JLXM、JLZX 系列立磨减速机
安装使用维护说明书

Installation & Operation Manual for

JLXM 、JLZX Series Vertical Mill Gear Reducer

CSSC

重庆齿轮箱有限责任公司

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安全事项

1.要求:

说明书是专门为减速机现场安装、使用、维修人员和相关设备操作人员编写配置的；为了您的人身安全和产品的正常使用，请在安装之前仔细阅读本安装使用说明书。只有完全掌握此操作手册，才能防止齿轮箱工作出现失误，并确保无故障运行。

我们推荐在开始安装使用减速机前进行此说明书的学习，若未学习而导致减速机损害与运行故障，我公司不承担任何责任。

2.符号和指令的说明

2.1 工厂安全符号

在本说明书中，该符号表示极可能会对生命和身体造成危险，必须注意,必须告知使用者。同时必须注意国家或行业相关的通用安全事故预防管理措施。

2.2 警告说明

WARNING! 在本说明书中该符号表示需要给予特别的关注，以便遵守相应的规定进行准确的维护工作，从而避免齿轮箱和其它零件损坏或发生故障。

2.3 任何会危及齿轮箱安全的工作方法都必须避免。

Safety particulars

1. Notes：

This manual is especially prepared for people who install， operate and maintain the machine. It must be read through before operation. Please read carefully prior to installation for your personnel safety and smooth operation of the machine. Only with the complete mastery of this manual can the error of the gear box work be prevented and the operation of the gearless operation can be ensured。

We recommend that we learn the instruction before installing and reducer. If we do not learn, it will cause any damage to the reducer and operation failure. Our company will not take any responsibility.

2. The description of symbols and instructions

2.1 Factory safety symbol

In the instruction, the symbol indicates that it is very to cause danger to life a body, and must be paid attention to. The user must be informed. At the same time, it is necessary to pay attention of general safety accidents related to the state or industry.

2.2 Warning

WARNING! In the instruction, the symbol indicates the need for attentions, so as to comply with the relevant provisions and make proper maintenance work, so as avoid damage to gearbox and other parts.

2.3 Any working methods that will endanger the safety of the gearbox must be avoided.

2.4 只能由具有相应资格的专业人员进行安装、检修，防止任何未经授权的人员操作齿轮箱。

2.4 Maintenance work is done only by qualified workers. Prevent unauthorized staff form operating the gearbox.

2.5 若齿轮箱有任何改变会影响其安全时，操作员有义务立即报告。

2.5 If any change in the gearbox affects its safety . the operator reports immediately.

2.6 进入设备工作区必须穿戴相应的防滑、防碰撞的保护用具。

2.6 Wear antislipping and anticollision articles when entering into working area.

2.7 该齿轮箱包含旋转机构，使用时注意人生安全。裸露运转部位（如膜片联轴器等）必须加装防护罩。

2.7 The gearbox includes a rotating mechanism, which is used to pay attention to personal safely.Bare rotating parts (such as coupling， etc.) must be equipped with protection guard.

2.8 减速机上的观察孔仅供观察用，严禁人员通过观察孔进入减速机内。

2.8 Inspection windows on the reducer are used for checking only. It is forbidden for any person entering the reducer through them.

3.重要性

3.1 潜在危险

WARNING! 设备边缘 3 米内严禁有明火出现，设备附近应有干粉灭火器用于紧急灭火。

3. Significance

3.1 Potential hazard:

WARNING! Naked fire is not allowed to appear within 3 meters from the equipment. CO_2 fire extinguisher for emergency must be provided nearby the machine.

WARNING! 设备安装、运行、维护期间的废润滑油，应根据润滑油厂家所提供建议，妥善安置。

Old used lubrication oil should be disposed properly according to the recommendations from the oil maker.

3.2 防护：

用户必须建立安全操作的规章制度，一定要按说明书的要求安装、使用、维护。

3.2 Protection:

The customer must constitute safety regulations. Installation, operation & maintenance must be performed in accordance with this manual.

按要求安装各种互锁保护装置，否则可能造成严重的意外事故。

Various interlocking devices should be fitted as required， otherwise severe accidents may be caused.

4. 重要申明

安装使用减速机之前，请务必仔细阅读本手册；

如未得到本公司的书面许可，减速机及配套部件不能露天安装使用；

使用环境与本手册不相符者，需本公司认可后，方能投入使用；

连锁、报警和保护条件与本手册不相符者，需本公司认可后，方能投入使用；

4. Important notes

Please read this manual carefully prior to installation and operation.

The reducer and associated components can not be installed in open area.

Without receiving written approval from my company.

For application environment, interlocking, alarming and protection devices not corresponding to this manual, those can be accepted only after getting permission from my company.

5. 保修条件

我公司产品的质保时间按与贵公司签订的合同或协议执行。

质保不包括由于使用不当或者不正确安装所产生的损坏。

必须使用在与预先设计的使用条件一致的工作环境中。

严禁不正确的安装、使用和维护齿轮箱。

在没有我公司授权前提下对齿轮箱进行的任何改动所引起的损失，我公司不承担任何责任。

5. Condition of warranty

The warranty time of the compang’s products is based on the technical agreement.

The warranty does not include damage cased by improper use or incorrect installation.

The gearbox must be used in an environment that is consistent with the predefined use conditions.

Strictly prohibit the incorrect installation and maintenance of the gearbox.

In the absence of our company’s authorization,our company is not liable for any loss caused any changes in the gearbox.

齿轮箱在出厂前已试车，并按合同的规定进行包装。除双方另有规定外，齿轮箱出厂后进行的所有活动均属用户责任，包括：运输、存放防腐、超期存放、安装、拆卸、启动前的检验、操作和维护。

The gearbox has been tested in front of the factory and packaged in accordance with the contract. Except for the two parties, he user is responsible for the production of the gearbox. It includes: transportation, preservation ,overdue storage, installation, disassembly, inspection, operation and maintenance before startin.

6. 齿轮箱的版权限制

我公司将保留所有齿轮箱版权的权利。禁止复制本产品或其中的某一部分结构以及本说明书，我公司将保留追究的权利。

6. The copyright restrictions of the gearbox

Our company will retain the right to copyright all gearbox .It is prohibited to copy the product or part of the structure and this specification,and our company will retain the right to investigate.

7.修订

本公司保留对本手册修定的权利，如有变更，恕不另行通知.

7. Revise

My company preserves modification rights for this manual, which is subject to any change without prior notice.

目 录

Content

前言

JLXM、JLZX 系列立式磨机减速机由减速机、联轴器（膜片联轴器或弹性柱销联轴器）和稀油润滑装置三大部分组成（这三部分可由减速机厂家同时提供，也可由磨机厂家或用户自行采购）。该系列减速机主要用于电力、建材等行业立式磨机用传动减速装置，也可用于其它机械作传动装置。

减速机及配套设备的现场安装工作应按本说明书规定和立式磨机有关规定进行，还应执行现场指导工程师的意见和决定。

减速机机房的建筑标准主要取决于当地情况和气候条件。要考虑出现最低的环境温度和整个粉磨车间所容许的最大噪音，特别要考虑防止粉尘直接沉积在减速机上，机房应有足够的检修场地，为的是方便日后的大修工作。

包装箱本身不完全具备防潮、防雨、防尘、防火、防碰撞等功能，故请妥善保存、运输。减速机及其配套部件在收到后应当及早安装，不能立即安装的须存放在温度-20℃～+50℃、湿度 70%RH 以下及酸碱为中性的仓库中，存放半年（6 个月）后应开包装箱进行防锈保养。

Preface

JLXM、JLZX series gear reducer for the vertical mill consists of gear reducer，coupling (diaphragm coupling or elastic coupling) and oil lubricating system(the total three parts can by supplied by the reducer maker or ordered by the mill maker or customer individually)， which is mainly used as vertical driving reduction device for electricity industry and as other mechanical driving device as well.

Installation of gear reducer and associated equipments in the field shall be carried out in accordance with the manual herein and vertical mill for electricity industry as well. Meanwhile，the advices and comments from the field service engineers shall be considered.

Gear reducer house is constructed mainly depending on the local actual condition and weather condition. Consideration shall be given to lowest ambient temperature and allowable max. noise present in the whole milling plant， particularly to the fact that dust shall not be directly deposited on the gear reducer. Sufficient room should be kept for maintenance in the house to facilitate the expected turnaround.

Install the gear reducer and auxiliary parts as soon as possible upon receipt and those which can not be installed immediately shall be stored in the damp-proof warehouse with temperature between -25℃~+50℃, humidity below 70%. Parts shall be subject to rust-resistant painting after 6-month storage.

