{\Delta P}} (mm)$$

Qm—Flow rate of motor seal cavity (L/s)

Qz—Flow rate of rotor nozzle(L/s)

Q—Total flow rate of motor with hollow rotor (L/s)

ηv—Volumetric efficiency

Motor pressure loss △P = Pst + Pop

△Pst—Motor start pressure loss (Mpa)

△Pop—Motor operating pressure loss (Mpa)

ρ -Mud density (kg/L)

In the equation, q is flow rate of hollow rotor motor (L/r)

For the parameters, (see table-1)

按以上推荐计算公式，用户可以根据使用需要随时更换不同直径的喷咀，从而达到理想的效果。

Based on the above recommended equation, the customers can timely change different diameter nozzles according to the actual demand, so as to reach ideal effect.

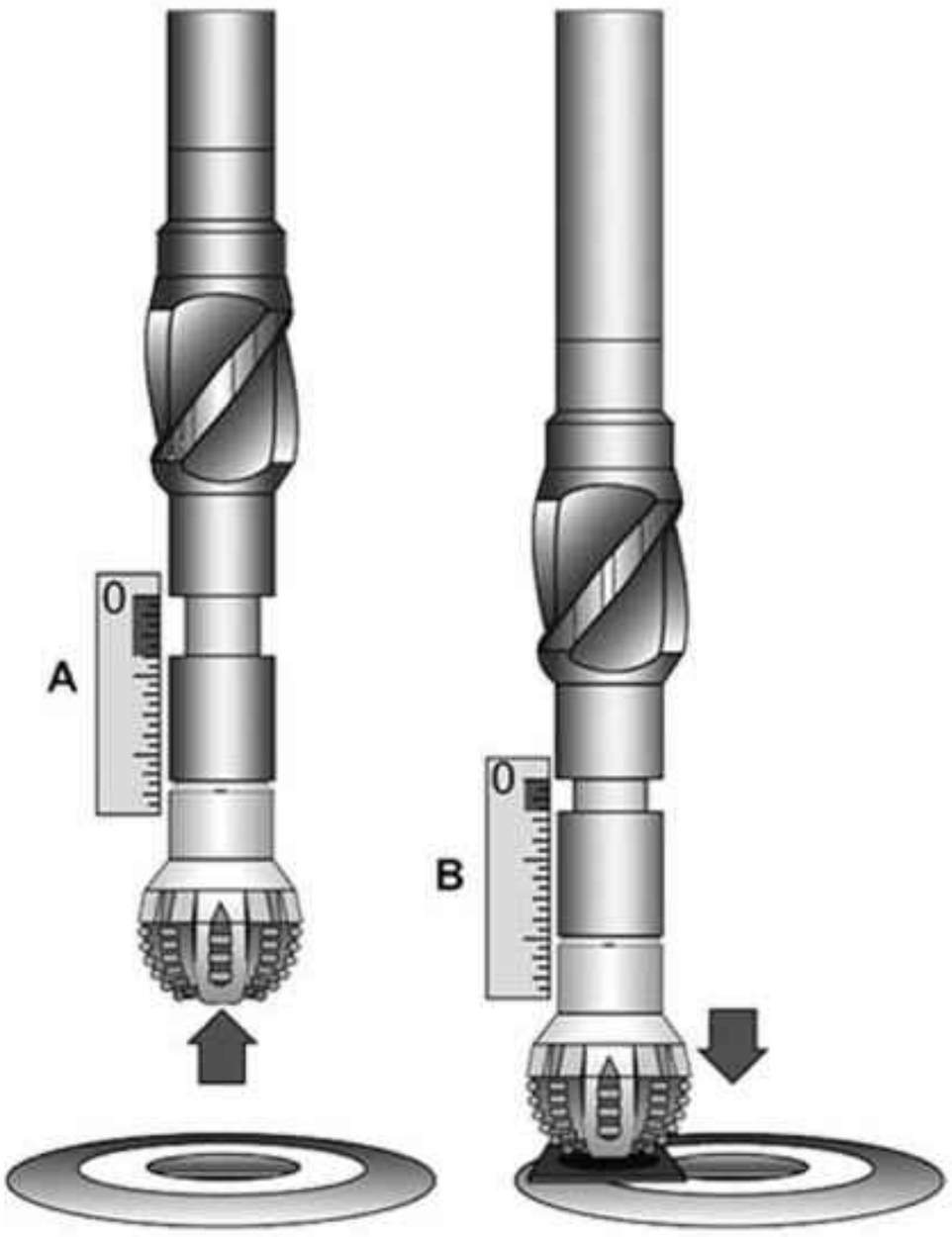
表1 中空转子马达每转排量估算:

(Table.1) Equation of Flow Rate of Hollow Rotor

5LZ 244 X 7.0 L		q = 20.3
5LZ 216 X 7.0 L		q = 17.1
5LZ 197 X 7.0 L	5LZ 197 X 14.0 L	q = 14.0
5LZ 172 X 7.0 L		q = 10.2
5LZ 165 X 7.0 L	5LZ 165 X 14.0 L	q = 8.5
5LZ 120 X 7.0 L	5LZ 120 X 14.0 L	q = 5.0
5LZ 95 X 7.0 L		q = 2.6
9LZ 95 X 7.0 L		q = 3.3
5LZ 89 X 7.0 L		q = 2.4
5LZ 73 X 7.0 L		q = 1.3

最大允许轴向轴承间隙说明：见图表2

Allowed Maximal Clearance of Axial Bearing:



间隙=A–B

Clearance=A-B

表2 (Table.2)

钻具型号 Size	间 隙 Clearance
Φ43mm	2mm
Φ54mm	3mm
Φ60mm	3mm
Φ73mm	3mm
Φ79mm	3mm
Φ89mm	4mm
Φ95mm	4mm
Φ105mm	4mm
Φ120mm	5mm
Φ140mm	5mm
Φ159mm	6mm
Φ165mm	6mm
Φ172mm	6mm
Φ197mm	7mm
Φ203mm	7mm
Φ216mm	7mm
Φ228mm	7mm
Φ244mm	8mm
Φ286mm	10mm

3.4 万向轴总成

万向轴的作用是将马达的行星运动转变为传动轴的定轴转动，将马达产生的扭矩及转速传递给传动轴至钻头。万向轴大多采用瓣形，也有采用挠轴形式的。天津立林钻具的瓣型万向轴采用线切割技术制成，切口平行度高，粗糙度可达 6.3 且不破坏金属化学成分，因此使用寿命高、机械损失小（如图5）。

钻具使用后，应立即拆卸，检查万向轴，如磨损量超过维修标准，应及时更换有关易损件，否则会因万向轴的使用过度致使钻具无法正常工作。

图5 (Fig.5)
球形万向轴 (Ball Drive Universal Shaft)

3.5 传动轴总成

传动轴的作用是将马达的旋转动力传递给钻头，同时承受钻压所产生的轴向和径向负荷。我公司制造的钻具传动轴总成有两种结构：

（1）钻头水眼压降为7.0Mpa，采用硬质合金径向轴承和中间有一组推力轴承的传动轴总成（如图6）；

（2）钻头水眼压降为14.0Mpa，采用硬质合金径向轴承和金刚石复合片（PDC）的平面止推轴承，其寿命更长、承载能力更高。

3.4 Universal Shaft Assembly

The function of cardan shaft is to convert planetary motion into fixed constant rotation of drive shaft, to transmit torque and speed from motor to the drive shaft, and to the bit. Cardan shaft mostly use flat shaft, but some are flexible shafts. Our flat type shaft used on our downhole motor is made by linear cutting technology. So the cut has high parallelism,Its roughness can reach 6.3 and it doesn't damage metal chemical composition. Thus, it has longer running life and less mechanical loss (Fig.5).

Downhole motor shall be disassemblied as quickly as possible after use to examine cardan shaft. If it is found out that wear degree is over maintenance standard, relevant consumable components shall be changed promptly. If not, downhole motor can not be running normally due to over run time of cardan shaft.

图5 (Fig.5)
瓣形万向轴 (Flat Universal Shaft)

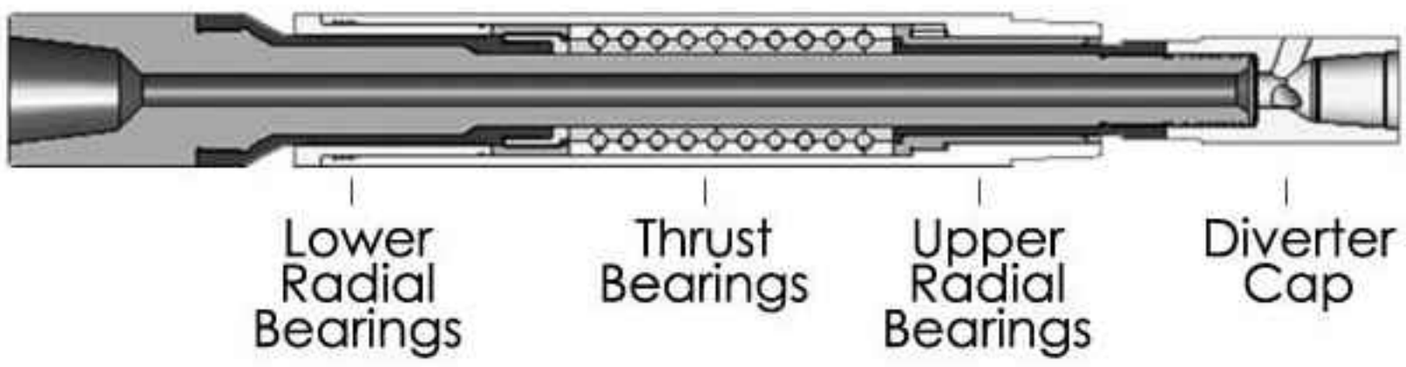
3.5 Drive Shaft Assembly

Drive shaft is used to transmit motor rotary dynamic force to the bit, meanwhile to withstand axial and radial load from drilling weight. We have two types of drive shafts, as follows:

1) Bit nozzle pressure loss is 7.0 Mpa, using hard alloy radial bearing and drive shaft assembly with thrust bearings (Fig.6);

2) Bit nozzle pressure loss is 14.0 Mpa, using hard alloy radial bearing and PDC cutter flat thrust bearing. It has longer lasting life and higher bearing capacity.

图6 (Fig.6)



4. 螺杆钻具型号说明

4. Model of Downhole Motor

□□LZ□x□-□□-□□□□□□□-L-□-□

导程
Lead distance

马达级数（用阿拉伯数字表示，如2,3,4,5……）：
Stages of power section （2,3,4,5 stage.....）

企业标志
Symbol of LILIN company

D–表示弯钻具弯角形式：
D-bend angle types
D–单弯（单弯壳体或弯接头）：
D-single bend （single bend housing or bend sub）
P–大偏移距同向双弯（弯接头+单弯壳体）：
P-large offset distance double bend housing in same direction（bendsub+single bend housing）
T–同向双弯：
T-double bend housing in same direction
S–异向双弯：
S-double bend housing in two directions opposite to each other
无–直钻具：
Omitted-straight motor

K–表示可调弯壳体钻具结构形式：
K-Adjustable bend housing

W–表示稳定器：
W-Assembled with stabilizer

H–表示可换稳定器：
H-Assembled with changeable stabilizer

F–表示转子中空分流（省略–转子非中空）：
F-Hollowed rotor （omitted：solid rotor）

G–表示钻具耐温特性（G–耐温150℃；省略–耐温120℃）：
G–heat-resistant performance：（G-150℃；omitted-120℃）

防掉形式（SF–双防结构、省略–为单防）
Anti -drop types：(SF-double anti-drop Omitted-single anti-drop)

产品改进次数（Ⅰ、Ⅱ、Ⅲ、Ⅳ、Ⅴ、Ⅵ、Ⅶ、Ⅷ……）
Design change times

钻头最大水眼压降（7.0 Mpa、14.0 Mpa）
Max bit pressure loss（7.0 Mpa、14.0 Mpa）

螺杆钻具规格（外径 mm）
Size of motor in millimeter（OD mm）

螺杆钻具产品代号
Code of motor

马达头数（1:2,5:6,9:10…）
Lobe for power section（1:2,5:6,9:10…）

马达形式（JC–加长马达、C–长导程马达、D–短马达、K–空气或泡沫马达、Y–油基泥浆、W–耐盐水泥浆、E–等壁厚马达、省略–常规）
Type of power section（JC-extended power section 、C-long guide rail、D-short power section、K-air or foam power section、Y-oil based mud、W–salty water based mud、E–even wall power section、omitted-conventional）

5. 使用须知

5.1 井场钻井技术人员和司钻必须了解钻具的结构原理和使用参数。按使用手册的要求合理使用钻具。

5.2 根据整个井眼的钻井作业计划，由钻井工程师根据任务结合地层结构、井眼孔径、深度、机械转速选定所用钻头与钻具型号，决定水眼直径和钻具组合。现场施工必须严格按制定的钻井作业计划执行。

5.3 对钻井液的要求：螺杆钻具的马达为容积式，决定钻具性能的因素是马达的输入流量和作用于两端的压力降，而不是钻井液的类型。钻井液的物理化学性能除个别有损钻具寿命外，一般不影响钻具性能，应注意考虑钻井工艺的需要。但钻井液所含的各种硬颗粒必须予以限制，因为它会加速轴承、马达的磨损而降低钻具的使用寿命，建议固相含砂量不超过1%（事实证明：若含砂量达到5%，钻具寿命会降低50%）。同时注意钻井液中不要混有各种气体，因为混有气体的钻井液在钻具中压力的变化下容易产生"气蚀作用"，加速钻具的损坏，尤其是定子橡胶更容易被气蚀坏，必须予以足够的重视。

5.4 使用钻头的选择：与螺杆钻具一起使用的钻头在选择上是十分重要的问题。因此螺杆钻具是否能成功的发挥作用的几个因素中，钻头与钻具的匹配是最重要的，希望能引起现场使用人员的重视。选择钻头与螺杆钻具配套使用的因素应是：

（1）钻井方案及计划；

5. Application Notices

5.1 Site drilling technical persons and drillers shall know well downhole motor structure principle and technical parameters, correctly apply downhole motor in accordance with requirements specified in this manual.

5.2 Drilling engineer shall make operation program upon the whole hole, and select the model of downhole motor and bit to be used , determine nozzle size and downhole motor combination according to formation edge structure, hole size, depth and mechanical speed. The determined drilling program shall be strictly carried out accordingly on the location.

5.3 Drilling Fluid Requirement: Downhole motor motor shall be volumetric. The key factor to downhole motor property is motor inlet flow rate, and the pressure loss functioning onto both ends. not the kind of drilling fluid. Physical and chemical property of drilling fluid, except the individual damage to downhole motor running life, normally does not affect its property.

This shall be considered for the need of drilling process. However, the content of hard grains in mud stream must be limited since they can speed up the wear of bearing and motor, may cause shortening downhole motor running life. It is suggested that solid sand content should not be over 1%(actually when sand content is 5%, running life will be reduced by 50%). Also, take care, not let drilling fluid mixed with any gas, because the fluid with gas may easily cause "Gas Erosion". It may speed up tool damage with change of pressure. In particular, the rubber on stator is more easily damaged by gas erosion. Enough attention shall be paid to this problem.

5.4 Bit Selection: For bit selection, it is important to combine and match downhole motor to be used. It relates to success of downhole motor application. It is advised site operators shall take care of this matter. Application factors to combine bit with downhole motor are as follows:

（2）针对地层需要的刃部结构；

（3）钻井液流通通道的结构；

（4）预先计划的机械钻速；

（5）使用该钻头，钻具运转的时间估算；

（6）钻头水眼压降的设计。

什么样的地层结构、地层软硬、使用哪类钻头、用什么样的刃部设计，请参考有关钻头的专业资料，这里仅就使用螺杆钻具完成各种钻井作业，对钻头的选择作些简要说明。

A：除了钻头水眼造成的压降外，要使钻井液流经钻头底部时别再形成其他较大的压力损失，尤其是钻头水眼压降已达到该型号钻具规定的压降值时更应注意。这对牙轮钻头不必担心，但是PDC钻头冠部液体通道的设计，就必须考虑通道过流面积是否可能造成额外过多的压力损失问题，同时并能保证岩屑及时排出及钻头冷却需要。

B：牙轮钻头：这类钻头在螺杆钻具配合使用时，更实用于钻井周期不长的作业，如定向造斜、侧钻等。

C：PDC钻头：PDC钻头不仅适用于定向造斜，更适用于钻井周期较长的作业，如打直井等。在较长周期的钻井作业中，最重要的因素就是钻头与钻具作为一个整体，不要由于其中的哪一部分出了问题，而造成不必要的起下钻。大家已熟知：复合片钻头较牙轮钻头寿命长，而且结构是整体的，具有很多优点。

D：提高钻具和钻头的使用寿命，也是一个重要因素。改善传动轴的稳定性，例如加稳定器，对提高钻具寿命发挥钻

(1) Drilling Plan and Program;
(2) Formation Edge Structure;
(3) Structure of Mud Flowing Channels;
(4) Determined Mechanical Drilling Speed;
(5) Estimation of Bit and Downhole motor Running Life;
(6) Design of Bit Nozzle Pressure Loss

Please refer relevant professional information for details of bit selection on formation structure. Hereby it briefly describes bit selection for performance of drilling operation with downhole motor.

A: Except bit nozzle pressure loss, in order to avoid producing higher pressure loss while drilling fluid flowing through bit bottom, attention shall be specially paid to this matter when the nozzle pressure loss has reached the specified loss value of this kind drilling tool. This does not affect rock bit, but for the crown passage design of PDC bit. The problem shall be considered that passing fluid area may cause much extra loss, meanwhile to ensure prompt discharge of cuttings and bit cooling.

B: Rock Bit: When this kind of bit is used with downhole motor, it is more appropriate to shorter drilling period, such as directional deflection and re-entry etc.

C: PDC Bit: It is not only used for directional deflection, but also more appropriate to longer drilling period, such as vertical well drilling. During longer period of drilling operation, the more important factor is to integrate bit and downhole motor. so as to avoid unnecessary trip operation due to some problem. It is known that PDC bit can last longer time than rock bit, and its integvity in structure, and more advantages.

