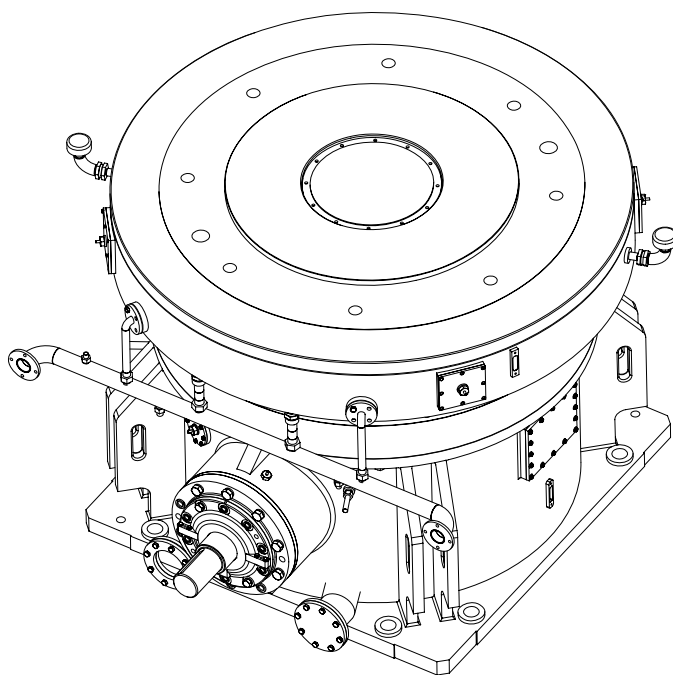


JLXM 系列立磨减速机 安装使用维护说明书

JLXM Series Vertical mill GearReducer

Manual for Installation, Operation and Maintenance



重庆齿轮箱有限责任公司

Chongqing Gearbox Co., Ltd.



重庆齿轮箱有限责任公司

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CHONGQING GEARBOX CO., LTD

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安全事项 Safety particulars:

1. 要求: Notes

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。

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.

危险: Danger

警告

本设备有危及生命的高速旋转裸露部件，疏忽下列限制将有生命危险

Warning

This machine is equipped with high-speed rotating bare parts endangering people's life. Collision may be suffered if neglecting the following restrictions:

进入设备工作区必须穿戴相应的防滑、防碰撞的保护用具。

Wear antislipping and anticollision articles when entering into working area.

裸露运转部位（如膜片联轴器等）必须加装防护罩。

Bare rotating parts (such as coupling, etc.) must be equipped with guard.

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。

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

只能由具有相应资格的专业人员进行安装、检修。

Maintenance work is done only by qualified workers.

2. 重要性 Significance

潜在危险 Potential hazard:



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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。

Naked fire is not allowed to appear within 3 meters from the equipment.
CO₂ fire extinguisher for emergency must be set up nearby the machine.

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 manufacturer.


防护：Protection:

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。

The customer must constitute safety regulations. Installation, maintenance and operation 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.

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前 言 Preface

JLXM 系列立式磨机减速机由减速机、膜片联轴器和稀油润滑装置三大部分组成。主要用于电力工业磨煤机的立式传动减速装置，也可用于其它机械作传动装置。

JLXM series gear reducer for the vertical mill is operating with an integration of gear reducer, diaphragm coupling and oil lubricating system, which is mainly used as vertical driving reduction device for electricity industry and as other mechanical driving device as well.

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

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

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。

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.

减速机及其配套部件在收到后应当及早安装，不能立即安装的应存放在防潮的仓库中，存放一年后应开箱进行防锈保养。开箱时应按装箱清单或零件目录、图纸仔细核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。

Gear reducer and associated parts shall be installed as soon as possible on receipt. Those which can not be installed at the moment shall be stored in the damp-proof warehouse and shall be subjected to rust-resistant painting after 1 year storage. When opening box, you should check the no. and condition of parts against the packing list, parts catalog or drawing and prepare the materials and tools necessary for the installation.

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。检查吊车的吊装能力是否符合安装工程的需要。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. Make sure that the crane is able to work under the required condition. Make sure that the surroundings for the installation field is clean and free of dust or foreign matter.