开箱时应按照装箱清单或零件目录、图纸仔细查对零部件数量和完好状况。同时贮备必要的材料和工具以备安装需要。如因特殊原因未能及时安装使用，须用包装胶布密封输出法兰与箱体、输入轴与箱体，以及透气帽孔等处的所有与空气相通的地方，通过箱体中部透气帽孔按“表 1-1”要求加入 NP-20 气相防锈油，迅速将灌注口密封，做好保养记录并明确下一次保养时间，避免内部零件锈蚀。

When opening box for this purpose, check the amount and condition of parts against the packing list or part catalog or drawings. Prepare the materials and tools necessary for installation. If the reducer can not be installed timely due to special reason, Seal with adhesive tapes the output flange and casing, input shaft and casing and vent cap holes etc. where is bare to air. Volatile corrosion inhibitor NP-20 should be applied as table 1-1 through the vent cap hole at the mid of casing to protect inner parts against corrosion, and seal the openings. Make the maintenance record and indicate the time for next maintenance.

如果由于用户保养不当，造成齿轮箱锈蚀等其它损坏，我公司将不承担任何责任。

Due to improper maintenance of users, gear box corrosion and other damage, our company doer not assume any responsibility.

表 1-1 气相防锈油 NP-20 加入量 Table.1-1 Volume of volatile corrosion inhibitor NP-20 put into

产品型号 type	NP-20 单位 unit（L）	产品型号 type	NP-20 单位 unit（L）
JLXM265	2	JLZX40-50	1.3
JLXM315	3	JLZX63-80	2.5
JLXM340	3.6	JLZX100-140	4.2
JLXM355	4.3	JLZX160-200	5.1
JLXM410	6.5	JLZX250-300	6.2
JLXM420	6	JLZX315-355	7
JLXM470	7.2	JLZX375-435	8.4

为了使安装工作顺利进行，必须准备好所需要的各种工具和仪器，要有合适的运输和吊装设备，最好用移动式起重机来完成。

In order to make the installation progress smoothly， it is necessary to prepare the required tools and instruments， appropriate transportation and lifting equipments， preferably using movable crane.

安装前必须仔细阅读本说明书，看懂安装基础图、装配图及外形图，熟悉安装程序，仔细查看减速机各部件和其它配套件的形状尺寸、重量以及数量。清除灰尘、杂物，保证安装工程周围环境的整洁。

Carefully read the manual before installation，particularly erection foundation drawing，assembly drawing and dimensional drawing; be familiar with erection procedure. Check the size，dimension， weight and quantity of gear reducer parts and relevant pieces. sure that the surroundings for the installation field is clean and free of dust or foreign matter.

由经过齿轮箱专业培训合格的员工对齿轮箱进行安装，对由未经培训合格的非专业技术员工的安装而导致的损坏,我们不予以认可。

The crane is able to work under the During construction， safety is the most important thing to be considered. Carefully inspect the lifting sling is tight or not. During transportation， nobody is allowed to stand under the crane.

吊装注意事项：

Precautions for hoisting


安装施工中，一定要注意安全，在吊运产品前，要仔细检查吊装索具是否牢靠。


Be sure to pay attention to safety during the installation and carefuly check the safety of the lock before the crane is shipped.


在吊运过程中，吊运物下面严禁站人,以防意外的发生。


In the lifting process, nobody is allowed to stand under the lifting, to prevent accident form happening.


整台齿轮箱起吊时，必须同时用箱体上的4 个专用吊耳进行起吊，以防意外的发生。


When the whole gearbox is hoisted, four special ears on the box must be used at the same time to prevent accident form happening.


齿轮箱起吊安装过程要求平稳、缓慢，起吊时，应避免碰坏齿轮箱及附件的损坏。


The requirement of the gearbox to be suspended is smooth an slow, and the damage of the gearbox and accessories should be avoided.


起吊过程时钢丝绳与箱体接触的地方垫上硬木块，不允许钢丝绳直接与箱体接触。要求对称两支钢丝绳的起吊夹角不得大于60°。


During transportation, place hard wood blocks to prevent from direct contact between the steel ropes and casing. No direct contact with the steel rope and the box. The angle is recommended less than 60° between both symmetric steel ropes.

1. 减速机的安装

1.1 概述

JLXM、JLZX 系列减速机采用水平输入，垂直输出的锥齿轮--行星齿轮两级减速传动的结构形式。

JLXM、JLZX 两级传动减速机主要由三部分组成:(1)锥齿轮传动部分(2)行星齿轮传动部分(3)输出法兰和箱体部分。

主电机通过膜片联轴器或弹性柱销联轴器联接输入轴，被动锥齿轮轴通过齿形联轴器与行星齿轮部分相联，行星架带动输出法兰将扭矩输出。

减速机除内齿圈采用优质合金调质钢外，其余全部齿轮均采用优质合金渗碳钢。齿面均经渗碳、淬硬后磨齿，具有很高的齿轮精度和负荷容量。

箱体为焊接或铸造两种结构。具有足够的强度和刚度，并且内齿圈、推力轴承、下箱体的平均直径设计一致，能承受很大的垂直负荷以及齿轮传动所产生的轴向和径向力。在箱体上部设计有油池，推力轴承完全浸在润滑油中，减速机运行时能有效形成油膜，保证减速机的运行。

减速机中，锥齿轮部分和行星齿轮部分采用滚动轴承，输出轴采用径向滑动轴承或滚动轴承。输出法兰的支承根据承受的垂直载荷大小不同采用相应的动压推力轴承。

1. Installation of gear reducer

1.1 Generals

JLXM、JLZX series gear reducer is working on double-stage drive from bevel gear-planetary gear in horizontal input and vertical output

JLXM、JLZX double-stage drive gear reducer is mainly composed of the following: (1) bevel gear drive; (2) planetary gear drive; (3) output flange and casing.

Main motor is coupled with input shaft via diaphragm coupling or elastic pin coupling and driven bevel gear shaft is coupled with planetary gear via cog-wheel coupling， thus torque output can take place on output flange driven by the planetary carrier.

Except for the quality alloy quenched and tempered steel applied to the annular gear， all other gears for the gear reducer are made of quality alloy case-hardened steel. Ground tooth face after case-hardened and quench-hardening process presents relatively high accuracy and load bearing capacity.

The casing is structured as welded or cast with high strength and rigidity and the average diameter for the annular gear， thrust bearing， lower casing is kept the same， which can withstand very high vertical load and axial and radial forces arising from gear driving. Oil reservoir is also designed at the upper casing. The thrust bearing is fully soaked into oil, which can form effective oil film to ensure smooth operation of gear reducer.

Roller bearing is utilized for the bevel gear and planetary gear while radial sliding bearing or roller bearing is used for the output shaft. Depending on sustained vertical loading， the support of output flange is working on the corresponding dynamic pressure thrust bearing.

1.2 减速机的技术参数

传递功率 kW
输入转速 r/min
输出转速 r/min
传 动 比
垂直静负荷 kN
垂直动负荷 kN
稀油站型号

详见合同、技术协议和外形图

齿轮精度：内齿圈 7 级其余 6 级以上

齿面硬度：内齿圈 HB275～310 其余 HRC60±2

额定载荷时齿面接触斑点：对圆柱齿轮，要求接触斑点长度≥70%、高度≥50%；对圆锥齿轮，要求接触斑点长度≥50～70%，高度≥55～75%

噪音：空载时小于或等于 85dB（A）

润滑油牌号： L-CKD320 GB5903 工业闭式齿轮油，推荐厂家及牌号（详见“附表二”）

旋向:
输入轴旋向 ：(面对输入轴) 顺时针;
输出法兰旋向：（从上向下看）顺时针;

1.3 减速机的安装程序

大型减速机安装，因其结构形式不同而安装内容和方法存在较大差别。由于受到整个车间的安装计划和厂房条件的影响，实际安装程序并不总是一成不变的。从技术上看，可以采用不同的分步安装程序，然而作为减速机制造公司推荐的安装程序如下：

1.2 Specifications for gear reducer

Transmitted power: kW
Input rpm: r/min
Output rpm: r/min
transmission ratio :
Vertical static load: kN
Vertical dynamic load: kN
Model of oil lubrication system:

Refer to the Contract , Agreement and dimensional drawing.

Accuracy of gear: GB10095 Class 7 for annular gear and Class 6 or higher for other

Face Hardness : HB275-310 for annular gear and HRC60±2 for others.

Contact pattern for gears at rating load: required length ≥ 70% and height≥ 50% for cylindrical gear pair，length ≥ 50～70% and height ≥ 55～75% for bevel gear pair.

Noise: ≤ 85dB(A) at no load

Oil grade: gear oil L-CKD320 acc. To GB5903 (recommended oil maker and oil grade seeing Annex Table 2)

Sense of rotation
(Facing the input shaft) input shaft rotates clockwise.
(Viewing from up to down) output flange rotates clockwise.