D: It is also an important factor to prolong running life of bit and tool. It is helpful to extend screw life and to develop bit property by improving stability of drive shaft, e.g. stabilizer. And what shall be considered is the close relationship between diamond geometric dimension, allocation,drilling weight load and the required high speed and lower drilling weight of downhole tool. In general, it is hard to obtain satisfactory effect without strictly

头性能是有帮助的。考虑钻头金刚石的几何尺寸、布置方位、钻压负荷与要求井下钻具转速高、钻压小的甚密关系。总之，使用螺杆钻具不对所匹配的钻头进行认真选择，要想取得满意的效果是困难的，还会造成钻具过早地损失。

5.5 对井底环境温度的要求：温度过高对钻具马达性能十分不利，会使所有不利因素加剧。使用油基泥浆液，井底温度低于95℃，钻具工作状态最佳。当温度超过150℃时，即使使用最佳的油基钻井液，甚至使用水基钻井液，钻具定子寿命也会大幅度缩短。

为使钻具在较高的油基钻井液下正常工作，可以采用分段下钻，间歇循环，使用带分流孔的空心转子，以加速循环或改善钻井液的散热性及其它性能的方法。保证实际定子工作温度低于极限值。

我公司生产两种定子。一种是普通定子，额定温度为95℃，最高温度120℃。一种是耐高温定子，额定温度105℃，最高温度150℃。

5.6 对钻井液流量的要求：螺杆钻具特点之一，输出转速与输入钻井液流量成正比。每种钻具都有一定的有效工作流量范围，建议按推荐参数进行选择，否则会降低钻具的工作效率和使用寿命。

5.7钻井液压力与钻压的特点：钻具进行空运转时，若保持泥浆流量不变，钻具与钻头的压降为一个常数，该值随钻具型式和规格的不同而有所不同。钻具工作时，随着钻压逐步增加，钻井液循环压力逐渐上升，该压力的增量与钻压或

matching bit and downhole motor, it can also cause earlier damage to the tool.

5.5 Requirement for Hole Bottom Temperature: It is unfavorable to the motor property, and it may intensify all disadvantageous factors if temperature goes too high. When using oil based mud, the hole bottom temperature shall be lower than 90℃, downhole motor shall be working in optimum condition. When temperature is over 150℃, stator life may be greatly shortened, even by using optimum oil based mud or using water based mud.

In order to keep downhole motor working normally at high temperature of oil based mud, the way shall be adapted to conduct trip-in by sections and intermittent recycling , to ensure the actual temperature of stator below the ultimate value by using hollow rotor with splitter hole to speed up recycling or improve heat radiation of the fluid and other property.

Our company manufacture two kinds of stators. One is conventional stator, with 95℃ of rated temperature and 120℃ of maximum temperature; another is hi-temperature stator, with 105℃ of rated temperature and 150℃ of maximum temperature.

5.6 Requirement for Flow Rate of Drilling Fluid: One of the downhole motor features is that the output speed is proportional to the input flow rate of drilling fluid. Each downhole motor has a certain effective range of working flow rate. It is advised to choose the range according to the recommended parameters. Otherwise, it may shorten the downhole motor's working efficiency and running life.

5.7 Features of Drilling Fluid and Drilling Weight: When downhole motor is in idle working condition, if keeping fluid flow rate unchanged, the pressure loss caused by both bit and downhole motor shall be a constant value. This value changes with the difference of drill model and specification. As downhole motor is running, fluid recycling pressure will gradually increase with gradual rise of drilling weight. The increment of pressure is

钻进所需扭矩的增量成正比，当达到最大推荐值时，产生最佳扭矩。继续增加钻压，当循环钻井液在马达两端产生的压降超过最大设计值时，钻具将发生泄漏。正常工作时，表压随钻压的增减而升降。如果泵压表突然增加了几兆帕，继续增加钻压，泵压不再增加，这说明钻具发生了泄漏，此时钻具定子与转子间密封破坏，钻井液通过破坏的马达密封腔从钻头水眼中流出。当因故障卡钻时，钻井液在钻具制动情况下，仍可以继续循环流过钻具。一旦钻具发生制动，应迅速将钻具提离井底降低钻压，因为钻井液长时间流过不转的马达会使钻具严重损坏。

另外，要使钻具获得最佳工作效率，应将钻具两端的压差控制在推荐参数范围内。

5.8 预先进行必要的水利计算：钻井作业时，由泥浆泵泵出的钻井液依次经立杆、水龙头、方钻杆而进入钻杆、钻铤、无磁钻铤、钻具（马达）、钻头水眼及环空而返回地面。在钻井液不断循环过程中，由于钻井液本身的摩擦和钻井液与管壁、井壁的摩擦及各局部流动造成的损失，皆需消耗一定的能量。这一能量损失以压力损失表现出来。累加各部分的压力损失后可计算出总的压力损失，按预计钻井深度算出总压力损失后，就可以作为确定泵压的一个参数，这种大量的压力损失计算是很繁琐的。对于现场操作者来说可以采用一种简便的做法，只要将钻头稍稍提离井底，在额定排量下，

proportional to the torque increment needed by drilling weight and stripping in. When it reaches the maximum recommended value, optimum torque shall be produced. If drilling weight goes on rising, when the pressure loss of recycling fluid at both ends of motor is over maximum design value, leakage shall occur from the downhole motor. In normal operation, the gauge pressure rises with the drilling weight up and down. If the gauge shows sudden rise of temperature to several Mpa, when the drilling weight goes on increasing, pump pressure shall no longer increases. This indicates there occurs some leakage from downhole motor. The seal between stator and rotor may be changed, and fluid may be flowing out from bit nozzle while going through the damaged seal cavity. When it is sticking due to this problem, fluid is still recycling through downhole motor since downhole motor's braking. Once downhole motor brakes, it shall be quickly lifted away from the hole bottom to reduce drilling weight, since downhole motor may be seriously damaged with fluid flowing through the idle motor for longer time.

Additionally, the pressure loss at the bottom ends of downhole motor shall be controlled within the recommended range, to ensure downhole motor in optimum working efficiency and running life.

5.8 Early Hydraulic Calculation: In drilling operation, the pumped mud flows successively through riser, swivel, kelly into drill pipe, collar, non-magnetic collar, motor ,bit nozzle and annular space, and upwards to the surface. During recycling, the loss caused from the friction of fluid its own and the friction of fluid onto the pipe wall, hole wall and/or partial flow will consumes a certain energy.

The energy loss will be shown from the pressure loss. Total pressure loss can be calculated by accumulating pressure loss in each portion. After calculation of total pressure loss according to the determined drilling depth, it can be a parameter to determine the pump pressure. It is complicated to calculate large

主管压力表上的读数值就是上述总压力损失值。

6. 钻具的使用方法

在选择钻具及其组合方案时，应制定钻井作业计划，充分考虑井眼轨迹、钻头类型、规格、地层结构和水利计算等细节。

6.1 钻具下井前的地面检查；

6.1.1钻具除提升短节与旁通阀连接外，其他部分的壳体连接均涂以锁紧剂。

6.1.2用钻头装卸器把钻头装上，只许用链钳转动钻具传动轴头，而且只能逆时针旋转（俯视旋向，下同），以防止内部螺纹松扣。

6.1.3吊起提升短节，把钻具放入转盘中，把旁通阀置于转盘中易于观察的位置。用卡瓦把钻具卡牢，卸去提升短节。

6.1.4检查旁通阀：用锤柄或木棒向下压旁通阀芯，从上部向旁通阀注满水，此时旁通阀应不漏，水面无明显下降，然后挪走木棒，阀芯应被弹簧弹起复位，所注水应从侧面各孔均匀流出，即可认为正常。

6.1.5接方钻杆并下放，使旁通阀位于钻杆下方便于观察的地方，开动钻井泵，逐渐提高排量直到旁通阀关闭，上提钻具，看钻头是否转动，此时旁通阀处于“关闭”位置。

不应有钻井液从旁通孔流出，检查的目的仅是看钻头是否旋转，不必持续很长时间，操作过程中应避免钻头与井口防喷器、井口管线接触、碰撞。停泵

amount of pressure loss. Therefore, the site operator can adapt a simple method. Only by lifting the bit a little bit from the bottom, the reading on the pressure gauge of main pipe shall be the mentioned total pressure loss at the rated flow rate.

6. Application

When selecting the downhole motor and its combination, you should work out drilling program, fully consider hole size, hole trace, bit type, specification, formation structure and hydraulic calculation.

6.1 Surface Checking Before Tripping in

6.1.1 Except lifting the connections between nipple and by-pass valve, other connections on shell of downhole motor shall be coated with locking agent.

6.1.2 Assembly bit on the handling device, counter clockwise rotate the drive shaft ends only with chain wrench to protect the inside threads from loosening .

6.1.3 Hoist lifting sub and put downhole motor into turntable and by-pass valve into the center in easy watch position. And then clamp tightly downhole motor with slips, and disassembly lifting sub.

6.1.4 Check by-pass valve: Press downward the valve stem with hammer handle or wood stick. Fill water from the top into the valve, there should no leakage from the valve and no great drop of water level .And then loosen the stick, the valve stem is springed up to its original position. The filled water shall flow out evenly from the side holes. This is normal .

6.1.5 Connect and low down the kelly. Put by-pass valve under the kelly in easy watch position. Start pump, and gradually increase flow rate till by-pass valve is closed. Lift the downhole motor to watch bit rotating. Now by-pass valve is in "close" position.

There should be no fluid flowing out of by-pass hole. To do this is only for checking bit rotation. It should not last longer. In the operation, it should prevent the bit from touching wellhead blowout preventer and flow line. After pump stops, check by-pass valve in open position or

后注意观察旁通阀是否再次打开，使钻井液从旁通孔排出。泵未完全停止之前，不要把旁通阀提到转盘以上，防止污染井台。

6.1.6卸下方钻杆，按设计的钻具组合，分别把弯接头、无磁钻铤、稳定器等接好。将弯接头拧入旁通阀之前，如果用斜口管鞋座造斜，应检查造斜键，保证斜口管鞋座处于正常的工作位置，并保证与接头的弯头刻线对准。

在所有钻具组合及钻杆连接过程中，注意防止粘扣错扣。为防止操作中移扣，建议装卸过程中应牢记：钻头接头相对于壳体的旋向为俯视反时针方向。违反此项规定，如反向转动转盘或用转盘旋紧马达以上的扣等，就会造成钻具内部零件的松扣或脱扣，请用户注意。

6.2 把钻具及其组合下到井眼里：尽管钻具本身外形简单，且有足够的刚性，司钻下放钻具时，仍需控制下放速度，否则易被井眼中的沙桥、井眼台肩、套管鞋所损坏。遇有这样的井段，往往需开动钻井泵，慢慢地扩大井眼再通过。

如果用弯接头或弯壳体，钻头侧面就更容易碰上井壁的硬岩层和套管鞋等，因此要周期性的转动钻具组合，以消除侧钻的影响。

对于深井和高温井，下放钻具时建议周期性地进行中途循环，这样可以防止钻头堵塞，或因高温造成钻具定子损坏。

在井内，钻井液若不能迅速通过旁通阀阀口，进钻柱中，应减慢下井速度，或不时停下来充灌泥浆，下钻时，注意

not. and fluid flowing out of by-pass valve or not. Do not lift the valve over turntable until pump completely stops as to protect the platform from pollution

6.1.6 Disassembly kelly and combine the downhole motor in accordance with the program. Connect bent sub, non-magnetic collar and stabilizer etc. separately . If you make deflection with muleshoe, before twisting bent sub into by-pass valve, you should examine deflecting key to ensure muleshoe sitting in normal working position, and align the scale line of connector and bent sub.

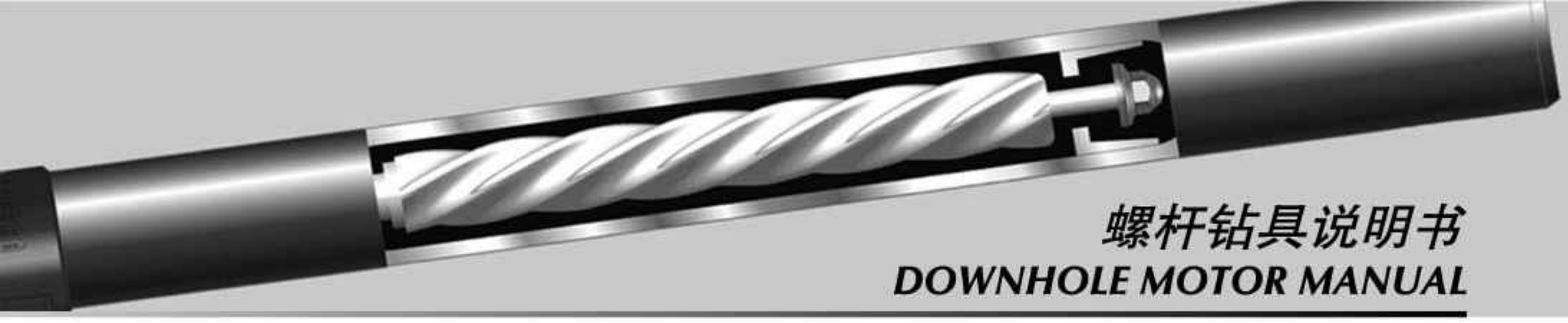
During the period of downhole motor combination and drill pipe connection, pay attention to avoiding thread gluing and alternation.

In order to prevent thread from moving in the operation, it is advised to keep in mind: Rotary direction of bit sub opposite the shell is counter clockwise. If you rotate turntable or clamp motor with turntable in wrong direction, thread loosening and thread off will occur on parts inside the downhole motor. This is the caution for the customers.

6.2 Trip in the combined downhole motor into borehole: Even though the outside of downhole motor looks simple and it has enough rigidity, it still needs controlling trip-in speed ,when drillers are stripping in downhole motor. Otherwise, the downhole motor may be damaged by san bridge, hole shoulder or casing shoe in the hole. When this happens, it is usually required to start pump, slowly to extend the hole for its passing.

If it is a bent sub or bent shell, it is easy for bit side to touch the hard rock status and casing shoe etc on the bore wall. So periodically rotate downhole motor combination to eliminate the influence of lateral drilling.

As to deep and hi-temperature well, it is advised periodically to conduct middle way recycling while stripping in the downhole motor. Thus, this can protect the bit from plugging or protect stator from damaging due to high temperature.



不可墩钻或将钻具直接放进井底。

6.3 开动钻具：如果钻具处于井底，必须提起0.3-0.6m，开动钻井泵此时记下立杆压力表读数，与计算的压力值对比一下，如果超过水力计算的压力数值也是正常的，这是钻头侧钻引起的。

清理井底，尤其是打斜井，井底必须足够“干净”，因为井底堆积或沉淀的岩屑影响转速或造斜。最好用正常的钻井液循环清理，清理时也可慢慢转动钻具或钻具分次转动（每次转动30° ~40° ），依次地把堆在井底的物体清理干净。

清理干净后，再把钻具上提0.3-0.6m，校对压力值，记录下来。

重新下入井底并逐步加井压，马达扭矩增加，立杆压力表压值升高，这个升高的压力值应符合各型号钻具规定的马达压降值，此压力表增大的数值反映了马达的负载是否正常，也反映钻压加的是否合适，因此保持马达转距基本稳定，钻压基本稳定，只要把立杆压力表读数限制在所选钻具推浮范围内就可以了。它能使司钻及时了解钻具工作情况。

钻头不在井底时，如果循环压力低于计算值，可能是旁通阀处与"开位"或钻杆损坏，井漏等造成的。

如果循环压力高于计算值，而且侧钻造成压力升高的因素已排除，循环压力仍高于计算值，则可能是钻头水眼被堵或传动轴被卡死，此时循环压力要比计算压力高得多。

6.4 起钻：钻具起钻过程类似常规操作。起钻时，旁通阀处于开位，允许钻柱中

In case the fluid can not rapidly flow through the holes of by-pass valve in the borehole, the strip-in speed should be slowed down or suspended regularly for mud filling. Again in stripping in, take care, there occurs no percussion or direct strip-in.

6.3 Start Downhole motor : If downhole motor is located at the hole bottom, you must lift it for 0.3-0.6m. Then start the pump and record the readings of riser pressure. As compared with the calculated pressure value, it is also normal if it is over the pressure of hydraulic calculation. This is caused from lateral drilling.

Clear the hole bottom. In particular, for slant hole, the hole bottom must be very "clean", since the cuttings packed and deposited in the bottom affect the torque or deflection. It is best to clean it with normal recycling. While cleaning, slowly turn the downhole motor or turn it by times(turning 30° - 40° each time), gradually to clean up the bottom. Then lift downhole motor for 0.3-0.6m, calibrate and record the pressure value.

Gradually enhance drilling weight when tripping into the bottom again. Meanwhile, motor torque increase, riser pressure on gauge increases, too. The pressure value should conform with the motor pressure loss specified for any type of downhole motor. The increased value on the gauge indicates motor load is normal or not, and also shows the added weight is appropriate or not. Therefore, motor torque and drilling weight shall be kept stable only by limiting the riser gauge reading to the recommended range. This makes drillers know downhole motor operation timely.

When the bit is not at the bottom , if recycling pressure is lower than the calculated value, it is possible that by-pass valve locates in "open" position, or it is caused by drill pipe damage or well leakage etc.

If recycling pressure is higher than the calculated value ,but still over the calculated value, and the factor of pressure rise caused in re-entry is eliminated, possibly the bit nozzle is plugged or drive shaft is sticked . Now

的钻井液泻入环空。但是钻具本身不能排出钻井液，通常在起钻前在钻柱上部注入一段加重钻井液顺利排出。

6.4.1在钻具提出到旁通阀位置后，卸下旁通阀口上各部件，先用清水从旁通阀顶部进行冲洗，然后使用木棒或锤柄等将阀芯按下、松开使其移动无阻。清洗完毕，拧上提升短节，提出钻具。

6.4.2装好钻头装卸器，卡牢钻具外壳，反转钻头（俯视反旋）把马达中残存的泥浆从旁通阀排出，卸下钻头。

6.4.3卸下钻具，从传动轴孔中冲洗钻头，将传动轴水帽及轴承清洗干净，然后平放钻具，正常维护保养待用。若暂停使用或长时间搁置不用，建议向钻具内注入少量矿物油防锈（注：不允许加入柴油）。

6.5 用钻具井的故障分析：

如前所述，钻井液循环压力变化反映在立杆压力表上，它可以帮助现场人员辩别井底发生的情况和问题，事实证明：正确的判断可以节省大量起下钻所耗费的时间和成本。综合考虑钻具使用过程中的各种因素，归纳为（表3）。供用户参考。

recycling pressure is much higher than the calculated value.

6.4 Trip Out: Downhole motor tripping out is similar to the conventional trip-out. By-pass valve is in open position in stripping out. The fluid in string is allowed to be drained into annular space. But downhole motor can not rapidly discharge the fluid by itself. Usually a section of heavy fluid is added into the top of string before stripping out, to press the fluid in the pipe smoothly to drain.

6.4.1 After downhole motor stripped out to the location of by-pass valve, disassembly the parts on the top of valve holes. Firstly wash it from the valve top with clean water, and then press down the valve stem with hammer handle or wood stick, loosen it for free movement. As soon as cleaning is completed, twist lifting nipple and trip out the downhole motor.