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，在吊运过程中，吊运物下面严禁站人。

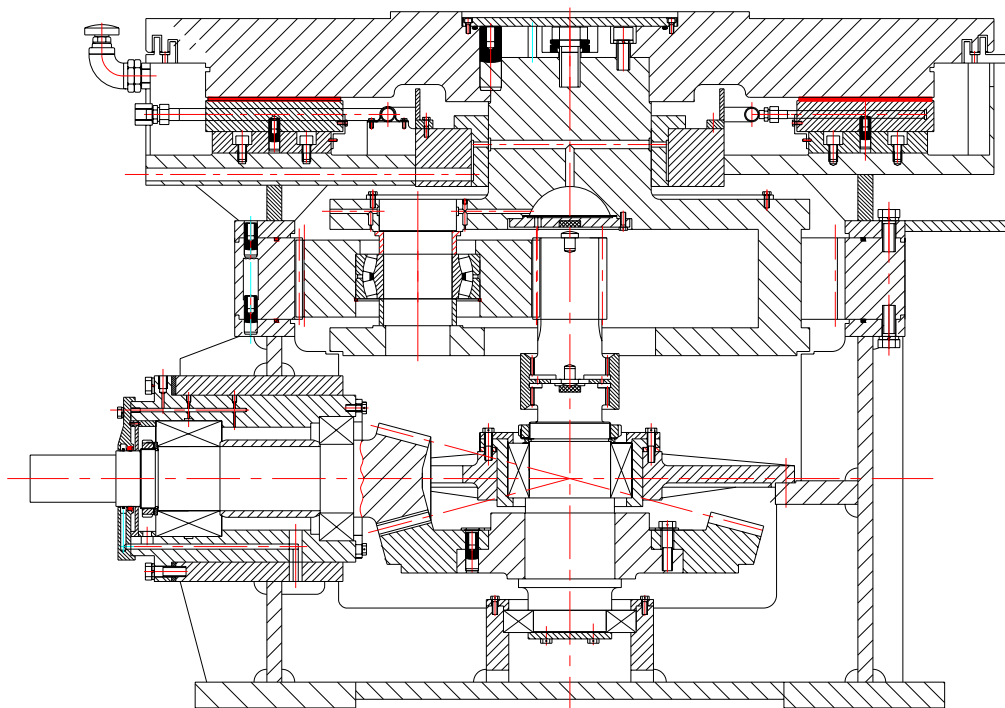
During construction, safety is the most important thing to be considered. Carefully inspect the lifting sling is tight or not. During transportation, nobody is allowed to stand under the crane.

1. 减速机的安装 Installation of gear reducer

1.1 概述 General

JLXM 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（图 1-1）。

JLXM series gear reducer is working on double-stage drive from bevel gear-planetary gear in horizontal input and vertical output (Fig.1-1)



(图 1-1)

JLXM 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。

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



主电机通过高速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。

Main motor is coupled with input shaft via high speed 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.

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。

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.

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。在上箱体上设计有油池。

The casing is structured as welded or forged with high strength and rigidity and the average diameter for the annular gear, thrust bearing, lower casing is kept the same, which is able to withstand very high vertical load and axial and radial forces arising from gear driving. Oil reservoir is also designed at the upper casing.

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。

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 Specifications for the gear reducer

传递功率 Transmitted power:	见合同或技术协议 see contract or agreement
输入转速 Input rpm:	见合同或技术协议 see contract or agreement
输出转速 Output rpm:	见合同或技术协议 see contract or agreement
传动比 transmission ratio :	见合同或技术协议 see contract or agreement
垂直静负荷 Vertical static load:	见合同或技术协议 see contract or agreement
垂直动负荷 Vertical dynamic load:	见合同或技术协议 see contract or agreement
稀油站型号 Model of oil lubricating station:	见合同或技术协议 see contract or agreement

齿轮精度: 内齿圈 7 级其余 6 级以上

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

齿面硬度: 内齿圈 HB300 其余 HRC60±2

Face Hardness : HB300 for annular gear and HRC6060±2 for others

齿面接触斑点: 额定载荷时, 长度和高度不少于 75%-55%



Tooth Contact pattern: length and height not less than 75%-55% at rating load

噪音: 空载时小于或等于 85db (A)

Noise: no more than 85dB(A) at no load

润滑油牌号: T&L GE PGP320CG、T&L GE SYN320CG 全合成齿轮油 (特浦朗克)

Designation of lubricating oil:

T&L GE PGP320CG、T&L GE SYN320CG Synthetic gear oil

1.3 减速机的安装程序 Installation procedure for the gear reducer

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:

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 the installation procedure as follows:

1.3.1 设备基础的验收 Acceptance of equipment foundation

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。找正基础底板的平行度, 使之符合 0.05mm/m 的平行度要求。

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. Align the base soleplate and ensure the parallelism to be 0.05mm/m.