1.3 Installation procedure for gear reducer

Installation of large gear reducer greatly varies on installation content and method due to different structures. Limited by the installation plan for the whole workshop and its condition， the actual installation procedure is not always kept unchanged. Technically， it is possible to carry out the installation based on phased means.

However， the gear reducer maker recommends installation procedure as follows：

1.3.1 设备基础的验收

检查立式辊磨的基础底板安装在基础上是否牢固。在基础底板上划出磨机中心线的位置，并检查基础底板上地脚螺栓孔的位置尺寸是否符合减速机外形和基础安装图的要求并存档备查。找正基础底板的平行度，使之符合 0.08mm/m 的平行度要求，且基础应进行了二次灌浆并达到防护要求。

1.3.1 Acceptance of equipment foundatio

Check that the soleplate for the base of vertical roller mill is properly secured. Mark on the soleplate the location of central line for the mill and check that anchor bolt hole is properly sized for the gear reducer installation as per the drawing. Alignment the base soleplate and ensure the parallelism to be 0.08mm/m. Second grouting shall be done for foundation to ensure protection.

1.3.2 减速机的安装就位

用汽油或其它溶剂清洗减速机底板，在加工面上涂一层薄薄的机油。将减速机推拉（吊）到已划好中心线的立式辊磨基础底板上，可用四个千斤顶, 东西南北各 1 个，顶住减速机底板，前后左右移动减速机，使减速机底板四周上刻划的中心线与基础底板的中心线对齐，误差在 1mm 内，检查减速机底板上地脚孔与基础底板孔的位置是否重合，螺栓是否干涉；同时检查减速机输入轴线与电机基础中心线是否重合；否则查找原因，重调减速机位置，使之达到要求。

1.3.2 Installation of gear reducer in place

Push the gear reducer to the central line marked on the base soleplate of vertical roller mill for preliminary orientation. Put dial indicator on the output flange and then turn reducer’s input shaft to slowly rotate output flange and to align with the locating hole of grinding disc, making sure that the co-axial level can meet the requirement. During the alignment, 4 jacks at each direction are used to jack up the soleplate of gear reducer for slightly tuning. When the co-axial requirement for the grinding disc and output flange is met, install dowel pins and connection bolts for the grinding disc and output flange.

插入固定地脚螺栓，拧紧地脚螺栓将减速机紧固在立磨基础底板上。通过减速机箱体底板上预钻的定位销孔，与立磨基础底板同钻铰定位销孔并装好定位销。清洗减速机输出法兰， 检查输出法兰联接螺孔并清洗干净，接合面涂少量的油脂，按磨机安装要求对磨机磨盘等其它部件进行安装。

Finally, with the anchor bolt holes on the casing soleplate, tighten the gear reducer to the base soleplate of vertical mill with anchor bolts. Meanwhile, with the dowel pin holes predrilled on the casing soleplate of the gear reducer, drill and ream the locating pin holes on the base soleplate of vertical mill and then put dowel pins in. Lastly, put dust guard .

1.3.3 安装注意事项

减速机就位前需把减速机底板底面、输出法兰联接位置清理干净并涂抹一层很薄的轻油。如果在安装磨机过程中需转动减速机输出法兰时，必须在减速机上部油池中注入一定量的齿轮油，达到油标规定油位，以防止转动时损坏减速机内推力瓦和轴承。减速机地脚螺栓及销的安装拧紧，需待按磨机安装要求完成后才进行。


当使用特殊装置时，如液压和气压等工具，要求参照该装置的使用说明书正确使用。

在齿轮箱安装和拆卸过程中，不能对齿轮箱传动轴、管道及附件等部位进行敲打、撞击、踩踏等，都可能会导致齿轮箱的损坏。


安装时，应确保周围人员与设备的安全。

1.3.3 Notes

Before mounting the reducer in proper position, the bottom of the base plate and the connecting place of output flange must be cleaned and coated with very thin light oil. If rotation of output flange during installation of mill is necessary, the upper oil sump of reducer must fill gear oil to required level for protecting the thrust pad and bearing inside the reducer against damage. The tightening of foundation bolts and pins must be done after ensuring the mill is installed in good condition.


When a special device is used, such as hydraulic, air pressure, etc. it is required to use the relevant instructions correctly.

In the gearbox installation and disassembly process, not on the gearbox drive shaft, pipes and accessories to beat, hit and stampede, damage are likely to cause the gearbox.


When the gearbox is installed, the safety of the surrounding personnel and equipment should be ensured.

2. 联轴器的安装

2. 1 概述

根据用户要求，可配用膜片(或弹性柱销)联轴器。膜片联轴器由膜片组、传动轴、联轴节、间隙调整片、膜片组及紧固件组成（弹性柱销联轴器由联轴节、弹性圈、柱销及紧固件组成）。

联轴节分为电机端联轴节和减速机端联轴节两部分，分别装在主电机与减速机的轴伸端。膜片（弹性柱销）联轴器除减少扭转振动和齿轮冲击，延长减速机的使用寿命外；同时膜片联轴器还可以拉开主减速机与主电机间的距离，避免主电机与磨机筒体发生干涉。

2. Installation of coupling

2.1 Generals

According to the customer， the gear reducer may be provided with diaphragm coupling， which consists of diaphragm pack， driving shaft， coupling flange， clearance adjusting shims and clamping parts.

One diaphragm pack is coupled with output flange of main reducer，the other diaphragm pack is coupled with the extension shaft at motor side (elastic pin coupling also can be used， which includes coupling， elastic ring， cylindrical pin and clamping parts). Besides reducing torsional

vibration and impact， extending reducer's service life， the diaphragm coupling also can increase the distance between main reducer and main motor to avoid interference of main motor and mill cylinder.

2. 2 安装程序

2.2 Installation procedure

2.2.1 膜片（弹性柱销）联轴器在出厂时为了方便运输，所有的零件组装在一起，拆开包装箱后，吊出联轴器组件，拆开取下两端的联轴节。主电机就位前，应将联轴器的左、右半联轴节分别装在主电机轴和减速机输入轴上。联轴节轴孔与主电机轴及减速机轴的配合是 H7/m6 或 H7/n6（装配前复核轴和孔的尺寸），装配前联轴节必须加热至一定温度，使轴与孔之间有 0.0005 D 以上的装配间隙（D 为轴直径，mm），以避免联轴节装入轴上时敲击(严禁用铁锤敲击)，使齿轮和轴承得以保护。

2.2.1 For transportation， the coupling is delivered after assembled. After unpacking， lift up the coupling parts， take out the half couplings at both sides after removing the bolts. Before the motor is placed， the two half couplings are respectively assembled on the main motor shaft and reducer's input shaft. Prior to assembly， making sure the fitting tolerance to be H7/m6 or H7/n6 (check the shaft and hole size again before assembly). Prior to assembly, the coupling must be heated up to such a temperature that a gap more than 0.00005D(D: shaft diameter, in mm) is available between the shaft and hole for assembly so as to avoid hammering on the coupling when installed (no hammering) and subsequently to protect the gears and bearings.

2.2.2 膜片联轴器的安装

2.2.2 Installation of diaphragm coupling

(1). 电机的转子一般有一定的轴向窜量，在留轴向尺寸时应把电机的转子置于中间位置 M 如图 2。

(1) The motor's rotor normally has some axial float， in this case， the rotor should be placed in the middle， seeing Fig.2.

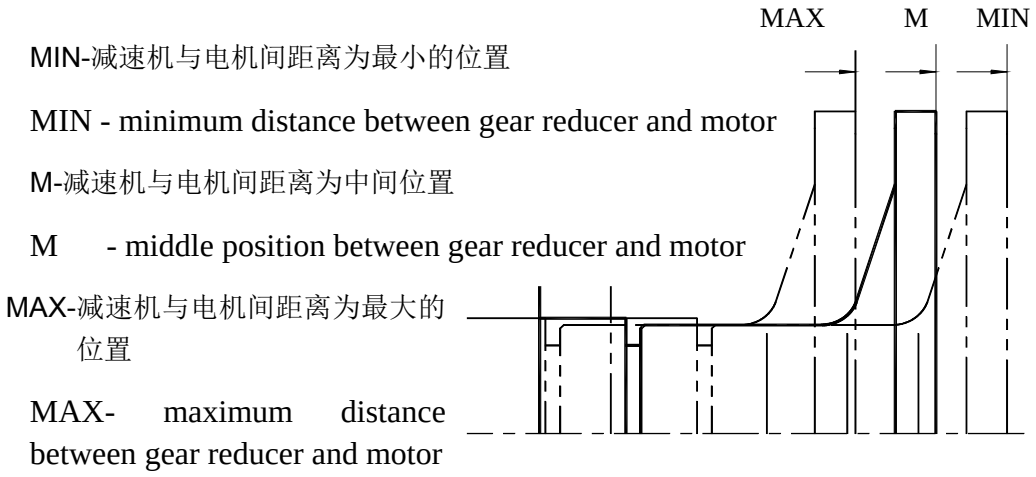

Fig.2

(2). 将传动轴水平地放在支架上（如图 3 所示），测量 L 的实际长度。
将装好半联轴节的电机就位前，应按减速机外形及安装示意图中联轴器的轴向总长尺寸（轴向总长尺寸由用户确定）留足空档 $L_0^{+0.25}$（如图 4 所示），以便膜片联轴器的顺利安装