6.4.2 Install the bit assembly and disassembly device to clamp the shell of downhole motor. Turn the bit in counter rotation to drain the residual mud from by-pass valve, and then disassembly bit.

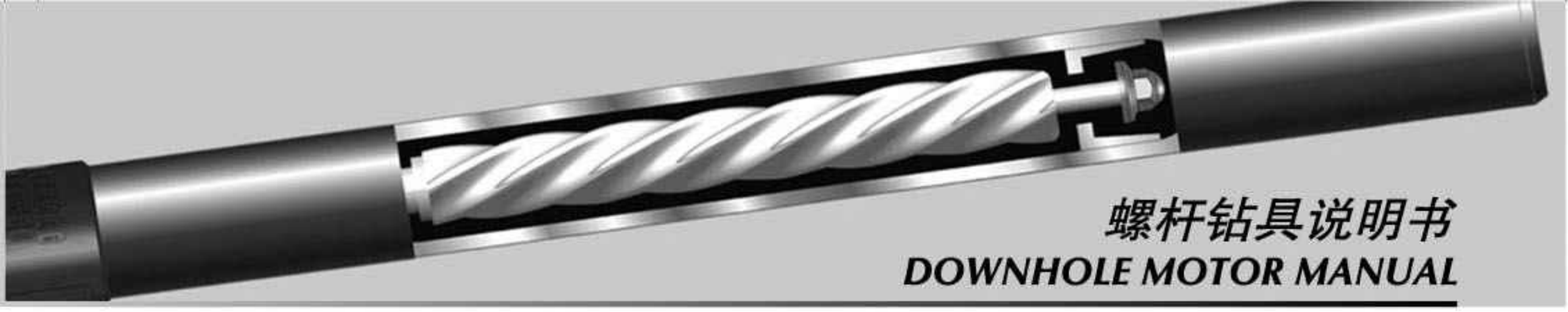
6.4.3 Disassembly downhole motor. Wash it from the holes of drive shaft, to clean the cap of drive shaft and bearing. Then handle the downhole motor onto a flat place. It is stand-by after repair and maintenance. It is advised to inject small quantity of mineral oil (not allow adding diesel) into downhole motor against rusting, if it is not used temporally or if it is stored for a longer time.

6.5 Troubleshooting

As mentioned above, the change of fluid recycling pressure is indicated from the pressure gauge of riser. This may help site operators identify what is happening at the bottom. In fact, correct identification can save tripping time and cut down the costs. Complex trouble shooting is shown in (Table-3) for customers reference.

表3：钻具故障分析表　(Table.3): Troubleshooting

异常现象 Problems	可能原因 Possible Causes	判断及处理方法 Troubleshooting
压力表压力突然升高 Gauge pressure loss sudden rise	马达失速 Motor speed loss	把钻具上升0.3–0.6m，核对循环压力，逐步加钻压，压力表随之逐步升高，均正常，可确认是失速。 Lift Downhole motor for 0.3-0.6m, examine recycling pressure, slowly enhance drilling weight. If gauge pressure rises accordingly in normal condition, the problem is speed loss.
	马达传动轴卡死，钻头水眼被堵 Motor drive shaft sticked tightly and bit nozzle plugged	把钻头提离井底，压力表读数仍很高，只能提出钻具检查或更换钻头。 Lift bit away from the bottom. If gauge pressure is still too high, only lift out the drill for checking or to change the bit.
压力表慢慢地增高（不指随钻井深度增加而增大的正常压降） Gauge pressure slowly increasing (not means increase of the normal pressure loss with the increase of drilling depth)	钻头水眼被堵 Bit nozzle plugged	把钻头提离井底，再检查压力，如果压力仍然高于正常循环压力，可以试着改善循环流量或上下移动钻杆，如无效只得取出修理、更换。 Lift bit away from the bottom, again examine the pressure. If the pressure is still over recycling pressure, try to improve recycling flow rate or to move the drill pipe up and down. If it is not solved, only lift out the drill for repair or change.
	钻头磨损 Bit wear out	继续工作，细心观察，如仍无进尺，只能取出更换。 Go on operating for careful watch. If still no footagerate, lift out the drill for change.
	地层变化 Formation change	把钻头稍稍上提，如果压力与循环压力相同，则可继续工作。 Lift the drill a little bit. If the pressure is same with recycling pressure, it may go on working.
压力表压力缓慢降低 Gauge pressure slowly drops	循环压力损失变化 Fluctuation of recycling pressure loss	检查钻井液流量。 Examine fluid flow rate.
	钻杆损坏 Drill pipe damaged	稍提钻具，压力表读数仍低于循环压力，提出井眼检查。 Lift the drill a little bit. If the gauge pressure is still lower than recycling pressure, lift it out for examination.



异常现象 Problems	可能原因 Possible Causes	判断及处理方法 Troubleshooting
没进尺 No footage rate	地层变化 Formation change	适当改变钻压和循环流量（注意必须在允许范围内）。 Appropriately change drilling weight and recycling flow rate (Note: it must be within the allowable range).
	马达失速 Motor speed loss	压力表读数偏高，钻具提离井底，检查循环压力，从小钻压开始，逐步增大钻压。 Gauge pressure increases, lift the drill away from the bottom, examine recycling pressure, to increase drilling weight gradually.
	旁通阀处于“开位” By-pass valve in OPEN position	压力表读数偏低，稍提起钻具，起停钻井泵两次仍无效，则需要提出井眼更换检查旁通阀。 Gauge pressure is too low, lift the drill a bit and start and stop the pump twice. If it is not solved, lift it out to check or change by-pass valve.
	万向轴损坏 Cardan shaft damaged	常伴有压力波动，稍提起钻具，压力波动范围小些，只能取钻具，检查更换。 Often with pressure fluctuation, lift the drill a bit, less fluctuation range. Only lift it out for examining and changing.
	钻头磨损 Bit wear out	更换新钻头。 Change new bit.

7. 定向井螺杆钻具的使用

定向钻井就是沿着预先设计的井眼轴线钻到目的层的钻井方法。要实现这个目标除螺杆钻具，还需要组成钻具组合的浮动接头、弯接头、钢钻铤、无磁钻铤、稳定器、钻头以及测量系统等配套工具和设备。我公司生产的螺杆钻具仅是完成这项工作的主要工具之一。

7.1 我公司生产的螺杆钻具可以满足定向钻井的各项需要。

7. Application of Steering Downhole Motor

Directional drilling is a way to drill the target along with the designed axial line. To do this, except for applying downhole motor, it is required to use a complete system, combined with float sub, bent sub, steel collar, non-magnetic collar, stabilizer, bit as well as MWD system. Our downhole motor is one of the drilling tools to perform this operation.

7.1 Our downhole motor meets the demands of directional drilling.

7.2弯接头是有弯曲角度的接头短节，其公扣拧入钻具上部。弯接头上部再接钻铤，这样在钻铤及钻具间形成一个角度，这个角度对决定定向斜角起主要作用。弯接头的角度为0° ~3° ，可以由用户自己决定。弯接头角度的选择应考虑井眼尺寸、井斜角变化的要求、所用钻具估计能完成的进尺等因素。弯接头的角度直接影响井眼尺寸、井斜角和井斜角的变化率。（见表4）

7.2 Bent sub is composed of bent nipples, with its male thread onto the top of the drill. The top of bent nipple is connected with collar. Thus, there forms an angle between collar and the drill. This angle plays a key role in determining directional oblique angle. The angle degree of bent sub ranges from 0° to 3° which is decided by the customers. The factors of change of hole size, hole deviation angle and footage rate shall be considered in selection of bent subs. The angle of bent sub may directly affect the hole deviation angle and inclination change (See Table-4).

表4 弯接头角度，井斜角变化率/30m

(Table.4) Bent Sub Angle and Inclination Angle Chane/30m

弯接头角度 Bent Sub Angle	120(4 3/4") Downhole Motor		165(61/2") Downhole Motor		197(7 3/4") Downhole Motor	
	井眼尺寸 Hole Size	变化率 Change	井眼尺寸 Hole Size	变化率 Change	井眼尺寸 Hole Size	变化率 Change
1°	152.4(6)"	3° 30'	222.3(8 3/4)"	2° 30'	250.8(9 7/8)"	2° 30'
1° 30'		4° 45'		3° 30'		3° 45'
2°		5° 30'		4° 30'		5° 00'
1°	171.5(6 3/4)"	3° 30'	250.8(9 7/8)"	1° 45'	269.9(10 5/8)"	2° 00'
1° 30'		4° 00'		3° 30'		2° 30'
2°		5° 00'		4° 45'		4° 15'
2° 30'		5° 45'		5° 00'		5° 30'
1°						
1°	200(7 7/8)"	2° 30'	269.9(10 5/8)"	1° 15'	311.2(12 1/4)"	1° 45'
1° 30'		3° 30'		2° 00'		2° 30'
2°		4° 30'		3° 00'		3° 30'
2° 30'		5° 30'		4° 00'		5° 00'

如果弯接头有斜口管鞋造斜键，应当检查一下这个件要对正弯接头上的刻线，这样可以保证定向方位的正确，并在运转前记录下来。

If the bent nipple has muleshoe key on it, you should examine the alignment between the key and bent sub, to ensure correct directional azimuth. If using magnetic deflection, you should examine the interaction between the alignment line and polarity of the magnet inserted in the collar, and record it before operation.

7.3 反扭矩对定向钻井的影响：钻具组合，通过钻杆下到预定定向造斜深度，从预定深度到井台在反扭矩的作用下产生变形。施加钻压时，钻具输出一定的扭矩，那么大小相同方向相反的反扭矩就作用在整个钻具组合及钻杆上，造成它们的扭转变形，因此必然影响定向的方位。在定向钻井工作中，为了保持正确的方向，必须考虑扭矩。由反扭矩造成的反扭角的大小取决于：

- 钻压。
- 钻杆的类型与长度 。
- 井斜角的大小。
- 钻铤和重钻的类形和长度。
- 装有扶正器时，扶正器的数量和长度钻柱的反扭角可以粗略地参照（表5）的数值。

7.3 Influence of Opposite Torque to Directional Drilling: The downhole motor combination will be stripped in with the drill pipe into the scheduled depth of directional deflection, deforming under the reaction of opposite torque from the schedule depth to the platform. When enhancing drilling weight, the drill may output a certain torque. Thus, the opposite torque of same force and reverse direction will react on the combination, causing torsion deformation. This will, of course, affect the directional azimuth.

During the period of directional drilling, the opposite torque shall be considered to ensure correct direction. The degree of opposite torsion angle caused by the opposite torque depends upon:

- Drilling weight
- Type and length of drill pipe
- Size of deviation angle
- Type and length of collar and heavy drill pipe
- The quantity and length of centralizer, when completed with centralizer for the opposite torsion angle of drill string, refer the data in (Table-5).

表5 钻柱反扭角估算

(Table.5) Estimation of Opposite Torsion Angle on String

开始造斜深度(m) Initial Deflection Depth (m)	估算反扭角 Estimated Opposite Torsion Angle
0-152	Left Turn 20° 左旋20°
>152-305	Left Turn 25° 左旋25°
>305-475	Left Turn 35° 左旋35°
>475-1524	Left Turn 50° 左旋50°
>1524-full well depth >1524-全井深	Left Turn 10° /305m 左旋10° /305m

如果在预定方位井斜角下继续造斜而造斜过程中出现偏离预定方位的情况，建议用（表6），它可获得最有效的方位变化，而又很少影响井斜角的变化。

If deviation of scheduled direction occurs, during on-going deflection with the planed deviation angle, it is advised to refer (Table-6) to obtain effective azimuth change, which is less affecting the deviation angle.

表6 已有井斜角时（纠偏）反扭角的估算
(Table.6) Estimation of Opposite Torsion Angle with Deviation

井 深 Well Depth	井 斜 角 Hole Deviation Angle	从井眼的高点调整钻具 Adjust the Drill from Top of Hole	
		向左纠偏 Left Correction	向右纠偏 Right Correction
地面-305 Surface-305	2° –5°	Left Turn 40° 左转	Right Turn 140° 右转
	5° –10°	Left Turn 40° 左转	Right Turn 135° 右转
	10° –15°	Left Turn 40° 左转	Right Turn 130° 右转
	15° –20°	Left Turn 40° 左转	Right Turn 125° 右转
	20° –25°	Left Turn 40° 左转	Right Turn 120° 右转
	25° –30°	Left Turn 40° 左转	Right Turn 115° 右转
	30° –35°	Left Turn 40° 左转	Right Turn 110° 右转
	Over 35°	Right Turn 40° 右转	Right Turn 105° 右转
305-710	2° –5°	Left Turn 30° 左转	Right Turn 155° 右转
	5° –10°	Left Turn 20° 左转	Right Turn 140° 右转
	10° –15°	Left Turn 10° 左转	Right Turn 135° 右转
	15° –20°	Left Turn 15° 左转	Right Turn 130° 右转
	20° –25°	Left Turn 0° 左转	Right Turn 125° 右转
	25° –30°	Left Turn 5° 左转	Right Turn 120° 右转
	30° –35°	Right Turn 5° 右转	Right Turn 115° 右转
	Over 35°	Right Turn 10° 右转	Right Turn 110° 右转
710-全部井深 710-Full depth	2° –5°	Left Turn 25° 左转	Right Turn 180° 右转
	5° –10°	Left Turn 15° 左转	Right Turn 170° 右转
	10° –15°	Left Turn 5° 左转	Right Turn 165° 右转
	15° –20°	Left Turn 0° 左转	Right Turn 145° 右转
	20° –25°	Right Turn 5° 右转	Right Turn 125° 右转
	25° –30°	Right Turn 10° 右转	Left Turn 115° 左转
	Over 35° 35° 以上	Left Turn 10° 左转	Left Turn 100° 左转

7.4 注意事项

- 调整弯接头指向时，转盘应按右旋定位，调整完毕，钻柱需慢慢地提升和下放数次（上提高度应超过9m）消除井眼中的钻杆应力，使其处于自由放松状态。
- 所测得的井眼方位和井斜角不是钻头处的数据而是在钻头以上15米左右处，这是测斜装置距钻头的距离。
- 连续造斜时，建议每钻一单根取一测量数据。
  为使造斜准确，所加钻压应稳定且不要过大。

7.5 导向钻井螺杆钻具

- 导向螺杆钻具是我公司为水平钻井设计和制造的新型井下动力钻具，通常是指配有弯壳体和稳定器的钻具。
- 用途
  配合PDC钻头或牙轮钻头组成不同的钻具组合，用于导向钻井系列，完成造斜和在不更换钻具组合而实现稳斜段（配合转盘低速旋转）及水平井段的钻井作业。
- 传动轴外壳带有不同直径和不同形状的稳定器（见图6），用户可根据钻井工艺的需要选择使用。
- 弯万向轴壳体
  弯万向轴壳体有单弯和双弯两种形式，并有不同角度的弯角供用户选择，双弯壳体还可选择同向双弯和反向双弯。（表7）为我公司常规钻具的弯角及造斜率供用户参考。

7.4 Cautions

- When adjusting the guide point of bent sub, turntable shall be orientated in right rotation. Then slowly trip in and out the drill string (lifting for over 9m)to eliminate the pipe stress in the hole, keeping it in free position.
- The measured hole azimuth and deviation angle is not the data of the bit location, but it is on about 15m point above the bit location. This is the distance between measuring device and bit.
- When continuously deflecting, it is advised to measure the data while stripping in a drill pipe.The added drilling weight shall be kept stable (not too heavy) to ensure correction of deflection.

7.5 Steering Downhole Motor

- Steering downhole motor is our newly designed and manufactured downhole dynamic tool. It is normally a kind of drilling tool completed with bent shell and stabilizer.
- Application
  Completed with PDC bit and rock bit, it composes various drill combination, being used for steering drilling. It may perform deflection without changing the combination to realize drilling operation in directional zone (with lower speed of turntable) and horizontal zone .
- The shell of drive shaft is completed with a stabilizer of different diameter and shapes (See Fig.6). The customers are required to choose them according to the drilling program.
- Bent cardan shaft shell
  Bent cardan shaft shell is divided into single and double. Various angle shall be provided for your selection. For double bent shell, you may choose both homo direction and reverse direction .
  (Table-7) shows bent angle and deflection of our conventional downhole motor for your reference.

● 为了解决水平钻井的携屑上返的困难问题，马达转子设计有中心分流孔入口处装有喷咀，从而增加输入流量，可以进行高压喷射钻井。当需要排量较小时，可以封堵转子中孔。

可根据用户要求，制造转子头数与定子头数比为1:2，3:4，6:7，9:10的各种规格见（图7），和不同规格的扶正器见（图8），且可根据使用要求为用户提供钻头水眼压力降为14Mpa的产品。

图7 (Fig.7)

8. 定货须知

如果您要使钻具取得良好的使用效果，不仅注重钻具本身质量状况，技术性能，还与您使用的目的、环境及介质条件、钻具组合等因素密切相关。因此您定货时正确选择钻具型号和结构形式尤为重要。

如果您在选型时存在疑问，请及时与我公司联系。

为了能正确、及时地向您提供所需产品，请您在定货时认真填写定货信息表，并且同时确定下面几个问题：

● In order to overcome difficulty in carrying solid to flow upward in horizontal drilling, a nozzle is designed at the inlet of center splitter on motor rotor, and it may increase the input flow rate and to perform hi-pressure jet drilling. When you need smaller flow rate, you may plug the splitter hole.

We may manufacture various types of Downhole motor with the ratio of numbers of stator rotor ends: 1:2, 3:4, 6:7 and 9:10 according to the customer's demand, see (Fig.7) and various stabilizer, see (Fig.8) and provide the products of 14Mpa bit nozzle pressure loss based on the customer's application.

图8 (Fig.8)

8. Purchase Guide

If you want to obtain good effectiveness by using downhole motor, you should take concern not only with its quality, technical property, but also with the application purpose, environmental conditions and its combination as well. So it is very important to make correct selection of the type and composition when purchasing the equipment. Please contact us if you have any questions for selection.

Please fill in the form when you are planning to order the equipment, to ensure correct and rapid provision of our products. So we need to confirm the following information:

（1）是否需提供附件或附加结构：

- 提升短节（井口或随钻）
- 定向接头

（2）如果有可能，定货时提供以下信息以便跟踪服务：

- 钻具使用单位
- 钻具使用井位，使用目的及预计使用时间
- 井身结构，使用钻具井段、泥浆条件等

(1) Need providing Accessories:

- Lifting nipple (wellhead or with drilling)
- Directional collar

(2) If possible, please provide the following information for feedback:

- Name of customers
- Location, purpose and estimated Duration
- Well bore structure, section to use screw drill and mud system.

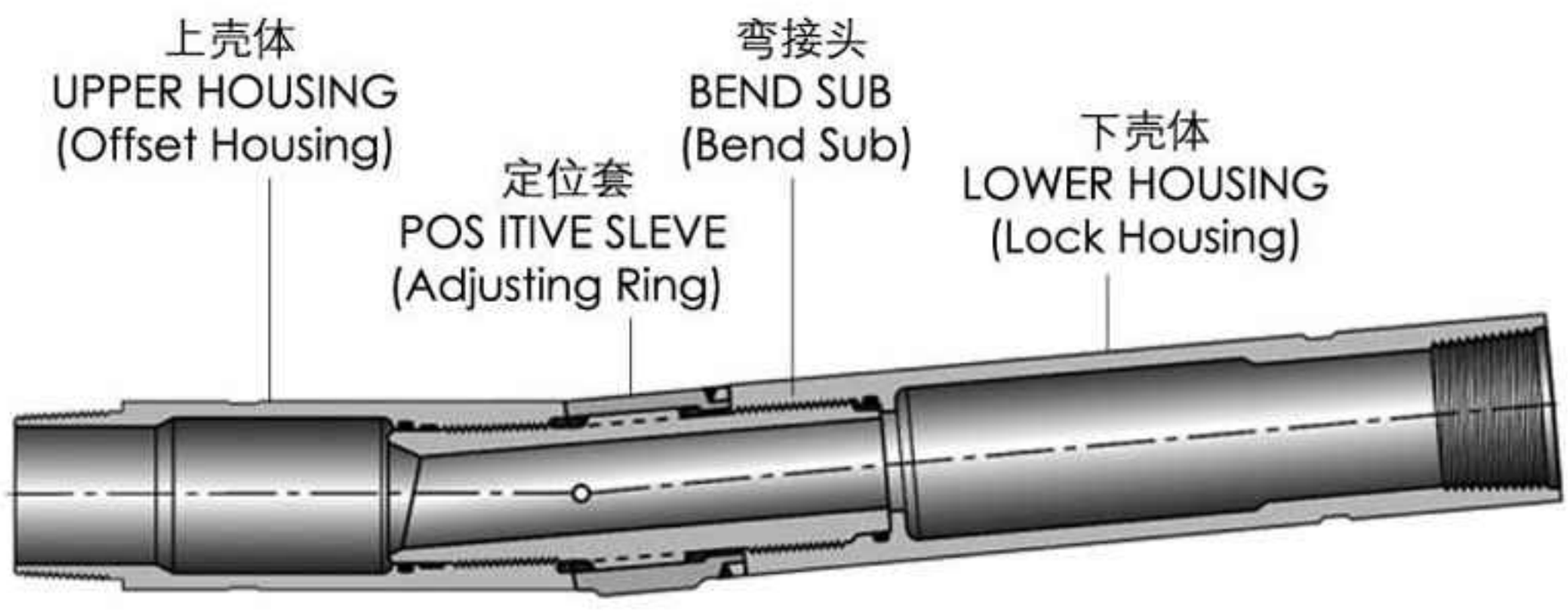
表7 弯外壳螺杆钻具造斜率

(Table.7) Deflection of Bent Shell

参数 Parameter / 钻具型号 Model	井眼尺寸 (in) Hole Size	TH。Def 理论造斜率 Angle K° 30m								
		30'	45'	1°00'	1°15'	1°30'	1°45'	2°0'	2°15'	2°30'
5LZ73 x 7.0L	3 1/8	5.9	7.8	20.3	23.6	30	37.6	43.7	48.6	53.8
5LZ89 x 7.0L	4 5/8	7.6	11.5	15.4	19.0	23.0	26.7	30.5	34.4	38.2
5LZ95 x 7.0L	4 5/8	7.3	10	13.4	16.3	20.0	23.7	27.4	30.0	34.8
5LZ95 x 7.0L	4 5/8	7.3	10	13.4	16.3	20.0	23.7	27.4	30.0	34.8
5LZ120 x 7.0L	6	6.5	7.6	11.3	14.3	17.2	20.7	24		
5LZ165 x 7.0L	8 1/2	4.4	6.5	8.9	12.0	13.9	15.4	17.5		
5LZ172 x 7.0L	8 1/2	4.0	6.02	8.1	9.80	11.4	13.3	15.7		
5LZ197 x 7.0L	12 1/4	4.0	6.0	8.2	10.2	12.3	15.2	16.3		
5LZ244 x 7.0L	12 1/4	3.6	5.4	7.3	9.1	10.9	12.7	14.5		

Ⅰ．可调弯壳体调节操作说明：图9

(Fig.9) Operate Description of Adjustable Bend Housing：



立林可调弯壳体可轻松简便的调节角度0° –3° 。

以下为立林可调弯壳体调节设置程序步骤：

参见（图10）来设置第1步和第2步：

1.将钳牙放在如图所标的旋扣区域，松开连结。

2.当定位套的牙与上壳体的牙啮合时，顺时针旋开下壳体2–4圈（但不要完全卸开）。

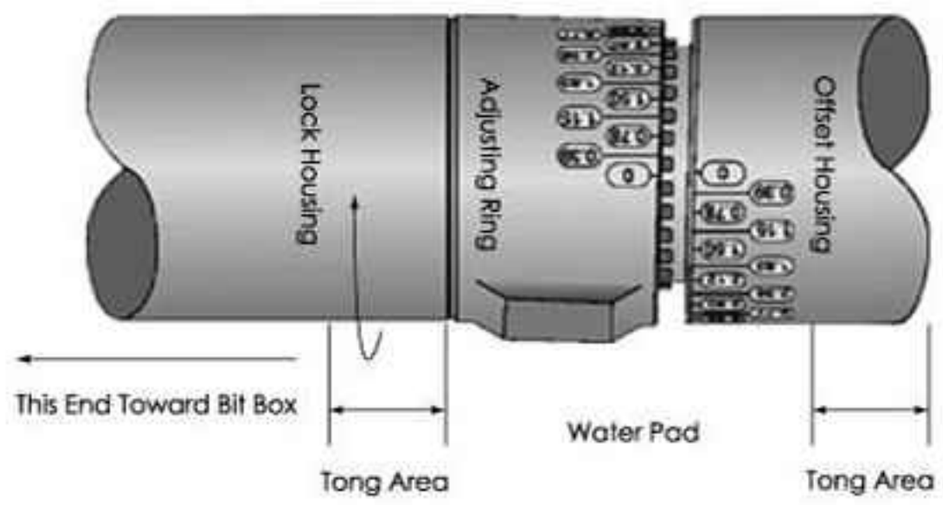
The LILIN adjustable bend housing allows for quick and easy bend angle adjustment from 0° - 3° .

Below is the procedure for setting the LILIN adjustable bend housing:

Refer to the above (Fig.10) for step 1and 2:

1. Place the jaws of tongs in the tong areas shown and break the tool joint.
2. While keeping the adjusting ring teeth engaged with the mated slots in the offset housing, unscrew the lock housing two to four complete turns in the clockwise direction (unthread).

图10
(Fig.10)



参见（图11）来设置第3步和第4步：

3. 下滑动定位套至牙齿之间脱离。

4. 调节弯壳体角度，顺时针旋转定位套，直到所需角度在上壳体上出现。

Refer to the above (Fig.11) for step 3 and 4:

3. Slide the adjusting ring down to disengage the teeth in the ring and the offset housing.
4. To adjust the bend angle of the bent housing, rotate the adjusting ring clockwise until the desired bend-angle marking on the offset housing.

图11
(Fig.11)

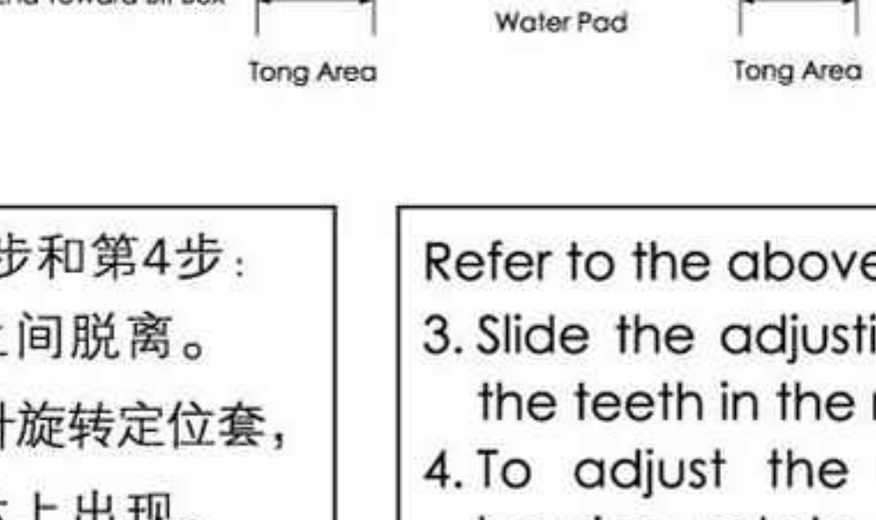
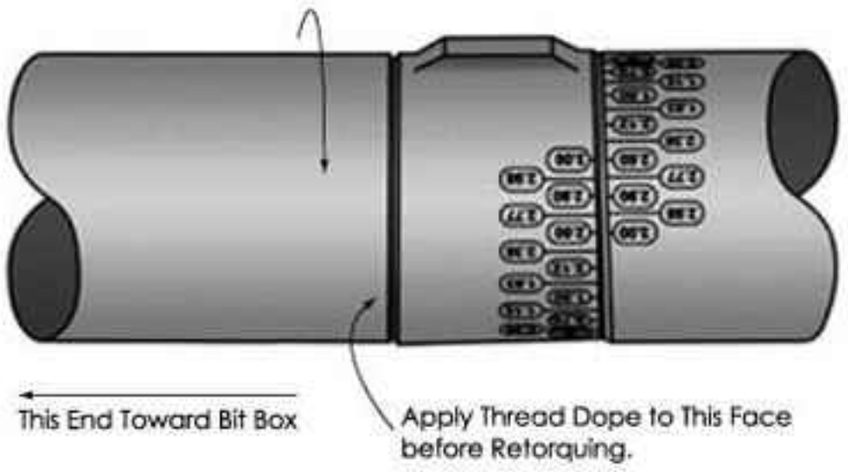


表8 钻具上下端螺纹安装扭矩

(Table.8) Top and Bottom Thread Torque

钻具规格 Size	上端螺纹 Top Thread	紧扣扭矩KNM Twist Torque	下端螺纹 Bottom Thread	紧扣扭矩KNM Twist Torque
43	1 REG	1.6~1.9	1REG	1.6~1.9
54	1 1/2 REG	2.8~3.5	1 1/2 REG	2.8~3.5
60	1 1/2 REG	2.8~3.5	1 1/2 REG	2.8~3.5
73	2 3/8 REG	3.4~4.8	2 3/8 REG	4.8~6.3
79	2 3/8 REG	3.4~4.8	2 3/8 REG	4.8~6.3
89	2 3/8 REG	3.4~4.8	2 3/8 REG	4.8~6.3
95	2 7/8 REG	6.8~11.6	2 7/8 REG	6.8~11.6
120	3 1/2 REG	14.3~17.2	3 1/2 REG	9.4~12.2
140	4 1/2 REG	27.9~31.6	4 1/2 REG	16.3~21.8
159	4 1/2 REG	31.6~33.6	4 1/2 REG	16.3~21.8
165	4 1/2 REG	32.4~35.6	4 1/2 REG	16.3~21.8
172	4 1/2 REG	32.4~35.6	4 1/2 REG	16.3~21.8
197	5 1/2 REG	54.4~68	6 5/8 REG	68.0~79.3
203	5 1/2 REG	54.4~68	6 5/8 REG	68.0~79.3
216	6 5/8 REG	68~79.6	6 5/8 REG	38.1~43.5
244	6 5/8 REG	74.8~88.4	7 5/8 REG	46.2~54.4
286	6 5/8 REG	74.8~88.4	7 5/8 REG	46.2~54.4

图12
(Fig.12)



参见（图12）来设置第5步和第7部：

5. 调节弯壳体角度，顺时针旋转定位套，调到所需角度。
6. 应用丝扣液来涂下壳体和定位套之间的对接面。
7. 一起调节下壳体和定位套，并且参考扭矩值表（Table 9）。匹配的上壳体外径和定位套显示数值。

Refer to the above (Fig.12)for step 5 and 7:

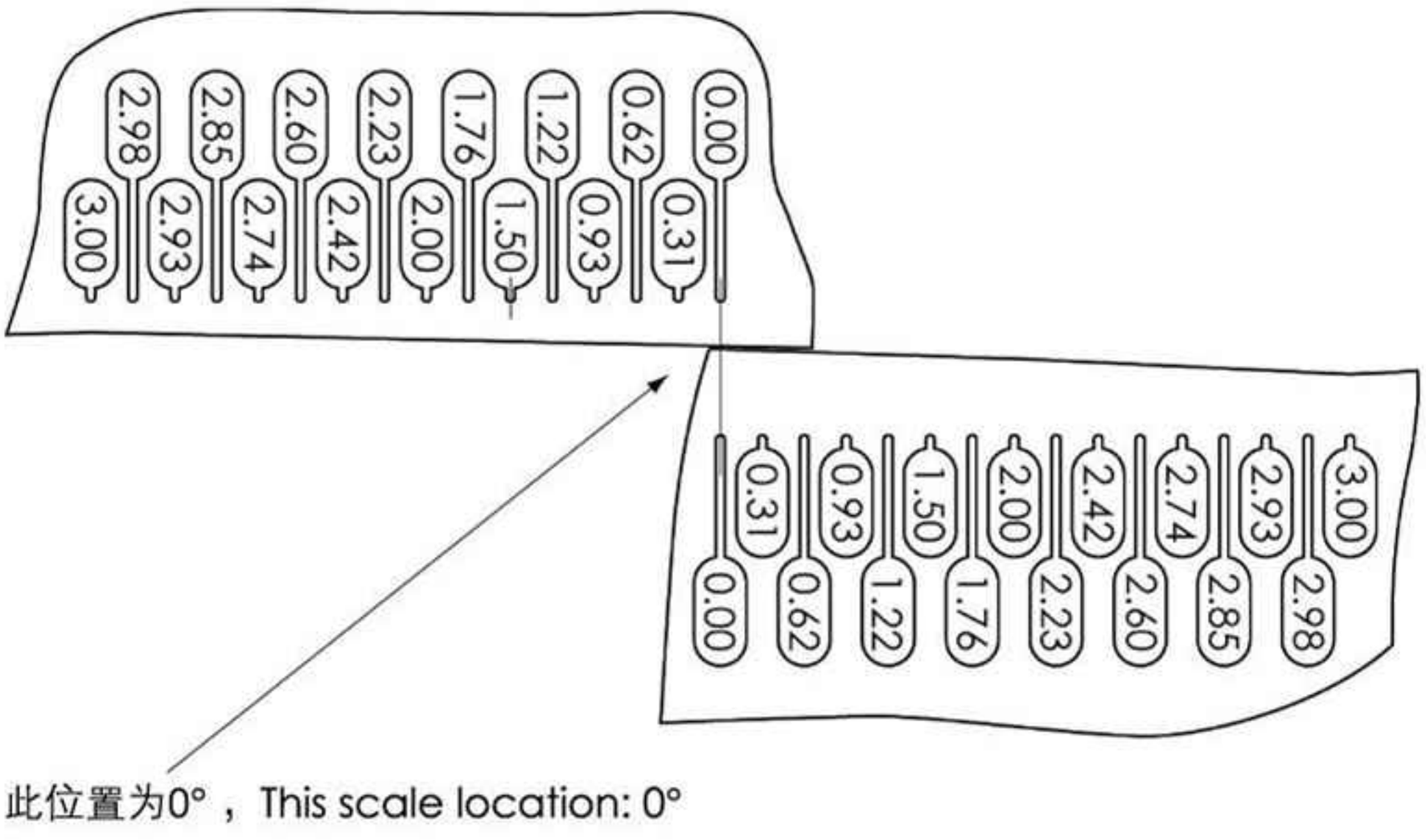
5. Engage the teeth of the adjusting ring and the offset housing at the desired bend angle.
6. Apply thread doping to the mated faces between the lock housing and the adjusting ring.
7. Screw the lock housing and the adjusting ring together and apply the torque value listed in (Table 9). The matching markings on the OD of the offset housing and the adjusting ring indicated as well as the high side marks to identify the high side of the tool.