(3). 主电机轴线和减速机轴线的对中找正（如图 4），两端半联轴节径向和端面都须按表 2 精度进行找正。找正不良将引起振动,发热,噪声，影响轴承的寿命和齿轮的正常啮合，严重时会损坏减速机。

(4). 测出实际尺寸，按图 5 方式吊入膜片组件，就位后拧紧螺栓，拧紧前在螺纹上涂抹厌氧胶防松。复查主电机轴是否处于中间位置。

(2) Horizontally put the driven shaft on the support (as shown in Fig.3) and measure the actual length. Before operating the motor with half coupling ready, a space $L_0^{+0.25}$ of should be left for overall axial length (decided by the customer) for the coupling for the installation of diaphragm coupling. Please see the reducer's outline & installation drawing

(3) For the axis alignment of main motor and reducer (Fig.4), the radial and end of double coupling must alignment accurate as table 2. Poor alignment will result in vibration, heating and noise, which has an effect on the bearing life and correct tooth contact and even damage the reducer.

(4) Measure the actual dimension. Lift in the diaphragm as shown in Fig.5 and tighten the bolts (remember first to apply anaerobic glue on the thread). After alignment, check the main motor shaft in middle position.

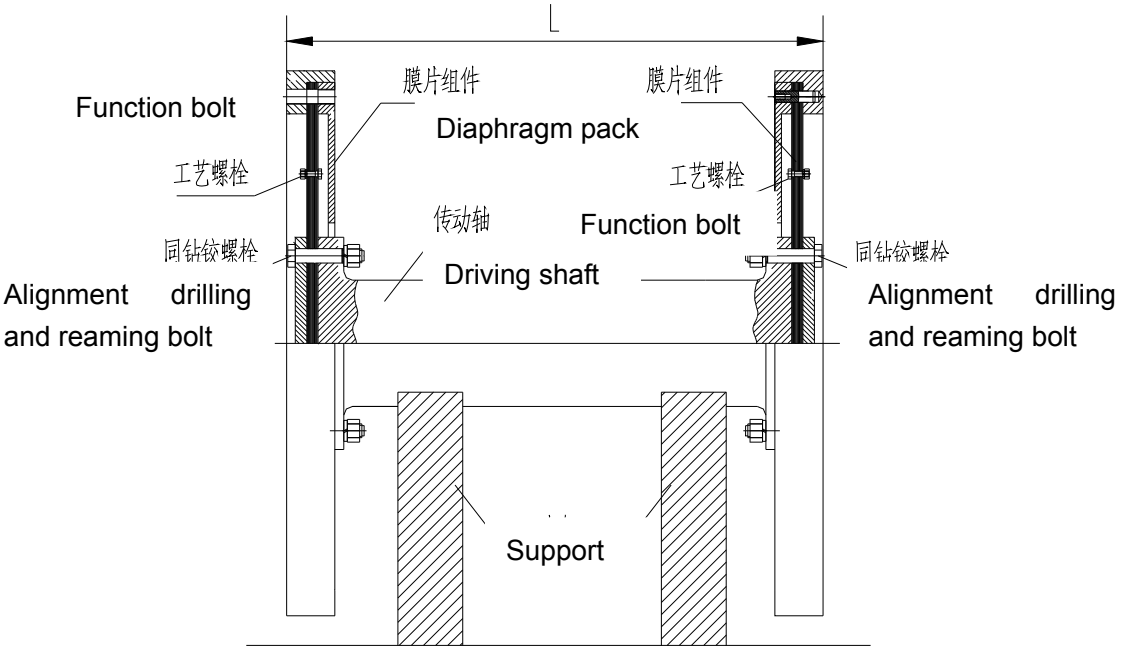
L
膜片组件
膜片组件
Function bolt
Diaphragm pack
工艺螺栓
工艺螺栓
传动轴
Function bolt
同钻铰螺栓
同钻铰螺栓
Driving shaft
Alignment drilling and reaming bolt
Alignment drilling and reaming bolt
Support

图 3

Fig.3

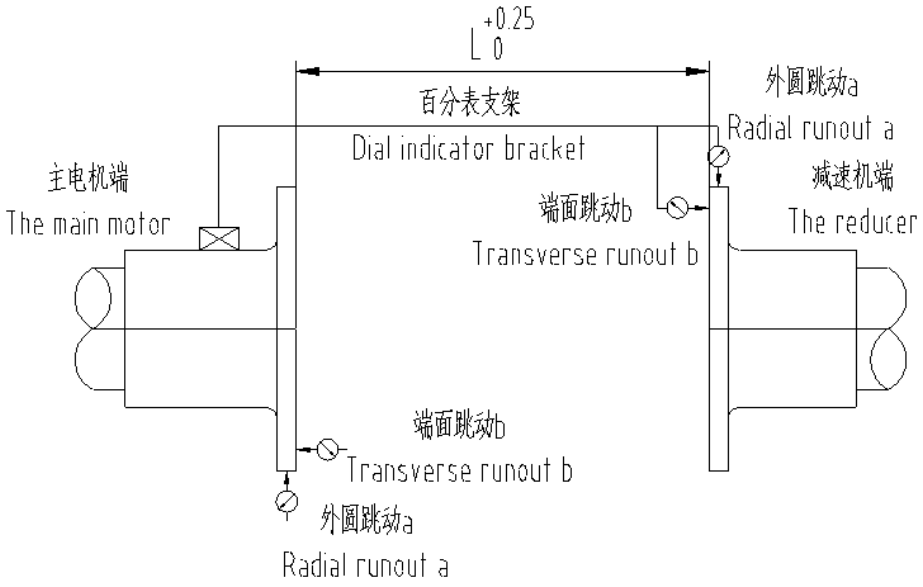
+0.25
L 0
百分表支架
Dial indicator bracket
外圆跳动a
Radial runout a
主电机端
The main motor
端面跳动b
Transverse runout b
减速机端
The reducer
端面跳动b
Transverse runout b
外圆跳动a
Radial runout a

Fig.4

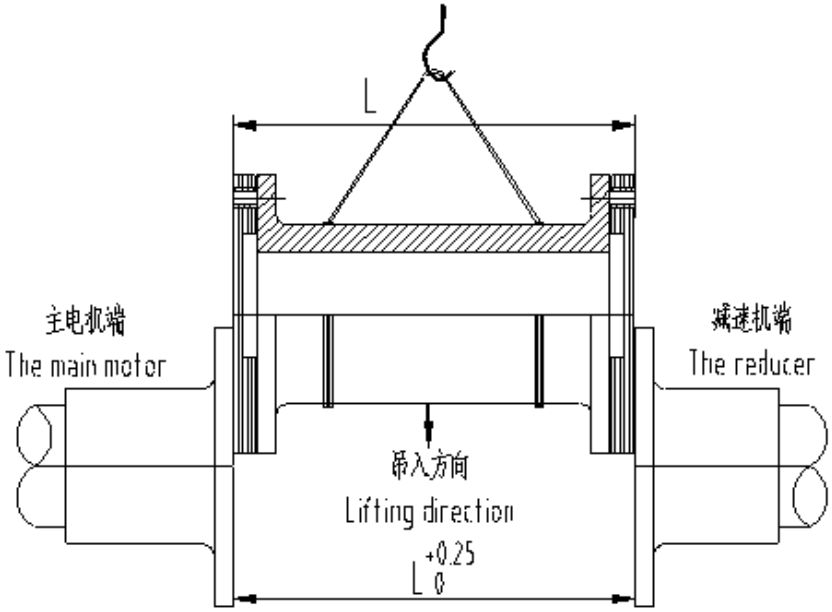

Fig.5

表 1 Table 1

	弹性联接 Elastic connection
外园径向跳动 a Radial run-out a	≤0.10 mm
法兰端面跳动 b Face run-out b	≤ 0.08/100 mm

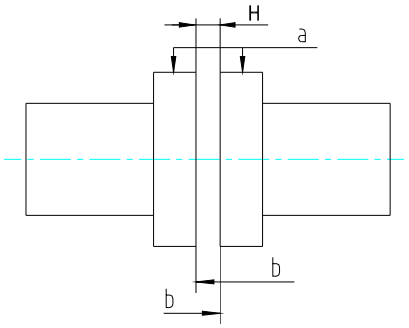

图 6 Fig.6

2.2.3 弹性柱销联轴器的安装

(1). 主电机的转子一般有一定的轴向窜量，在留轴向尺寸时应把电机的转子置于中间位置 M 如图 2。

2.2.3 Installation of elastic pin coupling

(1) Generally axial float is left for motor rotor. When considering the axial float, keep the rotor in the middle position M as shown in Fig.2.

(2). 将装好半联轴节的电机就位前，应按减速机外形及安装示意图中联轴器的总长 L(图 6)尺寸（总长 L 尺寸是由用户确定），留足轴向 L 尺寸。并保证联轴器的法兰间的间隙尺寸 H=10～15mm，该尺寸在联轴器装配图和减速机外形图标注有（如未标注，该尺寸为 H=10mm）。

(2) Before operating the motor with half coupling, sufficient space should be left (decided by the customer) for the coupling dimension L (see Fig.6) according to the reducer's outline & installation drawing. Meanwhile a clearance of H=10~15mm must be ensured between coupling flanges. H is indicated in coupling assembly drawing and outline drawing of reducer (In case no indication, H=10mm).

(3). 主电机轴线和减速机轴线的对中找正（如图 6）。其精度推荐按表 2 进行找正好后，固定主电机并按以上要求复查合格后，安装弹性销部件。

(3) For the axis alignment of main motor and reducer (Fig.6), the accuracy is recommended as table 2. After proper alignment, secure the motor and review again according to the above-said requirements. Then install the elastic pin assemblies

2. 3 安装注意事项

2.3.1 对膜片联轴器的膜片组件与传动轴组装前，不允许拆卸工艺螺栓，以防零件松落，引起同心度的变化。

2.3 Precautions

2.3.1 Prior to assemble the diaphragm pack and driving shaft， it is not allowed to remove the function bolts to prevent parts against loosen and concentricity change.

2.3.2 对膜片联轴器，吊装传动轴和膜片组件应按图 5 所示起吊，并注意在钢丝绳与轴之间垫上软物，以防钢丝绳将轴拉伤，不得挂吊膜片处，以防膜片变形。

2.3.2 For diaphragm coupling， lift the driving shaft and diaphragm pack according to Fig. 5 and take care that some soft material shall be placed between steel rope and shaft to protect shaft against scratch. The diaphragm can not be used as lifting point to prevent deformation.

2.3.3 在预留膜片联轴器中间轴长度时，一定要使主电机的法兰在中间位置。

2.3.3 When preconsidering the intermediate shaft length for diaphragm coupling, make sure that the flange of main motor in the middle position.

2.3.4 联接螺栓拧紧力矩优先按相应的外购件使用说明书执行，未提及的按附表一所示，按对称交叉顺序，分别按 0.5M、0.75M、0.9M、M 力矩进行拧紧，并涂胶进行防松。

2.3.4 Connected bolts are preferred to be tightened with corresponding torques specified in Instructions. Otherwise attached Table 1 can be referred to. Tighten in a symmetrical cross order with torques 0.5M,0.75M, 0.9M and M respectively, and coated with anaerobic adhesive for tightness.

3. 稀油润滑装置的安装及控制要求

3.1 稀油润滑装置的安装

JLXM、JLZX 系列减速机根据工况要求，配置有低压稀油润滑装置。

稀油润滑装置的安装按其使用说明书要求进行，现将主要程序说明如下:

3.1.1 按总体安装布置要求将清洗干净的稀油站、仪表盘和控制柜安放在指定位置，基础要牢固可靠，安放应平稳，四周要考虑有足够的用于维护、保养和检修的空间。

3.1.2 安装稀油站与仪表盘联接的 φ10 X 1 紫铜管;稀油站，仪表盘与电控柜联接的线路（仪表单独放置时才有上述安装过程）;按电控原理图安装电气元件。

3.1.3 安装稀油站与减速机的进油管和回油管。回油管的应保证油回流通畅，高度差每米应大于80mm；配制好的管路应进行酸洗，彻底清除氧化皮，砂尘和焊渣。清洗并吹干后，内壁涂润滑油，外表面涂防诱漆，管与管的法兰联接处用无石棉垫片防漏。

3. Installation of oil lubricating device and control requirements

3.1 Installation of oil lubricating device

JLXM、JLZX series gear reducer is equipped with low pressure oil lubricating device on the request of working condition.

Oil lubricating system shall be installed as per this manual and the main procedure is described as follows:

3.1.1 As per the general arrangement， it is required to put at the designated location properly cleaned oil lubrication system， instrument panel and control cabinet， where it shall have solid foundation and adequate room for future maintenance and overhaul.

3.1.2 Install φ10 × 1 red copper tubes connecting the oil lubrication system and instrument panel; run the wiring for the oil lubrication system， instrument panel and electrical cabinet; install electric components according to electric circuit diagram.

3.1.3 Install the oil feed line and return line for the oil lubrication system and gear reducer. The return line shall be properly sloped to allow smooth return of oil, height difference per meter shall be bigger than 80mm. Properly fitup pipes shall be pickled to thoroughly get rid of oxidization， dust and welding slag. After cleaning and purging， apply the lubricating oil to the inner wall and anti-rusting paint to the outer surface. Flange connections of pipes shall be treated with non asbestos backup plate against leak.

3.1.4 按多路温度巡检仪（合同要求配置时才配）使用说明书要求，联接与稀油站仪表盘和电控柜的输出报警触点信号。用户需用计算机控制的，可通过该巡检仪输出的中 4--20 mA 电信号与中控室计算机相联。注意所有联接序号要一 一对应，切勿接错，布线要整洁美观，并用塑料管或其它材料对线路加以保护。

3.1.4 As per the operation manual of multiplex temperature sensor(if Contract required)， run wiring of signal on output alarm contact for oil lubrication system instrument panel and electrically controlled cabinet. In case of computer control required by users， carry out connection to the central control room through 4-20mA electrical signal from the detector. Make sure that all connection numbers be properly matched. Cables shall be run in such way that plastic tube or other materials shall be used for protection.

3.1.5 按图纸规定，安装减速机和主电动机等电器设备的线路以及它们相互之间联锁控制线路。

3.1.5 Run the wiring for the gear reducer and main motor， etc. and their interlocking wiring according to the drawing.

3.2 稀油润滑装置的控制要求

该系列减速机，所配置的稀油润滑装置为低压油站。油站主要控制要求见 3.2.1--3.2.8 。

油站的详细控制要求见所配油站的使用说明书。

3.2Requirements on controls of oil lubricating device

The associated oil lubricating device is low pressure oil station. Please see 3.2.1-3.2.8 for requirements on control of low pressure oil station.

Regarding the detailed control requirements for the oil station， please see the relavent operation manual.

3.2.1 稀油站油箱油温低于 25℃ ，电加热器自动开启(指示灯亮)。油温升至 38℃ 时，电加热器自动关闭(指示灯灭)。

3.2.1 When the oil temperature in the oil sump of oil station is below 25℃， electrical heater will automatically startup (indication lamp on). When the oil temperature moves up to 38℃， electrical heater will automatically shut down (indication lamp off).

3.2.2 当油站供油口油温低于 25℃ 时,主电机不能启动。油站向减速机供油不少于 10 分钟后，同时供油口油温大于 28℃，主电机才允许启动。供油口油温高于 55℃ 时报警并停主电机。

3.2.2 When the oil temperature in oil supply port of oil station is lower than 28℃, main engine cannot startup. After supplying oil from oil station to reducer for 10 minutes, meanwhile oil temperature in oil supply port is higher than 28℃, main engine is allowed to startup. Alarm is activated and stop main engine when oil temperature in oil supply port is higher than 55℃.

3.2.3 当稀油站出油口压力低于0.12 MPa时，备用泵启动，同时声光报警。当油压升至0.4MPa时，备用泵停止工作。

3.2.3 When discharge pressure for the oil lubrication system is below 0.12MPa， standby pump will startup and acousto-optic alarm will be activated. When the oil pressure moves up to 0.4MPa， standby pump will stop.

3.2.4 当油泵出油口压力低于 0.1 MPa 时报警，同时主电机停止工作。高于0.5 MPa时，声光报警。

3.2.4 When discharge pressure is below 0.1MPa for the oil pump， alarm will be activated and meanwhile main motor stops working. Acousto-optic alarm will be activated in case of pressure higher than 0.5MPa.