表9 可调部分下壳体上紧扭矩
(Table.9) Lock Housing Make-up Torque

LOCK HOUSING MAKE-UP TORQUE		
Motor Size	English	Metric
2-7/8	2,300 ft-lbs	3,200 N-m
3-1/8	2,700 ft-lbs	3,600 N-m
3-1/2	3,800 ft-lbs	5,100 N-m
3-3/4	4,600 ft-lbs	6,300 N-m
4-1/8	7,000 ft-lbs	9,500 N-m
4-3/4	9,500 ft-lbs	12,700 N-m
5-1/2	16,000 ft-lbs	21,500 N-m
6-1/4	20,000 ft-lbs	26,700 N-m
6-1/2	23,000 ft-lbs	31,000 N-m
6-3/4	27,000 ft-lbs	37,000 N-m
7-3/4	29,000 ft-lbs	39,000 N-m
8	30,000 ft-lbs	40,300 N-m
8-1/2	38,000 ft-lbs	51,000 N-m
9	40,000 ft-lbs	53,700 N-m
9-5/8	61,000 ft-lbs	83,000 N-m
11-1/4	100,000 ft-lbs	136,000 N-m

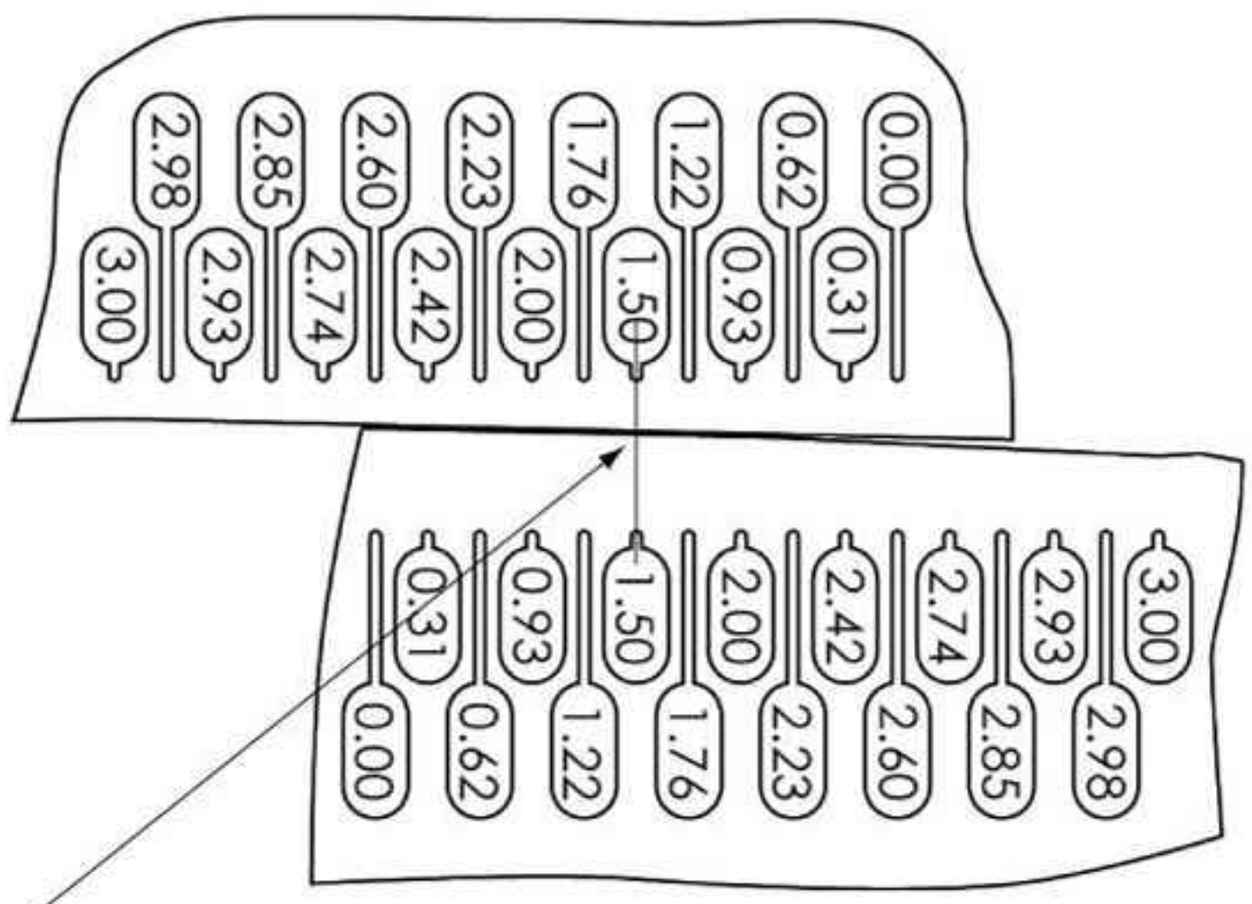
Ⅱ. 可调弯壳体调节角度说明：
Description of Adjustable Bend Housing：

图13
(Fig.13)



此位置为0°，This scale location: 0°

图14
(Fig.14)



此位置为1.5°，This scale location: 1.5°

Ⅲ. 螺杆钻具弯壳体角度标示规定：图15
(Fig 15)Description of Angle of Bend Housing:

弯度表示槽
Location of Angle Groove

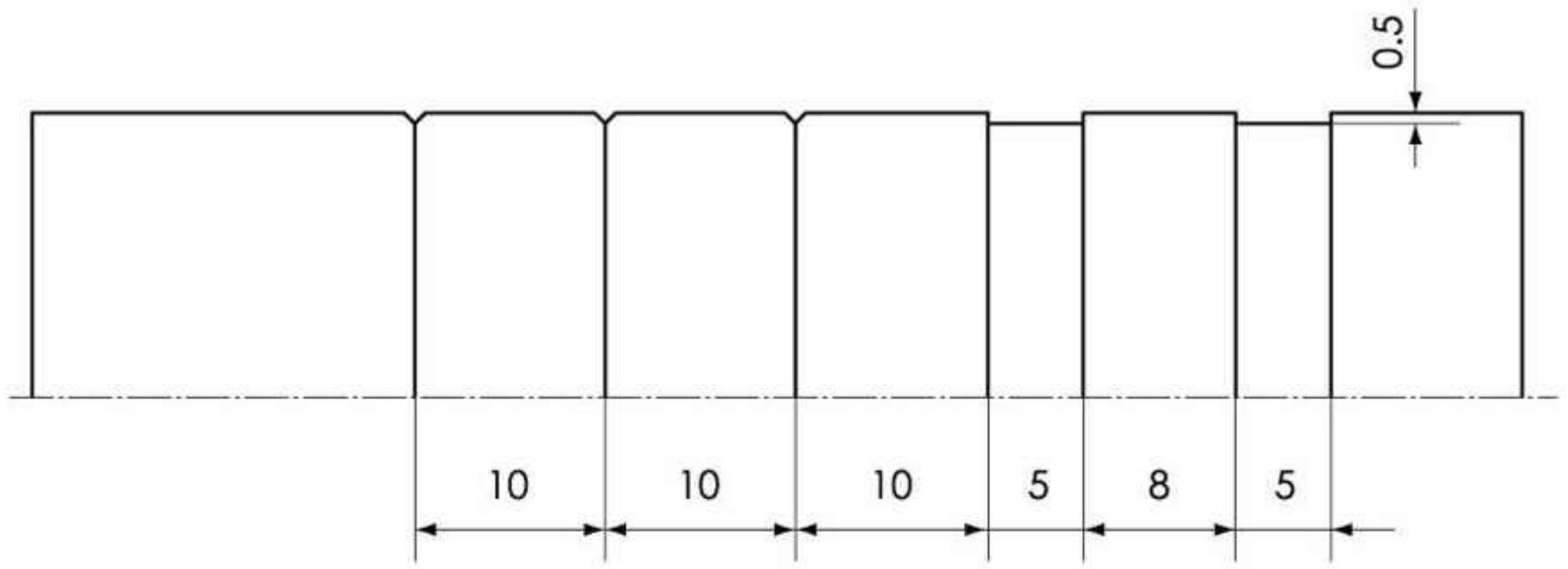
为使用户在使用钻具时能清楚了解到该钻具弯壳体角度，特将标示规定如下：

1. 以环形槽、尖槽标示所弯角度，每一空环槽表示1°，每一尖槽表示15'；
2. 空环槽、尖槽位置及尺寸如图：
3. 扎槽位置距内螺纹边缘200 – 250为宜；

For user clearly know the angle of bend housing when operate this downhole motor, description as follows:

1. Angle meaned by annular groove, acuminate groove, per empty annular groove is 1° per acuminate groove is 15 ';
2. Location and dimension of empty annular groove, acuminate groove (see fig 10):
3. It is propriety that Location of fluting near internal edge of thread 200-250.

图16
(Fig 16)



Example Note: Above Angle is 2° 45'

IV. 立林螺杆钻具在钻井中对应转盘速度:
Corresponding Speed of Turnplate When Drilling Well:

转盘以高于80rpm 的速度使马达旋转会损伤定子的合成橡胶。高转盘速度可以使转子和传动机构产生的离心力增大，引起定子、传动机构、径向轴承和内连接螺纹磨损增大。	Turnplate speed more than 80rpm lead to destroy of stator rubber. Turnplate's high speed leads to centrifugal force increasing at rotor and driving section, lead to abrasion increasing at stator, driving section, radial bearing and internal thread.

V. 转盘速度与弯外壳角度的关系: (见表10)
(Table.10) The Relation Between Speed of Turnplate and Bend Housing:

弯外壳角度（0° – 3° ） Angle of Bend Housing	转盘速度（rpm） Speed of Turnplate
0.00°	80
0.25°	70
0.50°	70
0.75°	60
1.00°	50
1.25°	40
1.50°	40
1.75°	NR
2.00°	NR
2.25°	NR
2.50°	NR
3.00°	NR

NR：为不推荐。
NR：Means not recommended.
注：弯外壳角度超过1.50°，禁止开动转盘导向钻进。
Note: If angle of bend housing exceed 1.50°, forbid turning turntable to steering drilling.

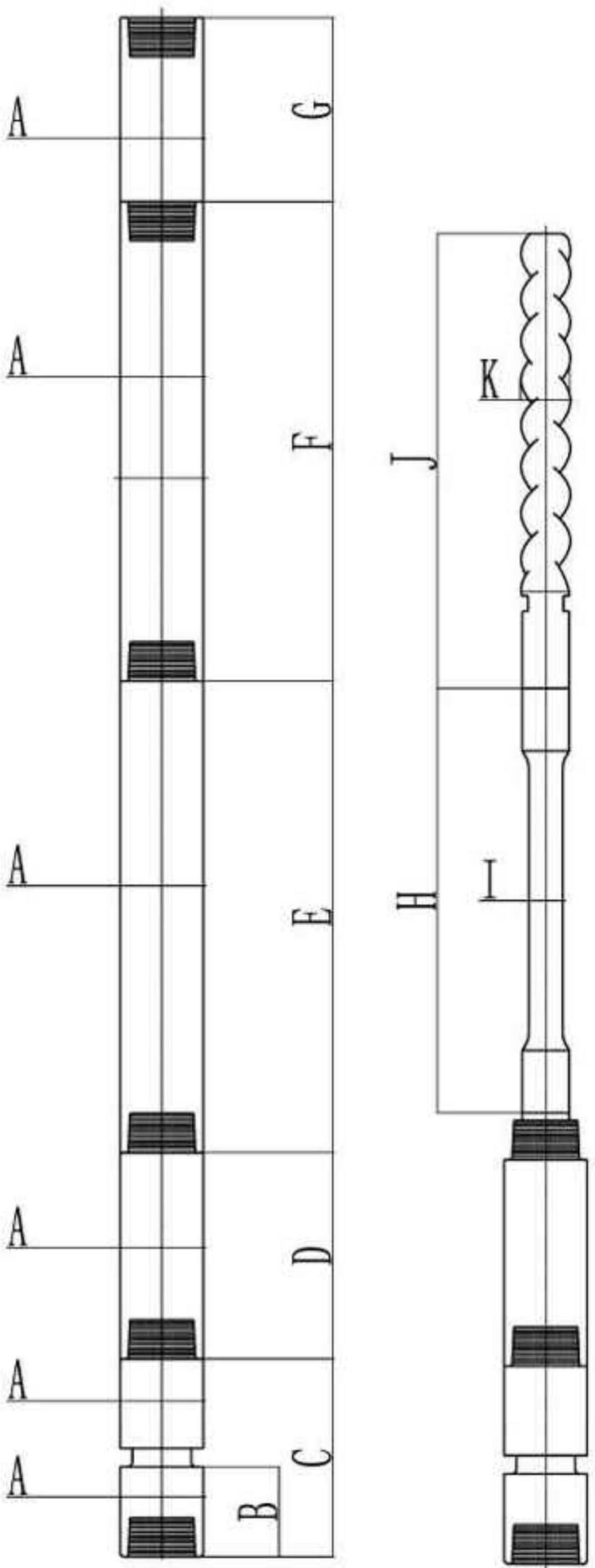
Ⅵ. 立林螺杆钻具允许承受最大拉力：（见表11）

(Table.11) Allowable Max Pull Downhole Motor :

钻具规格 size	作用在钻头上 working on drilling bit		作用在壳体上 working on housing	
	KN	LBS	KN	LBS
43	57	12800	145	32580
54	125	28090	230	51685
60	130	29200	285	64045
73	290	65170	420	94380
79	290	65170	595	133700
89	295	66300	640	143820
95	380	84900	870	195505
120	520	116850	1150	258425
140	723	162480	1592	357770
159	1115	250560	1865	419100
165	1250	280900	1900	426965
172	1370	307860	1935	434830
197	1540	346070	2600	584270
203	1585	356180	3220	723595
216	2395	538200	3700	831460
228	2395	538200	4360	979775
244	2590	582020	4530	1017980
286	3565	801120	4930	1107865

螺杆钻具说明书
DOWNHOLE MOTOR MANUAL

立林小规格螺杆钻具打捞尺寸图
The Fishing Size Drawing of Lilin Small Size Downhole Motor



立林小规格螺杆钻具打捞尺寸表
The Fishing Size Table of Lilin Small Size Downhole Motor

钻具型号 / 尺寸代号	5LZ43 X 3.5L	5LZ54 X 3.5	5LZ60 X 7.0L
A	Φ43	Φ54	Φ61
B	NA	100	110
C	64	210	230
D	153	212	260
E	340	855	990
G	120.5	165	130
H	270	970	950
I	Φ15	Φ18	Φ20

注：表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。

Above dimension is referenced, if you need detail dimension, please contact us.

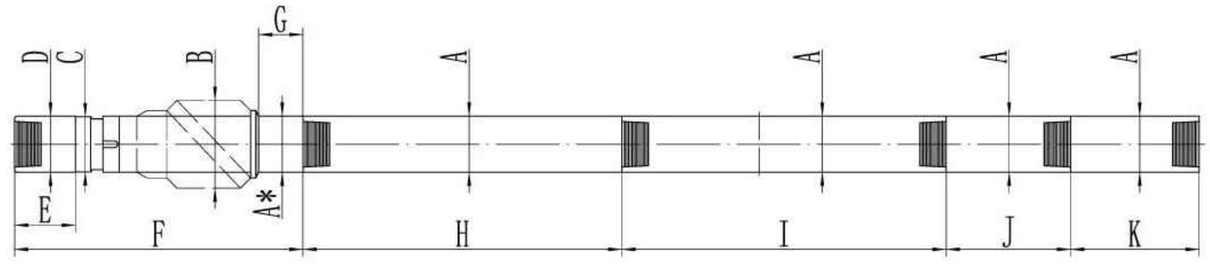
立林小规格螺杆钻具马达打捞尺寸表
LiLin Small Size Motor Fishing Dimension of Power Section

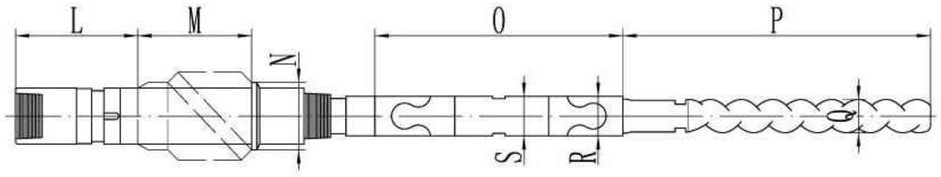
钻具型号 / 尺寸代号	5LZ43-4-192L	5LZ54-3-360L	E5LZ54-3-360L	5LZ60-3-390L
A	Φ43	Φ54	Φ54	Φ61
F	1000	1385	1385	1400
J	870	1200	1200	1340
K	Φ23.5	Φ31.3	Φ31.3	Φ33.1

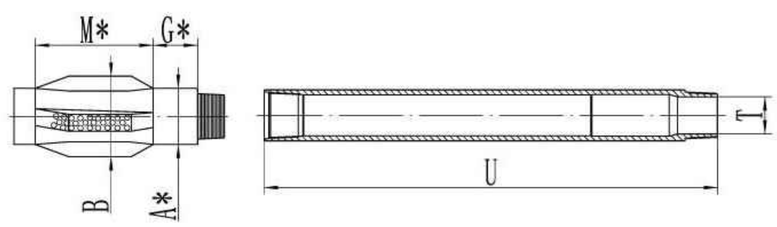
注：表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。

Above dimension is referenced, if you need detail dimension, please contact us.

立林常规螺杆钻具打捞尺寸图和尺寸表
The Fishing Size Drawing and Diagram of Lilin Downhole Motor (stright or bend housing)