3.2.5 当稀油站油箱油位高于油标刻度值时，声光报警，低于油标刻度值时停机报警。

3.2.5 When the oil sump level in the oil lubrication system is higher than that of the oil gauge， acousto-optic alarm will be activated; and alarm will be triggered when below oil gauge， causing the stoppage of equipment.

3.2.6 当稀油站过滤器压差高于0.08 MPa时，声光报警。稀油站换热器压差高于0.1MPa时，声光报警。

3.2.6 When filter DP is higher than 0.08MPa for the oil lubrication system， acousto-optic alarm will be activated. and heat exchanger DP is higher than 0.1MPa for oil lubricating station, acousto-optic alarm will be activated.

3.2.7 输入轴承等滚动轴承温度高于 75℃ 报警，80℃时停主电机，推力 1、推力 2、推力 3、推力 4 轴承温度高于70℃ 时报警，高于75℃主电机停止工作；上箱体油池温度高于60℃时报警，高于65℃时停止主电机。（注：油池的测点是根据用户要求定）

3.2.7 In case of input 1 or input 2 bearing temperature above 75℃ alarm will start and meanwhile above 80℃main motor stops work; In case of thrust 1， thrust 2， thrust 3， thrust 4 bearing temperature above 70℃， an alarm will start and meanwhile above 75℃main motor stops work; In case of oil reservoir temperature in the upper casing above 60℃ alarm will start meanwhile above 65℃main motor stops work （Note: the view point of oil pool required by clients）

3.2.8 当稀油站出油口油温高于 45℃ 时，声光报警并开启冷却器供水开关。当稀油站出油口油温低于38℃ 时，声光报警并关闭冷却器水。

3.2.8 When the discharge oil temperature is above 45℃ for the oil lubrication system， acousto-optic alarm will be activated and the cooler is working. When the temperature is below 38℃， acousto-optic alarm will be activated and the cooler stops working.

4. 安装施工中的注意事项

4. Precautions on the installation

4.1 减速机应存放在干燥、防晒、防潮的库房内。存放半年后应对减速机进行检查保养，特别是齿轮、轴、轴承等重要零部件，以防锈蚀，并按“前言”中“表一”要求加入 NP-20 气相防锈油。

4.1 Gear reducer shall be stored in a dry, sunshine shield, damp-proof warehouse. After six months, gear reducer shall be checked, particularly gear, shaft, bearing, etc. to prevent rust，and put into volatile corrosion inhibitor NP-20 according to Tab 1 in the preface.

4.2 按照工艺设备图、土建图，以立磨中心线为基础，检查所有基础标高及地脚螺栓孔尺寸，位置是否相符，发现不符及时修正。

4.2 According to equipment process drawings and civil construction drawing， with central line of vertical mill as a basis， check all foundation elevations， anchor bolt hole size， location and correct any findings.

4.3 由于减速机是精密设备，为了保证安装质量，清洁防尘是重要环节，应特别加以重视。

4.3 Special care shall be taken on dust removal to guarantee the installation quality since the gear reducer is a precision equipment.

4.4 为保证减速机精确定位及防止安装后的长期使用情况下，减速机底面与基础底板锈蚀在一起，应在基础底板表面上均匀涂以一层薄薄的 MoS2 润滑脂。

4.4 In order to assure the accurate positioning of gear reducer and prevent the possibility that gear reducer base may bond with soleplate due to rust after long-term operation， it is required to uniformly apply a thin film of MoS2 grease on base soleplate.

4.5 减速机在找正测量时，应注意避免损坏减速机内零件，特别是润滑管系和测温用的 PT100 铂热电阻。

4.5 Try to avoid damaging gear reducer internals during alignment， particularly PT100 platinum thermal resistance used for lubricating pipe set and temperature measurement.

4.6 减速机重要零部件的清洗，应使用 EC-30.D-40.PSC-003 等清洁剂。清洗时禁用棉纱擦抹，以防粘附在轴、齿轮、轴瓦上影响安装质量。应采用绸、棉毛衫等为好。

4.6 EC-30.D-40.PSC-003 Cleaning agent could be used to clean critical components of gear reducer. No cleaning with cotton is allowed to avoid cohesion on shaft， gear， bearing pad， which may impact erection quality. It is better to use silk， jumper， etc.

4.7 在安装磨机过程中需转动减速机输出法兰时，必须在减速机上部油池中注入一定量的齿轮油，达到油标规定油位，以防止转动时损坏减速机内推力瓦和轴承。

4.7 If rotation of output flange during installation of mill is necessary, the upper oil sump of reducer must fill gear oil to required level for protecting the thrust pad and bearing inside the reducer against damage.

5. 试运转、使用及维护

5.Commissionin， operation and maintenance

减速机必须在主电机、膜片联轴器、稀油润滑装置等按规定安装完毕，各种电器控制，互锁系统准确无误的情况下才能进行试运转。

Gear reducer is not allowed to be commissioned until main motor， diaphragm coupling，oil lubricating device are installed to the standard and electronics controls， interlocking system are properly checked.

WARNING! 齿轮箱的设计制造是严格按用户提供的技术规范所要求的载荷与条件下进行的，任何超出以上条件的使用，本公司对可能出现的问题不负任何责任。

WARNING! The design and manufacture of gearbox is strictly carried out according to the load and condition required by user spercifications,and any company that is beyond the specifition is not liable for possible problems.

5.1 串油清洗

减速机润滑系统的清洁度是十分重要的，运转前必须进行串油清洗。接好稀油站与减速机之间的进油管和回油管，向油箱内注入其容积约 80%的 L-CKD320 工业闭式齿轮油，在稀油站低压供油法兰处放置铜滤网。

5.1 Oil batching cleaning

It is crucial to guarantee that the lubricating system for the gear reducer is clean. Thus oil flushing must be carried out prior to running. Properly get connected oil feed line and return line between oil lubrication system and gear reducer so as to feed L-CKD320 gear oil into the oil sump up to 80% of oil sump capacity. Install copper strainer between LP oil supply flange for oil lubrication system.

注：减速机加油口可以选择透气帽接口。

Note：The ventilation cap interface of the reducer can be selected.

清洗前，将清洗油加热到 45℃（开通旁路阀并关闭出油口阀门，使油在油箱内自循环，以防加热时结碳），然后打开出油阀，关闭旁路阀，启动油站串油。

Prior to cleaning， heat the cleaning oil to 45℃ (open bypass valve and shut oil discharge valve so as to allow oil to self-circulate in the sump and to prevent carburization when heating). Then open discharge valve， shut bypass valve and startup oil station for oil flushing.

清洗过程中，开始每小时检查并清洗一次磁过滤器和双联过滤器滤网。4 小时后每隔两小时检查一次，串油 12 小时并确认没有杂物后，停止冲洗。拆下稀油站出油口处安放的铜滤网并清洗干净后放回原处。拧紧螺栓，继续进行串油清洗，直到安放的铜滤网确认无杂物后，此项工作才可结束。

During cleaning， check and clean magnetic filter and duplex filter screen every 1 hour in the beginning and later once every 2hrs after 4 hours' operation. After oil flushing for 12hrs， check and confirm no impurity and then stop flushing. Remove the copper screen at oil discharge of lubricating station for cleaning and then put back. Tighten the bolts and continue batching operation again until there is no impurity present at copper screen.

串油清洗结束后，取出稀油站供油口法兰处安放的铜滤网，排干油箱内清洗用油，彻底清除油箱内油泥杂物，必要时用面团将箱内砂粒粘贴干净后灌入规定的润滑油。

After oil flushing， remove the copper screen at oil supply flange of oil lubrication system and empty oil sump to thoroughly get rid of any foreign matters and used oil in the sump. When necessary， absorb sand particles in the sump with flour dough before feeding required lubricating oil.

整个串油过程中仔细检查管路有无渗漏，特别是各法兰联接处，同时通过箱体上各观察孔， 查看各润滑点是否有油润滑。

During oil flushing， carefully check for any leakage from lines， particularly connections of each flange. Meanwhile， check each lubricating point for oil through sight glass on the casing.

5.2 减速机试运转

5.2 Commissioning of gear reducer

5.2.1 试运转前的准备和检查项目

5.2.1 Preparations and checks prior to commissioning

检查整个系统地脚螺栓和所有联接螺栓是否紧固，检查整个控制系统是否完备和准确可靠。特别是主电机，稀油站和减速机的互锁，以及要求的其它联锁。

Check all anchor bolts and attachment bolts for tightness. And check the whole control system in good condition， in particular the interlocking of main motor， oil lubrication system and gear reducer and other necessary interlocks.