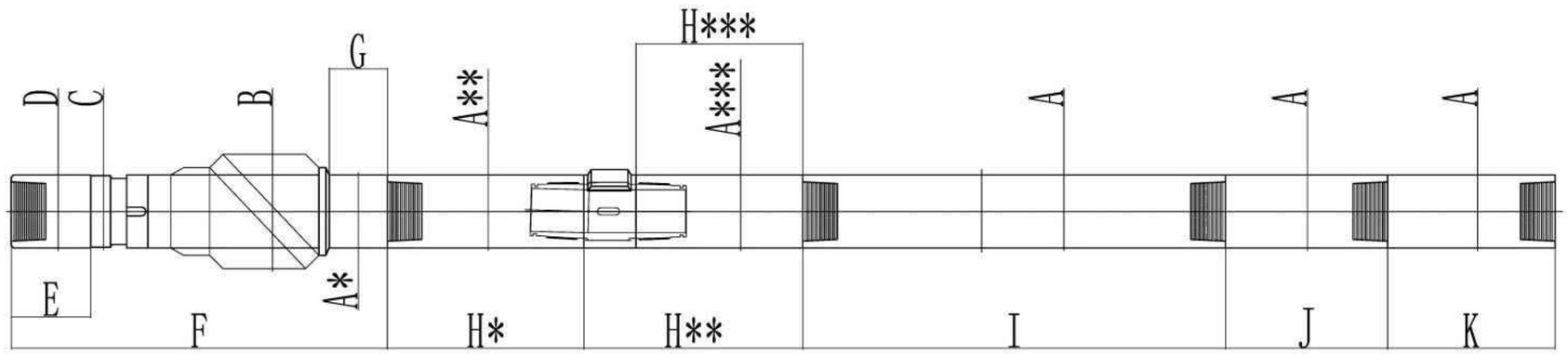


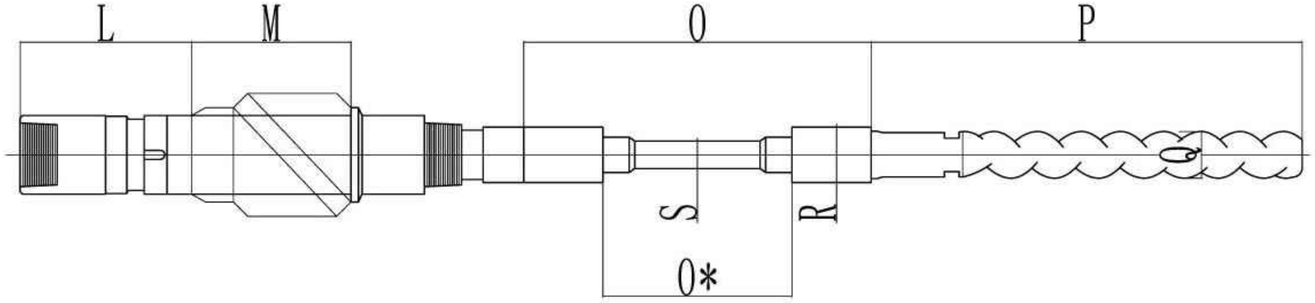


尺寸代号 \ 钻具型号	5LZ73 -VI	5LZ73 -VII	5LZ73 -VIII	5LZ79 -VI	5LZ79 -VIII	5LZ89 -VI	5LZ89 -VII	5LZ95 -VI	5LZ95 -VII	5LZ95 -VIII	5LZ102	5LZ105	5LZ120 -VIII	5LZ127 -VIII	5LZ127 -IX	5LZ140	5LZ146	5LZ159	5LZ165 -VIII	5LZ165 -IX	5LZ172 -VIII	5LZ172 -IX	5LZ172 -XI	5LZ185	5LZ197 -VIII	5LZ203 -VIII	5LZ203 -IX	5LZ210 -VIII	5LZ216 -VIII	5LZ216 -IX	5LZ228	5LZ244	5LZ286
A	Φ73	Φ73	Φ73	Φ79	Φ79	Φ89	Φ89	Φ96	Φ96	Φ96	Φ102	Φ105	Φ120	Φ127	Φ127	Φ140	Φ146	Φ159	Φ165	Φ165	Φ172	Φ172/Φ175	Φ172	Φ185	Φ197	Φ203	Φ210	Φ210	Φ216	Φ216	Φ228	Φ244.5	Φ286
A*	Φ73	Φ73	Φ73	Φ79	Φ79	Φ89	Φ89	Φ96	Φ96	Φ96	Φ102	Φ105	Φ120	Φ127	Φ127	Φ140	Φ146	Φ159	Φ165	Φ165	Φ172	NA	Φ175	Φ185	Φ197	Φ203	Φ203	Φ210	Φ216	NA	Φ228	Φ245	Φ286
C	NA	NA	NA	NA	NA	NA	NA	NA	NA	Φ94	NA	Φ102	NA	Φ122	Φ116	Φ137	Φ143	Φ155	Φ162	Φ162	Φ168	NA	Φ168	Φ182	Φ194	Φ194	Φ200	Φ208	Φ214	Φ212	Φ224	Φ238	Φ280
D	Φ73	Φ73	Φ73	Φ79	Φ79	Φ89	Φ89	Φ96	Φ96	Φ96	Φ102	Φ105	Φ120	Φ127	Φ120	Φ140	Φ146	Φ159	Φ165	Φ165	Φ172	NA	Φ172	Φ185	Φ197	Φ203	Φ203	Φ210	Φ216	Φ216	Φ228	Φ244.5	Φ286
E	125	125	128	125	125	160	160	175	140	155	160	160	180	180	170	180	180	210	210	210	210	NA	210	240	210	210	210	225	225	225	225	234	270
F	479	479	553	479	597	546	604	676	674	682	708	708	763	762	782	905	905	1108	1041	1039	1115	NA	1102	1168	1202	1202	1222	1243	1243	NA	1243	1320	1470
H	560	560	NA	NA	570	714	714	NA	NA	800	634	767	993	993	993	1160	1160	1440	1234	NA	1520	1520	NA	1490	1400	1400	NA	1394	1388	NA	1388	1555	1760
J	NA	NA	NA	210	210	250	250	NA	NA	270	268	270	311	311	NA	330	330	390	400	NA	390	390	390	410	420	420	NA	404	395	NA	378	464	510
K	190	190	NA	190	190	NA	230	NA	NA	245	243	270	306	306	NA	360	360	370	363	NA	370	370	370	370	410	410	NA	423	430	NA	423	464	520
O	174	536	NA	NA	537	430	547	NA	NA	515	500	580	880	880	880	680	680	934	733	NA	1014	1014	NA	994	794	794	NA	794	794	NA	794	930	1006
R	Φ45	Φ45	NA	NA	Φ50	Φ60	Φ60	NA	NA	Φ66	Φ72	Φ72	Φ82.5	Φ82.5	Φ82.5	Φ95	Φ95	Φ108	Φ108	NA	Φ120	Φ125	NA	Φ125	Φ140	Φ140	NA	Φ150	Φ150	NA	Φ150	Φ160	Φ180
S	Φ45	Φ45	NA	NA	Φ50	Φ58	Φ58	NA	NA	Φ66	Φ70	Φ72	Φ82.5	Φ82.5	Φ82.5	Φ95	Φ95	Φ108	Φ108	NA	Φ116	Φ116	NA	Φ116	Φ140	Φ140	NA	Φ150	Φ150	NA	Φ150	Φ160	Φ180
T	Φ49	Φ49	NA	NA	Φ52	Φ68	Φ62	NA	NA	Φ70	Φ70	Φ76	Φ81	Φ81	Φ81	Φ100	Φ100	Φ112	Φ114	NA	Φ120	Φ120	NA	Φ127.5	Φ152	Φ152	NA	Φ155	Φ160	NA	Φ150	Φ175	Φ200
U	620	620	NA	NA	630	784	784	NA	NA	780	716	847	1082	1082	1082	1250	1250	1550	1336	NA	1630	1630	NA	1610	1520	1520	NA	1520	1515	NA	1515	1691	1940

注:1.表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。
2."B"、"M*"、"G*"的外径尺寸根据用户需求而定，表中不提供。
1.Above dimension is referenced, if you need detail dimension, please contact us.
2.OD dimension of "B"、"M*"、"G*" of stabilizer determined by user, no data in above chart.

立林可调弯度螺杆钻具打捞尺寸图和尺寸表
The Fishing Size Drawing and Diagram of Lilin Downhole Motor With Adjustable Bend Housing (ABH)





尺寸代号 \ 钻具型号	5LZ73 -VII	5LZ79 -VI	5LZ79 -VIII	5LZ89 -VII	5LZ95 -VI	5LZ95 -VIII	5LZ105	5LZ120 -VIII	5LZ127	5LZ140	5LZ159	5LZ165 -VIII	5LZ172	5LZ197	5LZ203	5LZ228	5LZ244	5LZ286
A***	Φ73	Φ79	Φ79	Φ89	Φ97	Φ97	Φ105	Φ127	Φ127	Φ140	Φ159	Φ167	Φ172	Φ197	Φ203	Φ228	Φ245	Φ286
A**	Φ73	Φ79	Φ79	Φ89	Φ96	Φ96	Φ105	Φ120	Φ127	Φ140	Φ159	Φ165	Φ172	Φ197	Φ203	Φ228	Φ245	Φ286
H*	260	300	304	420	380	380	390	460	460	590	830	830	752	982	990	1000	1050	1150
H**	464	426	426	435	490	490	490	533	533	720	610	618	666	715	715	833	884	900
H***	388	350	350	356	410	410	410	433	443	620	514	522	566	602	600	663	714	720
O	538	697	NA	602	470	682	695	881	NA	680	934	934	997	1102	NA	1245	1294	1318
O*	270	401	NA	303	253	433	435	493	NA	392	610	610	683	736	NA	851	856	791
R	Φ45	Φ53	NA	Φ62	Φ67	Φ67	Φ73	Φ84	NA	Φ95	Φ110	Φ112	Φ119	Φ140	NA	Φ153	Φ165	Φ190
S	Φ21	Φ24	NA	Φ30	Φ32	Φ32	Φ37	Φ44	NA	Φ48	Φ62	Φ62	Φ66	Φ78	NA	Φ85	Φ88	Φ95

注:表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。

Above dimension is referenced, if you need detail dimension, please contact us.

立林螺杆钻具马达打捞尺寸表
LiLin Motor Fishing Dimension of Power Section

尺寸代号 \ 钻具型号	5LZ73 -3-600	5LZ73 -4-600	E5LZ73 -3-600	5LZ79 -3-600	5LZ79 -4-600	5LZ79 -4-600	7LZ79 -3-400	7LZ79 -4-400	5LZ89 -3-600	7LZ89 -4-720	1LZ95 -4-770	4LZ95 -5-600	5LZ95 -3-600	5LZ95 -4-600	5LZ95 -5-600	9LZ95 -4-600	4LZ95 -5-600	5LZ95 -5-600	9LZ95 -4-600	7LZ102 -4-600	5LZ105 -4-600	5LZ105 -10.1-522	9LZ105 -4-600	9LZ105 -5-600	5LZ105 -4-600	4LZ120 -5-725	4LZ120 -6-725	5LZ120 -3-540	5LZ120 -3-900	5LZ120 -4-900	5LZ120 -5-864	5LZ120 -6-864
A	Φ73	Φ73	Φ73	Φ79	Φ79	Φ79	Φ79	Φ79	Φ89	Φ89	Φ96	Φ96	Φ96	Φ96	Φ96	Φ96	Φ96	Φ96	Φ96	Φ102	Φ105	Φ105	Φ105	Φ105	Φ105	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120
I	2080	2680	2080	2080	2680	2680	1450	1850	2120	3100	3300	3300	2100	2700	3300	2700	3300	3300	2700	2720	2720	5550	2720	3320	2720	3945	4670	1910	3020	3920	4690	5484
Q	Φ45	Φ40.6	Φ40	Φ45	Φ41.8	Φ45	Φ46.8	Φ46.8	Φ59.8	Φ54	Φ58.5	Φ60	Φ62.8	Φ62.4	Φ62.4	Φ65.7	Φ54.8	Φ55.6	Φ57.7	Φ62.9	Φ67.5	Φ62.5	Φ71.5	Φ71.5	Φ62.5	Φ68.6	Φ68.6	Φ70.8	Φ70.8	Φ70.8	Φ71.2	Φ71.7
P	2025	2625	2002	2025	2625	2625	1395	1795	2040	3020	3280	3125	2015	2615	3215	2615	3215	3215	2615	2570	2645	5475	2645	3245	2645	3700	4425	1830	2940	3840	4610	5404

尺寸代号 \ 钻具型号	7LZ120 -6.5-896	7LZ120 -3-896	7LZ120 -4-896	7LZ120 -5-896	7LZ120 -7-624	9LZ120 -2-2600	9LZ120 -3.2-1600	9LZ120 -3.6-1450	9LZ120 -4-900	C7LZ120 -3-1200	KQ7LZ120 -2-1600	5LZ127 -4-900	5LZ140 -3-810	5LZ140 -4-810	7LZ140 -5-816	5LZ146 -3-756	5LZ159 -5-840	7LZ159 -3-1120	7LZ159 -5-840	1LZ165 -4-840	5LZ165 -3.5-660	5LZ165 -4-840	5LZ165 -4-1050	5LZ165 -5-840	5LZ165 -6-840	7LZ165 -3.8-1896	7LZ165 -5-1008	9LZ165 -3-1690	9LZ165 -4-840	1LZ172 -3-1120	1LZ172 -4-840	2LZ172 -8-780
A	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ120	Φ127	Φ140	Φ140	Φ140	Φ146	Φ150	Φ159	Φ159	Φ165	Φ165	Φ165	Φ165	Φ165	Φ165	Φ165	Φ165	Φ165	Φ165	Φ172	Φ172	Φ172
I	6130	3024	3920	4816	4670	5484	5484	5484	3920	3920	3520	3920	2790	3320	4410	2790	4640	3800	4640	3865	3910	3865	4600	4600	5440	7580	5440	5440	3865	3790	3780	6660
Q	Φ73.7	Φ73.7	Φ73.7	Φ73.7	Φ73.7	Φ75.2	Φ75.2	Φ75.2	Φ75.2	Φ73.7	Φ73.7	Φ70.8	Φ83.8	Φ83.8	Φ86.3	Φ83.8	Φ94.5	Φ97.1	Φ97.1	Φ90	Φ98.7	Φ96.6	Φ96.2	Φ96.2	Φ96.6	Φ101.3	Φ100.6	Φ101.8	Φ101.9	Φ99	Φ99	Φ100.6
P	6050	2944	3840	4736	4590	5224	5404	5404	3840	3840	3440	3840	2740	3550	4360	2740	4510	3670	4510	3720	2783	3720	4460	4460	5300	7440	5300	5300	3720	3630	3630	6540

尺寸代号 \ 钻具型号	3LZ172 -6-840	4LZ172 -7-770	5LZ172 -4-840	5LZ172 -5-840	5LZ172 -6-840	5LZ172 -7-840	7LZ172 -4-914	7LZ172 -4-1128	7LZ172 -5.5-914	7LZ172 -5.7-1080	7LZ172 -5-914	7LZ172 -6-840	7LZ172 -6-914	9LZ172 -2-850	9LZ172 -3-1690	9LZ172 -3.5-1420	9LZ172 -4-850	9LZ172 -5-850	E5LZ172 -4-840	E7LZ172 -4-920	KQ9LZ172 -2-1690	KQ9LZ172 -2-1690 (加长)	5LZ185 -4-1050	5LZ185 -5-840	7LZ185 -5-840	9LZ185 -3-1690	3LZ197 -7-840	4LZ197 -6-840	5LZ197 -4-840	5LZ197 -5-840	5LZ197 -6-840	7LZ197 -4-840
A	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ172	Φ185	Φ185	Φ185	Φ185	Φ197	Φ197	Φ197	Φ197	Φ197	Φ197
I	5350	5800	3780	4610	5350	6180	4025	4940	5400	6570	4940	5350	5844	2290	5350	5350	3780	4610	3780	4025	3660	3780	4600	4240	4600	5440	6280	5440	3760	4600	5440	3760
Q	Φ106.2	Φ104.6	Φ106.2	Φ106.2	Φ106.2	Φ106.2	Φ114.9	Φ114.9	Φ114.9	Φ114.9	Φ114.9	Φ114.9	Φ114.9	Φ123.2	Φ111.8	Φ111.8	Φ112.9	Φ112.9	Φ106.2	Φ109.8	Φ111.8	Φ111.8	Φ112	Φ112	Φ115.2	Φ116.4	Φ121	Φ121.7	Φ124.4	Φ124.4	Φ124.4	Φ129.1
P	5200	5650	3630	4460	5200	6030	3875	4790	5250	6420	4790	5200	5694	2140	5200	5200	3630	4460	3630	3875	3510	3630	4510	4510	4510	5350	6170	5330	3650	4490	5330	3650

尺寸代号 \ 钻具型号	7LZ197 -5-840	7LZ197 -6-840	9LZ197 -4-840	9LZ197 -4-1050	E5LZ197 -4-840	5LZ203 -4-840	5LZ203 -5-840	5LZ203 -6-840	7LZ203 -4-1056	7LZ203 -5-840	9LZ203 -4-840	9LZ203 -3-1810	5LZ210 -5-840	E7LZ210 -4.2-1008	5LZ216 -4-840	5LZ216 -4-1050	5LZ216 -5-840	5LZ216 -6-840	7LZ216 -5-840	7LZ216 -6-1008	KQ7LZ216 -2-1680	KQ9LZ216 -2.5-1260	5LZ228 -5-840	9LZ228 -3-1690	3LZ244 -5-1028	3LZ244 -6-1028	5LZ244 -4-1008	5LZ244 -4-1260	5LZ244 -5-1008	7LZ244 -4-1008	7LZ244 -4-1264	3LZ286 -4-1280
A	Φ197	Φ197	Φ197	Φ197	Φ197	Φ203	Φ203	Φ203	Φ203	Φ203	Φ203	Φ203	Φ210	Φ210	Φ216	Φ216	Φ216	Φ216	Φ216	Φ216	Φ216	Φ216	Φ228	Φ228	Φ245	Φ245	Φ245	Φ245	Φ245	Φ245	Φ245	Φ286
I	4600	5440	3760	4600	3760	3760	4600	5440	4600	4600	3760	5440	4660	4660	1760	4600	4600	5440	4600	6450	3760	3760	4600	5440	5570	6688	4562	5570	5570	4562	5570	5770
Q	Φ129.1	Φ129.1	Φ131.1	Φ131.1	Φ125.1	Φ124.4	Φ124.4	Φ124.4	Φ129.1	Φ129.1	Φ131.1	Φ131.1	Φ135.4	Φ140.4	Φ137.5	Φ135.4	Φ135.4	Φ138.3	Φ140.4	Φ139.5	Φ140.4	Φ144.8	Φ137.5	Φ144.8	Φ148.4	Φ148.4	Φ152.3	Φ152.3	Φ152.3	Φ157.5	Φ157.5	Φ169.5
P	4490	5330	3650	4490	3650	3650	4490	5330	4490	4490	3650	5330	4550	4550	3640	4480	4480	5320	4480	6330	3640	3640	4480	5320	5420	6538	4412	5420	5420	4412	5420	5572

注:表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。

Above dimension is referenced, if you need detail dimension, please contact us.

立林螺杆钻具可换扶正器打捞尺寸表
LiLin Motor Fishing Dimension of Changeable Stabilizer

钻具型号 / 尺寸代号	95-VIII	120-VIII	120-VIII (加长)	140 (加长)	165-VIII	165-VIII (加长)	172-VIII (加长)	172-XI	197-VIII	203-VIII	210	216-VIII	244	286
A*	Φ96	Φ120	Φ120	Φ140	Φ184	Φ184	Φ172	Φ175	Φ198	Φ203	Φ210	Φ216	Φ245	Φ286
N	Φ110	Φ136	Φ136	Φ158	NA	NA	Φ188	Φ193	Φ215	Φ215	Φ235	Φ250	Φ280	Φ335
G	148	152	91	122	208	208	218	163	244	249	232	203	236	212
L	315	371	341	400	528	418	420	463	562	562	502	532	541	660

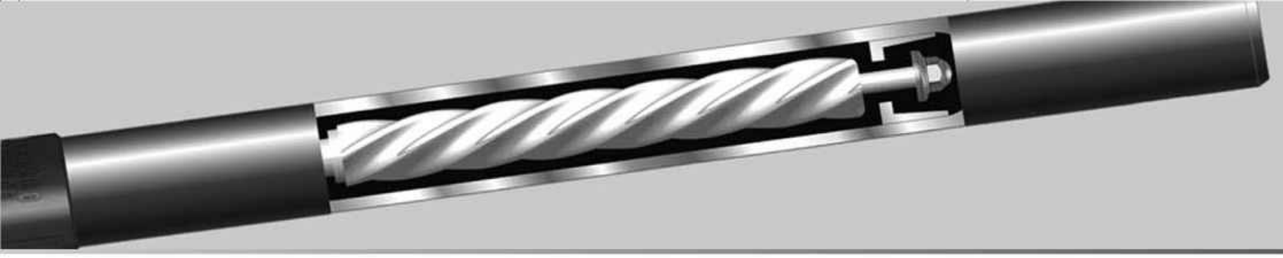
注:1.表中提供的尺寸仅供参考，如需要具体尺寸请与公司联系。
2."B"、"M"的外径尺寸根据用户需求而定，表中不提供。
1.Above dimension is referenced, if you need detail dimension, please contact us.
2.OD dimension of "B"、"M*"、"G*" of stabilizer determined by user, no data in above chart.

技术参数表
Technology parameters

钻具型号 Model	外径尺寸 Tool OD		钻头尺寸 Bit Size		两端连接螺纹 Connecting Thread		头数 Lobe	级数 Stage	排量 Flow Rate		转速 Rotory Speed	工作压力降 Working Pressure Loss		输出扭矩 Output Torque		最大压力降 Max Pressure Loss		最大扭矩 Max Torque		工作钻压 Working Pressure		最大钻压 Max Pressure		输出功率 Output Power	
	mm	in	mm	in	上端 up	下端 down			lpm	gpm	rpm	Mpa	psi	N.m	lb-ft	Mpa	psi	N.m	lb-ft	KN	lb	KN	lb	KW	hp
5LZ43x3.5 L-4-192	43	1 11/16	48-76	1 7/8-3	1AMMT	1AMMT	5:6	4	48-96	13-26	435-870	3.2	466	56	42	4.52	655	79	58	3	660	6	1320	6.5	9
5LZ45x3.5 L-3-330	45	1 3/4	48-76	1 7/8-3	1AMMT	1AMMT	5:6	3	57-170	15-45	228-680	2.4	350	85	62	3.39	495	125	90	3	660	6	1320	8	11
5LZ54x3.5 L-3-360	54	2 1/8	60-89	2 3/8-3 1/2	1REG	1REG	5:6	3	106-240	28-64	282-638	2.4	350	130	96	3.39	495	182	135	4	880	8	1760	11	15
7LZ54x3.5 L-4-416	54	2 1/8	60-89	2 3/8-3 1/2	1REG	1REG	7:8	4	150-300	40-79	292-585	3.2	466	235	173	4.52	655	332	245	4	880	8	1760	20	27
5LZ60x3.5 L-3-600	60	2 3/8	79-111	3 1/8-4 3/8	1REG	1REG	5:6	3	140-280	38-75	298-595	2.4	350	156	115	3.39	495	218	160	5	1100	10	2200	12	16
LZ73x7.0 L-7-400	73	2 7/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	1:2	7	102-205	27-55	400-810	5.6	817	204	151	7.91	1154	288	212	12	2640	25	5500	22	28
4LZ73x7.0 L-3-480	73	2 7/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	4:5	3	113-303	30-80	154-410	2.4	350	460	339	3.39	495	650	479	12	2640	25	5500	13	17
5LZ73x7.0 L-3-600	73	2 7/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	5:6	3	162-578	76-153	121-432	2.4	350	460	339	3.39	495	650	479	12	2640	25	5500	27	36
5LZ73x7.0 L-4-600	73	2 7/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	5:6	4	162-578	76-153	121-432	3.2	466	613	452	4.52	655	867	639	12	2640	25	5500	36	48
5LZ79x7.0 L-4-600	79	3 1/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	5:6	4	162-578	76-153	121-432	3.2	466	613	452	4.52	655	867	639	12	2640	25	5500	36	48
7LZ79X7.0 L-4-400	79	3 1/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	7:8	4	140-419	37-111	138-413	3.2	466	465	342	4.52	655	617	455	12	2640	25	5500	24	32
JC7LZ79X7.0 L-4-720	79	3 1/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	7:8	4	252-755	66-200	138-413	3.2	466	745	548	4.52	655	1050	775	12	2640	25	5500	40	55
9LZ79x7.0 L-4-600	79	3 1/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	9:10	4	162-578	76-153	97-347	3.2	466	676	490	4.52	655	954	703	12	2640	25	5500	37	49
9LZ79x7.0 L-5-600	79	3 1/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	9:10	5	162-578	76-153	97-347	4.0	585	845	608	5.65	824	1192	878	12	2640	25	5500	46	62
4LZ89x7.0 L-4-600	89	3 1/2	107-121	4 1/4-4 3/4	2 3/8REG	2 3/8REG	4:5	4	265-570	70-150	180-390	3.2	466	634	467	4.52	655	895	660	22	4400	35	7700	34	45
4LZ89x7.0 L-5-560	89	3 1/2	114-149	4 1/2-5 7/8	2 3/8REG	2 3/8REG	4:5	5	190-570	50-150	140-420	4.0	585	726	535	5.65	824	1025	756	22	4400	35	7700	40	54
5LZ89x7.0 L-4-600	89	3 1/2	114-149	4 1/2-5 7/8	2 3/8REG	2 3/8REG	5:6	4	255-766	67-202	108-325	3.2	466	1080	800	4.52	655	1526	1126	22	4400	35	7700	47	63
7LZ89x7.0 L-3.8-720	89	3 1/2	107-121	4 1/4-4 3/4	2 3/8REG	2 3/8REG	7:8	3.8	170-490	45-130	74-215	3.04	440	952	702	4.29	622	1342	990	22	4400	35	7700	28	37
LZ95x7.0 L-4-770	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	1:2	4	150-450	40-119	160-478	3.2	466	432	319	4.52	655	574	423	30	6600	55	12100	26	35
4LZ95x7.0 L-5-600	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	4:5	5	270-720	71-190	129-340	4	585	1190	880	5.65	824	1680	1240	30	6600	55	12100	59	80
5LZ95x7.0 L-3-600	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	5:6	3	320-800	85-211	124-300	2.4	350	833	615	3.39	495	1177	868	30	6600	55	12100	32	43
5LZ95x7.0 L-5-600	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	5:6	5	320-800	85-211	124-300	4	585	1388	1025	5.65	824	1962	1447	30	6600	55	12100	53	72
7LZ95x7.0 L-3-600	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	7:8	3	389-778	102-205	167-335	2.4	350	710	525	3.39	495	1000	740	30	6600	55	12100	32	43
K7LZ95x7.0 L-2-1440	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	7:8	2	480-960	127-254	87-174	1.6	232	1129	832	2.26	328	1595	1176	30	6600	55	12100	24	32
7LZ95x7.0 L-10.1-520	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	7:8	10.1	300-680	80-180	150-340	8.08	1170	2212	1632	11.41	1655	3125	2305	30	6600	55	12100	100	135
7LZ95x7.0 L-6.7-616	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	7:8	6.7	300-610	80-160	126-257	5.36	777	1738	1280	7.57	1098	2455	1810	30	6600	55	12100	60	81
9LZ95x7.0 L-4-600	95	3 3/4	118-149	4 5/8-5 7/8	2 7/8REG	2 7/8REG	9:10	4	460-928	120-245	139-280	3.2	466	1426	1052	4.52	655	1895	1320	30	6600	55	12100	48	64
7LZ102x7.0 L-4-600	102	4	121-152	4 3/4-6	2 7/8REG	2 7/8REG	7:8	4	425-850	112-225	150-300	3.2	466	1133	835	4.52	655	1600	1180	30	6600	55	12100	45	60
5LZ105x7.0 L-4-600	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	5:6	4	450-900	120-240	146-292	3.2	466	1248	920	4.52	655	1656	1222	35	7700	80	17600	46	61
5LZ105x7.0 L-10.1-522	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	5:6	10.1	340-700	90 -185	150-310	8.08	1172	2310	1700	11.4	1652	3250	2400	35	7700	80	17600	90	120
7LZ105x7.0-6-696	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	7:8	6	420-780	111-206	123-228	4.8	700	2214	1662	6.78	988	3128	2348	35	7700	80	17600	67	89
9LZ105x7.0 L-4-600	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	9:10	4	498-997	131-263	132-265	3.2	466	1630	1200	4.52	655	2165	1597	35	7700	80	17600	51	68
9LZ105x7.0 L-5-600	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	9:10	5	498-997	131-263	132-265	4	585	2037	1503	5.65	824	2706	1995	35	7700	80	17600	63	85
9LZ105x7.0 L-6-660	105	4 1/8	121-152	4 3/4-6	2 7/8REG	2 7/8REG	9:10	6	510-1020	135-270	140-280	4.8	696	2215	1633	6.78	983	3127	2306	35	7700	80	17600	75	105
2LZ120x7.0 L-4-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	2:3	4	454-909	120-240	180-360	3.2	466	1030	760	4.52	655	1367	1008	49	10803	100	22000	46	62
4LZ120x7.0 L-6-725	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	4:5	6	495-990	131-262	150-300	4.8	700	2137	1576	6.78	988	3019	2226	49	10803	100	22000	81	108
4LZ120x7.0 L-5-725	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	4:5	5	495-990	131-262	150-300	4	585	1780	1313	5.65	824	2515	1855	49	10803	100	22000	71	95
5LZ120x7.0 L-3-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	3	694-1388	184-367	140-278	2.4	350	1620	1195	3.39	495	2288	1688	49	10803	100	22000	57	76
5LZ120x7.0 L-4-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	4	694-1388	184-367	140-278	3.2	466	2160	1593	4.52	655	2869	2116	49	10803	100	22000	71	95

技术参数表
Technology parameters

钻具型号 Model	外径尺寸 Tool OD		钻头尺寸 Bit Size		两端连接螺纹 Connecting Thread		头数 Lobe	级数 Stage	排量 Flow Rate		转速 Rotory Speed	工作压力降 Working Pressure Loss		输出扭矩 Output Torque		最大压力降 Max Pressure Loss		最大扭矩 Max Torque		工作钻压 Working Pressure		最大钻压 Max Pressure		输出功率 Output Power	
	mm	in	mm	in	上端 up	下端 down			lpm	gpm	rpm	Mpa	psi	N.m	lb-ft	Mpa	psi	N.m	lb-ft	KN	lb	KN	lb	KW	hp
5LZ120x7.0 L-3.3-660	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	3.3	380-1040	100-275	105-295	2.64	380	1260	930	3.73	540	1670	1230	49	10803	100	22000	44	58
5LZ120x7.0 L-5-864	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	5	650-1300	171-342	140-280	4	585	2344	1730	5.65	824	3312	2442	49	10803	100	22000	87	117
5LZ120x7.0 L-6-720	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	6	540-1080	143-286	140-280	4.8	696	2344	1729	6.78	983	3312	2443	49	10803	100	22000	85	114
5LZ120x7.0 L-6-864	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	6	650-1300	171-342	140-280	4.8	700	2831	2076	6.78	988	3974	2930	49	10803	100	22000	99	133
K7LZ120x7.0 L-2-1600	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	2	603-1206	159-318	60-120	1.6	232	2074	1530	2.26	328	2930	2161	49	10803	100	22000	33	45
C7LZ120x7.0 L-3-1200	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	3	745-1489	196-393	98-196	2.4	350	2468	1819	3.39	495	3277	2417	49	10803	100	22000	60	81
7LZ120x7.0 L-4-896	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	4	745-1489	196-393	130-261	3.2	466	2468	1819	4.52	655	3277	2417	49	10803	100	22000	75	102
7LZ120x7.0 L-6.5-896	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	6.5	745-1489	196-393	130-261	5.2	757	4010	2956	7.35	1065	5325	3938	49	10803	100	22000	122	166
7LZ120x7.0 L-7-624	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	7	516-1030	130-273	128-256	5.6	817	2829	2087	7.91	1154	3997	2848	49	10803	100	22000	85	114
9LZ120x7.0 L-3.6-1450	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	9:10	3.6	745-1489	196-393	72-143	2.88	421	3685	2717	4.1	590	5245	3868	49	10803	100	22000	71	95
9LZ120x7.0 L-4-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	9:10	4	745-1489	196-393	115-230	3.2	466	2546	1873	4.52	655	3588	2646	49	10803	100	22000	77	104
9LZ120x7.0 L-6.5-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	9:10	6.5	745-1489	196-393	115-230	5.2	757	4137	3043	7.35	1065	5830	4300	49	10803	100	22000	126	169
9LZ120x7.0 L-2-2600	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	9:10	2	745-1489	196-393	40-80	1.6	233	3685	2717	2.26	328	5245	3868	49	10803	100	22000	39	53
2LZ127x7.0 L-4-900	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	2:3	4	454-909	120-240	180-360	3.2	466	1030	760	4.52	655	1367	1008	49	10803	100	22000	46	62
4LZ127x7.0 L-6-725	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	4:5	6	495-990	131-262	150-300	4.8	700	2137	1576	6.78	988	3019	2226	49	10803	100	22000	81	108
4LZ127x7.0 L-5-725	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	4:5	5	495-990	131-262	150-300	4	585	1780	1313	5.65	824	2515	1855	49	10803	100	22000	71	95
5LZ127x7.0 L-3-900	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	3	694-1388	184-367	140-278	2.4	350	1620	1195	3.39	495	2288	1688	49	10803	100	22000	57	76
5LZ127x7.0 L-4-900	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	4	694-1388	184-367	140-278	3.2	466	2160	1593	4.52	655	2869	2116	49	10803	100	22000	71	95
5LZ127x7.0 L-5-864	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	5	650-1300	171-342	140-280	4	585	2344	1730	5.65	824	3312	2442	49	10803	100	22000	87	117
5LZ127x7.0 L-6-720	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	6	540-1080	143-286	138-280	4.8	696	2344	1729	6.78	983	3312	2443	49	10803	100	22000	85	114
7LZ127x7.0 L-4-896	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	4	745-1489	196-393	130-261	3.2	466	2468	1819	4.52	655	3277	2417	49	10803	100	22000	75	102
7LZ127x7.0 L-7-624	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	7:8	7	516-1030	130-273	128-256	5.6	817	2829	2087	7.91	1154	3997	2848	49	10803	100	22000	85	114
9LZ127x7.0 L-4-900	127	5	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	9:10	4	745-1489	196-393	115-230	3.2	466	2546	1873	4.52	655	3588	2646	49	10803	100	22000	77	104
5LZ140x7.0 L-4-810	140	5 1/2	171-222	6 3/4-8 3/4	4 1/2REG	4 1/2REG	5:6	4	718-1436	190-379	101-202	3.2	466	2613	1927	4.52	655	3471	2560	49	10803	100	22000	73	98
7LZ140x7.0 L-5-810	140	5 1/2	171-222	6 3/4-8 3/4	4 1/2REG	4 1/2REG	7:8	5	794-1587	210-419	95-190	4	585	3848	2838	5.65	824	5436	4009	49	10803	100	22000	98	131
5LZ159x7.0 L-5-840	159	6 1/4	171-222	6 3/4-8 3/4	4 1/2REG	4 1/2REG	5:6	5	828-1656	219-438	88-177	4	585	4221	3113	5.65	824	5962	4397	80	17600	160	35200	111	148
7LZ159x7.0 L-3-1120	159	6 1/4	171-222	6 3/4-8 3/4	4 1/2REG	4 1/2REG	7:8	3	828-1656	219-438	67-135	2.4	350	3775	2784	3.39	495	5332	3932	80	17600	160	35200	68	90
LZ165x7.0 L-4-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	1:2	4	450-899	119-237	163-325	3.2	466	1018	751	4.52	655	1352	997	49	10803	100	22000	46	62
5LZ165x7.0 L-3.5-660	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	3.5	686-1371	181-362	87-174	2.8	408	2555	1885	3.955	577	3609	2662	80	17600	160	35200	66	88
4LZ165x7.0 L-7-770	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	4:5	7	730-1460	193-386	109-217	5.6	815	4799	3539	7.91	1147	6778	4998	80	17600	160	35200	139	186
5LZ165x7.0 L-4-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	4	862-1724	228-456	87-174	3.2	466	3673	2709	4.52	655	4878	3597	80	17600	160	35200	88	119
5LZ165x7.0 L-5-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	5	862-1724	228-456	87-174	4	585	4590	3386	5.65	824	6484	4783	80	17600	160	35200	100	135
5LZ165x7.0 L-6-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	6	862-1724	228-456	87-174	4.8	700	5509	4063	6.78	988	7781	5739	80	17600	160	35200	121	162
7LZ165x7.0 L-3.8-1890	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	3.8	1200-2400	317-634	51-103	3.04	440	8975	6620	4.3	624	12700	9366	80	17600	160	35200	123	165
K9LZ165x7.0 L-2-1690	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	2	1148-2296	303-606	55-110	1.6	232	4374	3226	2.26	328	6178	4556	80	17600	160	35200	64	86
JC9LZ165x7.0 L-3-1690	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3	1110-2220	293-586	51-103	2.4	350	6560	4838	3.39	495	9264	6838	80	17600	160	35200	90	120
JC9LZ165x7.0 L-3.7-1370	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3.7	1110-2220	293-586	51-103	2.96	430	6550	4832	4.18	610	9259	6832	80	17600	160	35200	90	120
9LZ165x7.0 L-4-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	4	990-1979	262-523	93-187	3.2	466	4579	3377	4.52	655	6082	4485	80	17600	160	35200	98	132
LZ172x7.0 L-4-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	1:2	4	450-899	119-237	191-382	3.2	466	1018	751	4.52	655	1352	997	80	17600	160	35200	46	62