运转前使油站加热器工作,将润滑油加热到 38℃（注意：加热时使油站自循环），才可向减速机供油。供油 30min 后，检查上箱体蓄油池是否充满油(可通过油标孔观察)并检查确认管系各联接法兰，油站油压、油温及各系统工作正常后，停止稀油站工作，马上检查稀油站油箱油位是否在规定刻度线上，否则再加油至规定油位。下箱体存油作油箱(稀油站无油箱)的减速机按上述方法进行同样检查，保证油位正常。

Prior to commissioning， startup the heater in the oil station so that the lubricating oil shall be heated up to 38℃ (note: make oil station self circulate during heating) before feeding oil to gear reducer. After supplying oil for 30min， check oil reservoir if full or not in the upper casing (via oil gauge hole). After check and confirm that piping，each connection flange，oil pressure for oil station，oil temperature and each system are working properly， stop oil lubrication system and immediately check that oil sump level in oil lubrication system is above the specified level，otherwise continue feeding until the specified oil level. Above mentioned inspection method will also be adopted for the gear reducer with lower casing as oil sump(no oil tank for the lubricating station), ensuring satisfactory oil level.

检查主电机的转向是否符合工作转向要求。通过加长手柄(铁棍)使电机与减速机联轴器用手盘动慢转，确认运转灵活，无卡滞或撞击发生后，方可启动电机运转。运转前必须先启动稀油站工作，使之达到正常工作状态。

Check the rotation direction of main motor. Slowly turn motor and gear reducer coupling manually with extended handle (the iron rod) until freely operation and no block or impingement. Then start up the motor. Prior to operation of motor，start the oil lubrication system in operation first to the normal condition.

5.2.2 减速机空负荷（磨机未装物料，磨辊脱离磨盘）运转时间为 180min，运行中每 30min 检查记录内容如下：

5.2.2 Gear reducer shall be operating for 180min under no load (mill is not loaded and grinding roller is not in contact with grinding disc) and check and record the following items every 30min:

环境温度（℃） Ambient temperature (℃)
主电机转速（r/min） main motor rpm (r/min)
润滑油出口温度（℃） Outlet temperature of lubricating oil (℃)

主电机电压（V） main motor voltage (V)
润滑油低压出口压力（MPa） LP outlet pressure of lubricating oil (MPa)

主电机电流（A） main motor current (A)
各轴承处温度（℃） temperature at each bearing (℃)

5.2.3 负荷试运转

减速机负荷试运转按表 1-2 进行:

5.2.3 Commissioning with load

Gear reducer shall be commissioned with load as per the following Table 1-2:

表 1-2 负荷试运转各工况及运行时间

Table 1-2 Commissioning load and operation time

序号 No.	电机转速 Motor rpm（r/min）	电机功率 Motor power（kW）	磨机额定负荷 Rated load for roller mill（%）	运行时间 Operation time length（H）	备注 Remark
1	额定转速 Rated speed	3/4P	70	24	P：电机额定功率各工况运行时间可根据磨机试运行规定进行。P: motor's rated power. The operation time for each duty shall be defined according to commissioning of roller mill.
2	额定转速 Rated speed	4/5P	80	16	
3	额定转速 Rated speed	9/10P	90	16	
4	额定转速 Rated speed	P	100	48	

各工况运行时，每隔 60min 除按 5.2.2 记录内容记录外，补充记录如下内容：

For operation under each duty， record every 60min additional information plus those listed in 5.2.2:

冷却水流量（m^3/h） Cooling water flowrate (m^3/h)
冷却水出口温度（℃） cooling water outlet temperature (℃)

冷却水进口温度（℃）
减速机噪音及振动

cooling water inlet temperature (℃)
gear reducer noise and vibration

5.2.4 试运转的注意事项

每次主电机停止运行时，在 5 分钟后，方可关闭稀油站。

试运转期间操作人员应加强巡回检查，作好运行记录，发现异常声响或其它问题应立即停机检查。

每隔 4 小时检查一次过滤器滤网，如发现有金属碎屑或其它杂质，应停机查明原因并确认故障完全排除后，方可继续运转。

各轴承温度、滑油压力或其它系统超过额定整定值时，报警系统报警后应立即停机并查明原因予以排除，不允许原因未查明或故障未排除前强行启动或拆除保险装置。

5.2.5 检查和验收

试运转结束后，进行详细检查，检查并记录各齿轮副齿面接触印痕情况；检查并整理试运转的各项记录；检查各控制系统的准确可靠性；检查滑油过滤器并清洗干净；检查整个运转系统各联接处是否松动。

上述检查内容应作全面文字记录和图片记载，并作为验收的依据。

5.3 使用维护

JLXM、JLZX 系列减速机是精密、重要的设备，必须加强管理和维护，操作人员应全面了解掌握各项设备的使用说明书的要求，并切实遵照执行。

5.2.4 Precautions for commissioning

Each time stop oil lubrication system 5min after main motor stops.

During commissioning， the operators shall carefully monitor the operation and make records. Stop motor immediately in case of any abnormal operation or noise.

Check the filter screen every 4hr. Stop the equipment and do troubleshooting whenever any metal scrap or impurity is spotted. Resume the operation when trouble is eliminated.

In case of bearing temperature， lubricating oil pressure or other system higher than the rated settings， alarm system is activated and stop the system immediately for troubleshooting. It is not allowed to restart the system or remove safeguard before the cause of problem is found out or eliminated.

5.2.5 Inspection and acceptance

After commissioning， carry out careful inspection and record down the tooth contact pattern of gear wheel pair; check and compile each commissioning record; check each control system in good condition: check grease filter and clean it; check each connection of the whole driving system for any looseness.

The above checks shall be properly documented and pictured as basis for acceptance.

5.3 Operation and maintenance

JLXM 、 JLZX series gear reducer is a precision and important equipment， requiring careful management and maintenance. Operators shall get themselves familiarized with operation requirements on each equipment and abide by them in practice.

除其它很多因素外，齿轮箱的运行安全性和寿命取决于正确的维护。设备管理人员应每天根据运行记录分析减速机的运行情况，必要时停机检查并及时排除故障，以防酿成严重后果。未经许可，擅自拆开齿轮箱，我公司不承担任何责任。

Equipment serving people shall analyze the operation condition of gear reducer according to operation records. The equipment management personnel shall analyze the operation of the gearbox every day according to the operation records, stop and check and check the faults timely if necessary, so as to prevent serious consequences. If necessary， stop the equipment for troubleshooting to avoid serious consequences.

5.3.1 启动前的准备和操作程序

5.3.1 Preparations before startup and operation procedure

5.3.2 每次启动主电机前，必须先启动稀油站向减速机供油，先启动油泵 5 分钟后，确认供油压力达到规定值，并且减速机上箱体蓄油池装满润滑油后才能启动电机进行工作。

5.3.2 Each time before main motor startup， it is required to startup oil lubrication system firstly to feed oil to gear reducer. Start the oil pump for 5 min， making sure that oil supply pressure is up to the required value and oil reservoir in the upper casing of gear reducer is filled with lubricating oil， then motor can be started.

5.3.3 停机操作程序

5.3.3 Shutdown procedure

因各种原因需停止减速机工作时，应先停主电机工作。由于惯性缘故，减速机还会运转，必须待减速机完全停止运转后，才能关闭油站停止供油，否则会烧损轴瓦甚至损坏减速机。

For whatever reasons that gear reducer has to be stopped， first stop main motor. Due to inertia，gear reducer will continue rotation. Therefore，you cannot shut oil supply from oil lubrication system until gear reducer comes to a full stop. Otherwise， bearing pad may be burned or even gear reducer is damaged.

5.3.4 运行中的检查

5.3.4 Checks during operation

5.3.4.1 每日检查内容

5.3.4.1 Daily checks

按 5.2.2 款检查记录内容每隔 60min 检查记录一次；检查各联接部位是否漏油；检查各紧固螺栓有否松动；检查各运动副处有否异常响声或振动。按油站规定进行维护保养。

Check every 60min and make record as per 5.2.2: check each connection for any leakage: check each bolt for loose: check each traveling part for abnormal noise or vibration. Maintenance shall be exercised as per oil station regulations.

5.3.4.2 每月检查内容

5.3.4.2 Monthly checks

检查并清洗油站磁性过滤器和双联过滤器，如发现有铁屑，巴氏合金的碎屑，塑料碎屑等应立即停机查明原因并加以排除；检查各联轴器及其它联接部位的情况，发现问题及时排除。按油站规定进行每月的维护保养内容进行。检查齿面接触情况，如发现异常（压痕偏少接触面积过小）应仔细分析原因并与我公司联系协商处理办法。

Check and clean the magnetic filter and duplex filter in the oil station. Stop the equipment for troubleshooting whenever iron chips， white metal chips， plastic scrap， etc. are spotted. Check each coupling and other connection locations. Get rid of problems identified. Maintenance shall be exercised every month as per oil station regulations. Check tooth contact pattern. If any abnormal (less impression or smaller contact area) is identified， make careful analysis and consult us for solution.