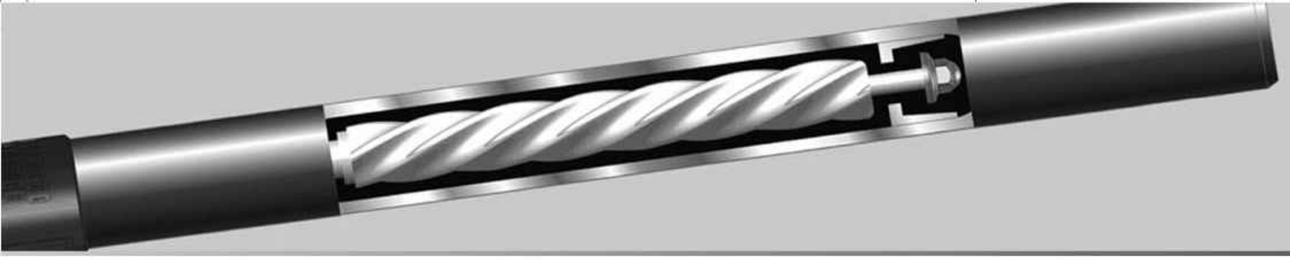


技术参数表
Technology parameters

钻具型号 Model	外径尺寸 Tool OD		钻头尺寸 Bit Size		两端连接螺纹 Connecting Thread 上端 up	下端 down	头数 Lobe	级数 Stage	排量 Flow Rate		转速 Rotory Speed	工作压力降 Working Pressure Loss		输出扭矩 Output Torque		最大压力降 Max Pressure Loss		最大扭矩 Max Torque		工作钻压 Working Pressure		最大钻压 Max Pressure		输出功率 Output Power	
	mm	in	mm	in					lpm	gpm	rpm	Mpa	psi	N.m	lb-ft	Mpa	psi	N.m	lb-ft	KN	lb	KN	lb	KW	hp
2LZ172x7.0 L-8-780	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	2:3	8	590-1180	156-312	120-240	6.4	933	4011	2958	9.04	1318	5566	4179	100	22000	170	37400	126	168
2LZ172x7.0 L-7-780	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	2:3	7	590-1180	156-312	120-240	5.6	817	3510	2588	7.91	1154	4958	3656	100	22000	170	37400	110	147
3LZ172x7.0 L-6-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	3:4	6	770-1539	204-407	130-220	4.8	700	4660	4854	6.78	988	6580	4854	100	22000	170	37400	126	206
4LZ172x7.0 L-7-770	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	4:5	7	833-1665	220-440	102-205	5.6	817	6158	4541	7.91	1154	8698	6415	100	22000	170	37400	154	206
5LZ172x7.0 L-4-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	4	947-1894	250-500	78-154	3.2	466	4160	3068	4.52	655	5525	4075	100	22000	170	37400	126	170
5LZ172x7.0 L-5-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	5	947-1894	250-500	78-154	4	585	5200	3835	5.65	824	7345	5417	100	22000	170	37400	118	159
5LZ172x7.0 L-6-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	6	947-1894	250-500	78-154	4.8	700	6240	4600	6.78	988	8814	6500	100	22000	170	37400	142	190
5LZ172x7.0 L-7-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	7	947-1894	250-500	78-154	5.6	812	7280	5367	7.91	1154	10283	7583	100	22000	170	37400	141	189
6LZ172x7.0 L-6.5-700	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	6:7	6.5	828-1655	218-437	92-184	5.2	760	6040	4460	7.345	1070	8530	6292	100	22000	170	37400	147	198
7LZ172x7.0 L-5-914	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	5	1183-2366	312-625	84-168	4	585	7176	5293	5.65	824	10137	7476	100	22000	170	37400	150	200
7LZ172x7.0 L-5.5-914	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	5.5	1183-2366	312-625	84-168	4.4	640	7895	5823	6.22	902	11160	8230	100	22000	170	37400	176	236
7LZ172x7.0 L-6-914	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	6	1183-2366	312-625	84-168	4.8	700	8611	6352	6.78	988	12165	8971	100	22000	170	37400	180	240
7LZ172x7.0 L-5.7-1080	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	5.7	1183-2366	312-625	76-152	4.56	660	9030	6660	6.44	934	12750	9400	100	22000	170	37400	170	230
7LZ172x7.0 L-7.5-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	7.5	1050-2100	277-554	90-179	6.0	870	8960	6610	8.46	1228	12634	9317	100	22000	170	37400	213	285
K9LZ172x7.0 L-2-1690	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	2	1110-2220	293-586	43-86	1.6	232	5284	3897	2.26	328	7464	5505	100	22000	170	37400	61	82
JC9LZ172x7.0 L-3-1690	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3	1110-2220	293-586	48-96	2.4	350	7926	5846	3.39	495	11196	8857	100	22000	170	37400	100	135
C9LZ172x7.0 L-3.5-1426	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3.5	1110-2220	293-586	51-101	2.8	408	7808	5758	3.995	577	10978	8096	100	22000	170	37400	100	135
9LZ172x7.0 L-2-850	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	2	1206-2411	319-637	78-156	1.6	233	3148	2320	2.26	330	4446	3279	100	22000	170	37400	61	82
9LZ172x7.0 L-4-850	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	4	1110-2220	293-586	84-169	3.2	466	5355	3949	4.52	655	7112	5245	100	22000	170	37400	78	105
LZ178x7.0 L-4-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	1:2	4	450-899	119-237	191-382	3.2	466	1018	751	4.52	655	1352	997	80	17600	160	35200	46	62
2LZ178x7.0 L-8-780	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	2:3	8	590-1180	156-312	120-240	6.4	933	4011	2958	9.04	1318	5566	4179	100	22000	170	37400	126	168
2LZ178x7.0 L-7-780	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	2:3	7	590-1180	156-312	120-240	5.6	817	3510	2588	7.91	1154	4958	3656	100	22000	170	37400	110	147
3LZ178x7.0 L-6-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	3:4	6	770-1539	204-407	130-220	4.8	700	4660	4854	6.78	988	6580	4854	100	22000	170	37400	126	206
4LZ178x7.0 L-7-770	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	4:5	7	833-1665	220-440	102-205	5.6	817	6158	4541	7.91	1154	8698	6415	100	22000	170	37400	154	206
5LZ178x7.0 L-4-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	4	947-1894	250-500	78-154	3.2	466	4160	3068	4.52	655	5525	4075	100	22000	170	37400	126	170
5LZ178x7.0 L-5-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	5	947-1894	250-500	78-154	4	585	5200	3835	5.65	824	7345	5417	100	22000	170	37400	118	159
5LZ178x7.0 L-7-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	7	947-1894	250-500	78-154	5.6	812	7280	5367	7.91	1154	10283	7583	100	22000	170	37400	141	189
5LZ178x7.0 L-6-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	6	947-1894	250-500	78-154	4.8	700	6240	4600	6.78	988	8814	6500	100	22000	170	37400	142	190
7LZ178x7.0 L-5-914	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	5	1183-2366	312-625	84-168	4	585	7176	5293	5.65	824	10137	7476	100	22000	170	37400	150	200
7LZ172x7.0 L-7.5-840	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	7:8	7.5	1050-2100	277-554	90-179	6.0	870	8960	6610	8.46	1228	12634	9317	100	22000	170	37400	213	285
JC9LZ178x7.0 L-3-1690	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3	1110-2220	293-586	48-96	2.4	350	7926	5846	3.39	495	11196	8857	100	22000	170	37400	100	135
C9LZ178x7.0 L-3.5-1426	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	3.5	1110-2220	293-586	51-101	2.8	408	7808	5758	3.995	577	10978	8096	100	22000	170	37400	100	135
9LZ178x7.0 L-2-850	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	2	1206-2411	319-637	78-156	1.6	233	3148	2320	2.26	330	4446	3279	100	22000	170	37400	61	82
9LZ178x7.0 L-4-850	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	9:10	4	1110-2220	293-586	84-169	3.2	466	5355	3949	4.52	655	7112	5245	100	22000	170	37400	78	105
5LZ185x7.0 L-5-850	185	7 1/4	222-251	8 3/4-9 7/8	4 1/2REG	6 5/8REG	5:6	5	985-1970	260-520	91-182	4	585	5548	4090	5.65	824	7836	5779	100	22000	170	37400	134	180
6LZ185x7.0 L-7-840	185	7 1/4	222-251	8 3/4-9 7/8	4 1/2REG	6 5/8REG	6:7	7	1032-2065	273-546	87-174	5.6	819	8985	6626	7.7	1126	12355	9111	100	22000	170	37400	202	272
7LZ185x7.0 L-7-840	185	7 1/4	222-251	8 3/4-9 7/8	4 1/2REG	6 5/8REG	7:8	7	1164-2328	308-615	78-156	5.6	819	11258	8303	7.7	1126	15479	11416	100	22000	170	37400	252	339
9LZ185x7.0 L-3-1690	185	7 1/4	222-251	8 3/4-9 7/8	4 1/2REG	6 5/8REG	9:10	3	1080-2700	285-713	38-96	2.4	350	8589	6335	3.39	495	12132	8948	100	22000	170	37400	109	147
LZ197x7.0 L-4-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	1:2	4	465-930	123-246	139-277	3.2	466	1366	1007	4.52	655	1814	1338	100	22000	170	37400	47	62

技术参数表
Technology parameters

钻具型号 Model	外径尺寸 Tool OD		钻头尺寸 Bit Size		两端连接螺纹 Connecting Thread 上端 up	下端 down	头数 Lobe	级数 Stage	排量 Flow Rate		转速 Rotory Speed	工作压力降 Working Pressure Loss		输出扭矩 Output Torque		最大压力降 Max Pressure Loss		最大扭矩 Max Torque		工作钻压 Working Pressure		最大钻压 Max Pressure		输出功率 Output Power	
	mm	in	mm	in					lpm	gpm	rpm	Mpa	psi	N.m	lb-ft	Mpa	psi	N.m	lb-ft	KN	lb	KN	lb	KW	hp
4LZ197x7.0 L-6-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	4:5	6	1020-2040	269-538	85-170	4.8	700	7340	5415	6.78	988	10367	7646	150	33000	200	44000	166	222
4LZ197×7.0 L-7-720	197	7 3/4	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	4:5	7	1020-2040	230-461	86-172	5.6	812	7800	5752	7.91	1147	11020	8125	150	33000	200	44000	178	240
5LZ197x7.0 L-4-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	4	1113-2225	295-588	79-158	3.2	466	5022	3704	4.52	655	6700	4920	150	33000	200	44000	99	133
5LZ197x7.0 L-5-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	5	1113-2225	295-588	79-158	4	585	6277	4629	5.65	824	8866	6540	150	33000	200	44000	130	176
5LZ197x7.0 L-6-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	6	1113-2225	295-588	79-158	4.8	700	7533	5555	6.78	988	10640	7847	150	33000	200	44000	157	210
9LZ197x7.0 L-4-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	9:10	4	1267-2534	335-670	72-145	3.2	466	6260	4617	4.52	655	8315	6132	150	33000	200	44000	113	152
7LZ197x7.0 L-5-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	7:8	5	1230-2460	322-645	75-150	4	585	7220	5324	5.65	824	10197	7520	155	34100	200	44000	130	176
C9LZ197x7.0 L-4-1050	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	9:10	4	1510-3028	400-800	67-135	3.2	466	9022	6655	4.52	655	12743	9398	150	33000	200	44000	162	217
C9LZ197x7.0 L-2-2100	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	9:10	2	1510-3028	400-800	34-67	1.6	233	9022	6655	2.26	328	12743	9398	150	33000	200	44000	81	109
LZ203x7.0 L-4-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	1:2	4	465-930	123-246	139-277	3.2	466	1366	1007	4.52	655	1814	1338	100	22000	170	37400	47	62
C4LZ203x7.0 L-5-1015	203	8	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	4:5	5	1320-3410	350-900	90-235	4	585	7850	5790	5.65	824	11090	8180	155	34100	250	55000	218	292
4LZ203x7.0 L-6-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	4:5	6	1020-2040	269-538	85-170	4.8	700	7340	5415	6.78	988	10367	7646	150	33000	200	44000	166	222
5LZ203x7.0 L-4-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	4	1113-2225	295-588	79-158	3.2	466	5022	3704	4.52	655	6700	4920	155	34100	250	55000	99	133
5LZ203x7.0 L-5-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	5	1113-2225	295-588	79-158	4	585	6277	4629	5.65	824	8866	6540	155	34100	250	55000	130	176
7LZ203x7.0 L-5-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	7:8	5	1230-2460	295-650	75-150	4	585	7220	5324	5.65	824	10197	7520	155	34100	250	55000	143	194
9LZ203x7.0 L-4-840	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	9:10	4	1267-2534	335-670	72-145	3.2	466	6260	4617	4.52	655	8315	6132	150	33000	200	44000	113	152
C9LZ203x7.0 L-4-1050	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	9:10	4	1510-3028	400-800	67-135	3.2	466	9022	6655	4.52	655	12743	9398	150	33000	200	44000	162	217
5LZ210x7.0 L-5-840	210	8 1/4	251-375	9 7/8-14 3/4	6 5/8REG	6 5/8REG	5:6	5	1228-2455	325-650	75-150	4	585	7481	5517	5.65	824	10567	7793	180	39600	300	66000	149	200
7LZ210x7.0 L-5-840	210	8 1/4	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	7:8	5	1345-2650	350-700	69-138	4	585	9795	7222	5.65	824	13832	10200	220	48400	330	79200	179	240
7LZ210x7.0 L-5-1008	210	8 1/4	251-375	9 7/8-14 3/4	6 5/8REG	6 5/8REG	7:8	5	1580-3160	418-835	121-142	4	585	11459	8450	5.65	824	16186	11937	180	39600	300	66000	216	290
5LZ216x7.0 L-4-840	216	8 1/2	251-375	9 7/8-14 3/4	6 5/8REG	6 5/8REG	5:6	4	1228-2455	325-650	72-145	3.2	466	6105	4502	4.52	655	8108	5980	180	39600	300	66000	112	150
5LZ216x7.0 L-5-840	216	8 1/2	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	5:6	5	1228-2455	325-650	72-145	4	585	7631	5628	5.65	824	10607	7823	180	39600	300	66000	147	197
5LZ216x7.0 L-6-840	216	8 1/2	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	5:6	6	1228-2455	325-650	72-145	4.8	700	10267	7572	6.78	988	14502	10695	220	48400	330	79200	198	265
7LZ216x7.0 L-5-840	216	8 1/2	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	7:8	5	1325-2650	350-700	69-138	4	585	9795	7222	5.65	824	13832	10200	220	48400	330	79200	179	240
K9LZ216x7.0 L-1260	216	8 1/2	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	9:10	2.5	1440-2880	380-760	45-90	2	290	7230	5333	2.83	410	10230	7545	180	39600	300	66000	77	103
5LZ228x7.0 L-5-840	228	9	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	5:6	5	1228-2455	325-650	72-145	4	585	7631	5628	5.65	824	10607	7823	180	39600	300	66000	147	197
5LZ228x7.0 L-6-840	228	9	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	5:6	6	1228-2455	325-650	72-145	4.8	700	10267	7572	6.78	988	14502	10695	220	48400	330	79200	198	265
9LZ228x7.0 L-3-1690	228	9	251-311	9 7/8-12 1/4	6 5/8REG	6 5/8REG	9:10	3	1440-3600	380-950	33-83	2.4	350	13295	9805	3.39	495	18779	13850	180	39600	300	66000	147	197
LZ244x7.0 L-6-1026	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	1:2	6	1345-2690	399-797	100-200	4.8	700	8983	6625	6.78	988	12690	9358	220	48400	330	79200	240	320
3LZ244x7.0 L-6-1026	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	3:4	6	1345-2690	355-710	75-150	4.8	700	10465	7718	6.78	988	14782	10902	220	48400	330	79200	179	240
5LZ244x7.0 L-4-1008	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	5:6	4	1650-3300	450-880	64-129	3.2	466	9114	6722	4.52	655	12105	8927	220	48400	330	79200	147	197
5LZ244x7.0 L-5-1008	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	5:6	5	1650-3300	450-880	64-129	4	585	11393	8402	5.65	824	16092	11868	220	48400	330	79200	195	262
5LZ244x7.0 L-6-1008	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	5:6	6	1650-3300	450-880	64-129	4.8	700	13670	10082	6.78	988	19310	14240	220	48400	330	79200	234	315
C5LZ244x7.0 L-4-1260	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	5:6	4	2100-4200	600-1110	65-131	3.2	466	13020	9602	4.52	655	17290	12753	220	48400	330	79200	215	288
7LZ244x7.0 L-4-1008	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	7:8	4	1775-3550	469-938	61-122	3.2	466	10300	7598	4.52	655	14550	10733	220	48400	330	79200	167	224
C7LZ244x7.0 L-4-1264	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	7:8	4	2225-4450	588-1176	61-122	3.2	466	14765	10890	4.52	655	20856	15381	220	48400	330	79200	240	321
7LZ244x7.0 L-5-1096	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	7:8	5	2270-4540	600-1200	68-135	4.0	585	15950	11760	5.65	824	24030	17720	220	48400	330	79200	310	415
7LZ244x7.0 L-5.7-1008	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	7:8	5.7	2270-4160	600-1100	72-132	4.56	660	20600	15190	6.44	934	29090	21460	220	48400	330	79200	330	442
3LZ286x7.0 L-4-1280	286	11 1/4	375-660	14 3/4-26	(6 5/8REG)7 5/8REG (6 5/8REG)7 5/8REG		3:4	4	2850-5700	1000-1500	97-196	3.2	466	11840	8731	4.52	655	15724	11.597	300	67500	550	123750	290	388



等壁厚(螺杆钻具)技术参数表
Uniform Thickness (Downhole Motor) Technology parameters

钻具型号 Model	外径尺寸 Tool OD		钻头尺寸 Bit Size		两端连接螺纹 Connecting Thread		头数 Lobe	级数 Stage	排量 Flow Rate		转速 Rotory Speed	工作压力降 Working Pressure Loss		输出扭矩 Output Torque		最大压力降 Max Pressure Loss		最大扭矩 Max Torque		工作钻压 Working Pressure		最大钻压 Max Pressure		输出功率 Output Power	
	mm	in	mm	in	上端 up	下端 down			lpm	gpm	rpm	Mpa	psi	N.m	lb-ft	Mpa	psi	N.m	lb-ft	KN	lb	KN	lb	KW	hp
U5LZ73x7.0 L-3-600	73	2 7/8	95-121	3 3/4-4 3/4	2 3/8REG	2 3/8REG	5:6	3	176-616	76-162	167-589	3.36	489	445	327	4.746	691	628	463	12	2640	25	5500	34	46
U5LZ120x7.0 L-4-900	120	4 3/4	149-200	5 7/8-7 7/8	3 1/2REG	3 1/2REG	5:6	4	694-1388	184-367	140-278	4.4	647	2795	2061	6.215	900	3948	2912	49	10803	100	22000	103	138
U5LZ165x7.0 L-4-840	165	6 1/2	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	4	862-1724	228-456	87-174	4.8	700	5507	4062	6.78	988	7780	5737	80	17600	160	35200	120	160
U5LZ172x7.0 L-4-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	4	947-1894	250-500	92-184	4.4	647	5719	4218	6.215	900	8079	5959	100	22000	170	37400	140	187
U5LZ172x7.0 L-5-840	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	5:6	5	947-1894	250-500	92-184	5.5	808	7148	5272	7.769	1125	10099	7449	100	22000	170	37400	140	187
U6LZ178×7.0 L-4.5-700	178	7	213-251	8 3/8-9 7/8	4 1/2REG	4 1/2REG	6:7	4.5	1080-2100	285-555	110-225	4.95	722	6451	4756	6.93	1011	9220	6799	100	22000	170	37400	185	248
U7LZ172x7.0 L-4-920	172	6 3/4	213-251	8 3/8-9 7/8	41/2REG	4 1/2REG	7:8	4	1183-2366	312-625	84-168	4.4	647	7895	5822	6.215	900	11150	8220	100	22000	170	37400	220	295
U7LZ172x7.0 L-5-920	172	6 3/4	213-251	8 3/8-9 7/8	4 1/2REG	41/2REG	7:8	5	1183-2366	312-625	84-168	5.5	809	9866	7276	7.75	1139	13905	10253	100	22000	170	37400	220	295
U5LZ197x7.0 L-4-840	197	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	4	1113-2225	295-588	79-158	4.8	700	9146	6745	6.78	988	12920	9528	150	33000	200	44000	180	240
U5LZ203x7.0 L-4-840	203	7 3/4	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	5:6	4	1113-2225	295-588	79-158	4.8	700	9146	6745	6.78	988	12920	9528	150	33000	200	44000	180	240
U7LZ203x7.0 L-4-1050	203	8	251-311	9 7/8-12 1/4	5 1/2REG	6 5/8REG	7:8	4	1530 -3060	404-808	75-151	4.4	647	11345	8366	5.65	824	14567	10743	155	34100	250	55000	207	278
U7LZ210x7.0 L-4.2-1008	210	8 17/32	251-375	9 7/8-14 3/4	6 5/8REG	6 5/8REG	7:8	4.2	1589-3178	420-839	68-137	4.62	679	13570	10000	6.52	958	19152	14125	180	39600	300	66000	247	331
U7LZ244x7.0 L-4.5-1096	244	9 5/8	311-445	12 1/4-17 1/2	6 5/8REG	6 5/8REG(7 5/8REG)	7:8	4.5	2270-4540	600-1200	68-135	4.95	727	21530	15878	6.975	1025	30330	22373	220	48400	330	79200	385	517