每月对油品化验一次，检查其中各类化学元素的含量及其变化，以便及早分析减速机内部情况，并及时提供预案，提出解决措施。

Oil test shall be performed every month for checking chemical composition and content change.

5.3.4.3 半年的检查内容

检查润滑油的质量，发现变质，及时更换。换油时，减速机内部和油站油箱内的残油必须彻底排放干净，以利于保证新油的工作寿命。检查控制系统的准确可靠性。

5.3.4.3 Checks every half a year

Check the quality of oil and replace when deteriorated. For replacement， remaining oil must be completely emptied out of gear reducer and oil tank of oil station to improve the life of new oil. Check control systems in good condition.

5.3.4.4 定期检查及维护（详见表 1-3）

5.3.4.4 Regular check and maintenance (see table 1-3)


在维护齿轮箱之前，必须使机组安全停机，并确保不会因为误操作而启动，防止意外发生。


Before maintaining the gearbox, the unit must be shut down safely and ensure that it will not be started by misoperation to prevent accidents.


在齿轮箱维护和维修过程中，应严防各种异物进入齿轮箱内部，以免造成齿轮箱的损坏。


During the maintenance of the gearbox, all kinds of foreign objects should be prevented from entering the gearbox so as not to caused the gearbox to be damaged.

表 1-3 定期检查及维护 Table 1-3 Regular check and maintenance

检查部位 Check location	检查项目及内容 Check item and content	备注 Remark
基础 Foundation	基础沉降，电机与减速机中心线对中 Foundation settlement， and alignment of central line of motor and gear reducer	每年检查一次 Check every year
减速机内部 Gear reducer inside	齿轮表面损伤及接触印痕 Tooth face damage or contact impression	每月检查一次 Check every month
	内部各零件联接螺栓 Connection bolt of each part inside the reducer	是否松动 Loose?
	有否其它异常现象 Any other abnormal condition	
减速机外部 Gear reducer outside	各联轴器同轴度误差及轴向间隙 co-axial error and axial clearance of each coupling	
	地脚螺栓有否松动 Anchor bolt is loose?	
	各密封面、管路 Each seal face and piping	是否漏油、漏水 Oil leak or water leak?
	多路温度巡检仪 Multiplex temperature sensor	按说明书要求校验 Calibrated as per instruction
膜片联轴器 Diaphragm coupling	有否异常响声及螺栓松动 Any abnormal noise or loose bolt?	按说明书要求校验 Calibrated as per instruction
稀油润滑装置 oil lubrication system	更换油时清洗油箱 Clean oil tank during oil replacement	
	油泵、油冷却器、电加热器 Oil pump， oil cooler， electrical heater	
	磁过滤器、双联过滤器、阀门 Magnetic filter， duplex filter， valve	
	控制柜、仪表盘上仪表及电器元件 Control cabinet，instruments on the panel and electronics	

5.3.4.5 特别注意事项及建议

减速机运行 1 年后，应重新对减速机基础底板的水平度和电机与减速机中心线的同轴度进行复查，如有超差，应查明原因（如基础下沉），并按 1.3.2 和 2 的规定重新调整。

减速机首次使用的润滑油应半年进行更换，以后换油期为 10000-13000h（根据油品分析检验结果定）。油液更换时，必须使用和先前同一牌号的油液。不允许使用混合油或不同生产厂家的油液。如果更换不同品牌的油液，要彻底清洗齿轮箱后更换。

WARNING! 旧的油液应该在停机后齿轮箱冷却之前尽快排出。

减速机如长期停止运行（15 天以上）每周需启动油泵向其供油，同时启动主电机使其运行 10min。

当主电机由于紧急跳闸而停车时，跳闸原因没有查清和完全排除以前，不得重新启动主电机。

润滑油质量是减速机安全运行的重要保证条件之一，我们推荐选用 GB5903 工业闭式齿轮油标准中的 L-CKD220 或 L-CKD320 齿轮油。油品推荐厂家及型号（详见“附表二”）

正确选用润滑油添加剂，可改善减速机的润滑条件和效果，延长齿轮和轴承的使用寿命。

5.3.4.5 Special precautions and proposals

After the gear reducer is working for one year，it is required to recheck the level of base plate of reducer, co-axial alignment for motor and gear reducer central line. Find out the reason why the limit is exceeded (such as foundation settlement). Carry out alignment once again as per Item 1.3.2 and 2.

The lubricating oil used for the gear reducer shall be replaced every half a year for the first time and later the interval is 10000 to 13000h (according to oil analsysis result). When the oil is replaced,it must use the same type of oil as the previous one, and it is not allowed to use mixed oil or different manufactures’ oil.If you replace the different brands of oil ,clean the gearbos thoroughly and replace it.

WARNING! The old oil should be discharged before the gearbox is cooled.

If the gear reducer stops operation for a long time (15 days above)， it is required to startup oil pump for feeding and meanwhile startup main motor to make it work for 10min.

When the main motor trips on emergency，you are not allowed to re-startup the motor until the trip reason is spotted and eliminated.

Quality of lubricating oil is one of the factors contributing to the safe operation of gear reducer. We recommend L-CKD220 or L-CKD320 as shown in GB5903 Gear Lubricating Oil. Oil type recommendations seeing Appendix Table 2.

Correct choice of additive for lubricating oil can improve the lubricating condition of gear reducer and extend the life of gears and bearings.

减速机在运行过程中，每月或季度定期须对润滑油进行油品检测化验，如达到下述情况应对润滑油进行处理或更换：

1）40 摄氏度时的粘度变化量大于 10%

2）TAN（酸性值）大于 2

3）水含量大于 0.5% （5000 ppm）

X 光线检测出的各项元素含量值须符合油品出厂时的规定；金属含量反映了齿面及轴承的磨损情况，对前后两期检验结果进行比较，如某种或几种金属含明显且较大，请咨询相关人员，并查找原因。

During reducer operation, check the oil quality every month or every quarter. The lubrication oil must be checked or replaced in following conditions：

1） viscosity at 40℃ varies greater than 10%

2） TAN greater than 2

3） Water content greater than 0.5%(5000ppm)

The element contents checked by X-ray shall be as specified oil quality when delivery. The wear condition can be evaluated from metal contents by comparing results from previous and later inspections. In case results vary greatly for one metal or some metals, please consult relevant personnel to find out causes.

所有电气仪表自出厂之日起，应每年检定一次。

All electrical instruments shall be calibrated once a year since the date of ex-work.

附表一 联接螺栓的拧紧力矩 Attached table 1:Tightening torque connected to bolts

螺栓直径 Dia. Of bolts	扭力扳手力矩 Torsion wrench torque		螺栓直径 Dia. Of bolts	扭力扳手力矩 Torsion wrench torque		螺栓直径 Dia. Of bolts	扭力扳手力矩 Torsion wrench torque
D (mm)	Dr (N*m)		D (mm)	Dr (N*m)		D (mm)	Dr (N*m)
M6	7		M30	1004		M80×6	20368
M8	18		M36	1749		M90×6	29492
M10	35		M42	2806		M100×6	41122
M12	61		M48	4236		M110×6	54799
M16	149		M56	6791		M125×6	80284
M20	290		M64	10147		M140×6	113326
M24	500		M72×6	14689		M160×6	171027

注：

1. 表中所列拧紧力矩数值为: 螺栓强度为 8.8 级的拧紧力矩。

2. 力矩公差±5% 。

3. 螺栓级别见螺栓头部。头部无级别标记的为自制件，级别全部为 8.8 级。

4. 对于其它等级的螺栓所需拧紧力矩，按机械设计手册要求计算。

5. 所给数值为使用润滑剂的螺栓，对于无润滑剂的螺栓的拧紧力矩应为表中值的 133%。

Notes:

1. The torque values listed in table above refer to that of bolts with a strength grade of 8.8.

2. Tolerance of torque is ±5%.

3. The bolt grade see the bolt head. Bolts without marks in the head are self-made parts and are all of grade 8.8.

4. The required tightening torque for bolts of other grades is calculated according to Mechanical Design Manual.

5. the torque values are for using anti-friction material bolts, for non anti-friction material bolts, the torque values are 133% of table's value.

附表二：推荐润滑油 Attached table 2: Recommended lubricating oil

油品 种类 Oil grade	**粘度 ISO VG (40 ºC, mm^2/s) vicosity**	**克鲁勃 Klüber**	**壳牌 Shell**	**美孚 Mobil**	**嘉实多 Castrol**	**长城 Great Wall**
合成烃 PAO Composite hydrocarbon	VG 320	Kluebersynth GEM 4-320 N	Shell Omala HD 320	Mobilgear SHC XMP 320	Tribol 1510/320	AP-HD 320 Synthetical