1.3.2 减速机的安装就位

将减速机推拉到已划好中心线的立式辊磨基础底板上, 初步定位后, 在输出法兰上装上百分表, 盘动减速机输入轴, 使输出法兰缓慢旋转, 找正磨盘定位孔, 使其同轴度符合有关规定的要求。在找正过程中, 可用四个千斤顶, 东西南北各 1 个, 顶住减速机底板, 使其微调, 达到磨盘与输出法兰同轴度要求后, 安装磨盘与输出法兰的定位销和联接螺栓。最后通过箱体底板上的地脚螺栓孔, 用地脚螺栓将减速机紧固在立磨基础底板上, 同时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, 最后安装防尘罩。

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 alignment. 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 slight tuning. When the co-axial requirement for the grinding disc and output flange is met, install dowel pins and attachment bolts for the grinding disc and output flange. 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 on.

2.联轴器的安装 Installation of coupling

2.1 概述 Generals

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。


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 (elastic pin) 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 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。安装联轴节时,应保证其孔径符合图纸规定的要求。由于联轴节轴孔与主电机轴及减速机轴的配合是过盈配合,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,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。主电机端联轴节装好后,应按电机的要求装好切向键。

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, the coupling must be heated up to such a temperature that the gap is made available between the shaft and hole for more than 0.0005D for assembly so as to avoid blowing on the coupling when installed (no hammering!) and subsequently to protect gears and bearing. When the motor-side coupling is installed, tangential key is mounted.

2.2.2 膜片联轴器的安装

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(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。

2.2.2 Installation of diaphragm coupling

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

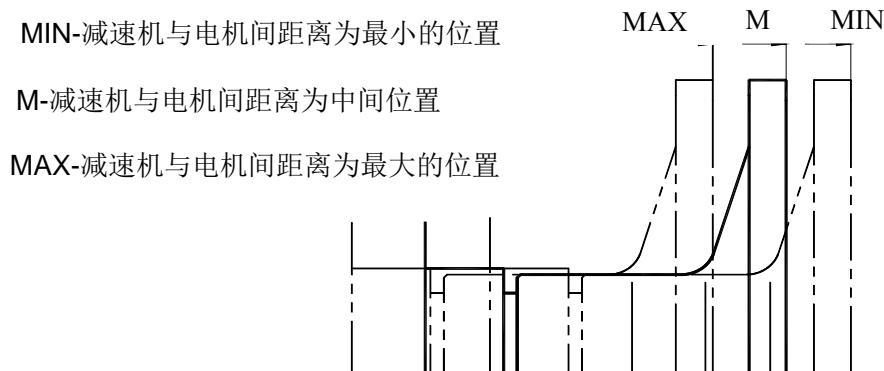


Fig.2

MIN - minimum distance between gear reducer and motor

M - middle position between gear reducer and motor


MAX- maximum distance between gear reducer and motor

(2). 将传动轴水平地放在支架上, 对准同钻铰的对位印记, 分别装好两端的膜片组和压板 (如图 3 所示), 拧紧铰制螺栓。装入螺栓前, 螺纹要用清洗剂清洗干净, 铰制配合面要用二硫化钼 (MoS₂) 涂抹, 以防装时拉伤配合面。拧紧螺栓前在螺纹处涂厌氧胶防松。组装后拆下膜片组件上的工艺螺栓 (两端共 8 件)。

将装好半联轴节的电机在就位前, 应按减速机外形及安装示意图中联轴器的轴向尺寸留足空档 L_{-6}^{+4} (如图 4 所示), 以便膜片联轴器的顺利安装。

(2) Horizontally place the driving shaft on the support, in alignment with the drilling and reaming matched mark. Assemble the diaphragm pack and plates (see Fig.3) on both sides and tighten the reamed bolts. Before mounting the bolts, thread shall be cleaned with cleaning agent and the mating face shall be coated with MoS₂ to prevent damaging the face. Thread shall be coated with ANAEROBIC GLUE. After assembling, remove the function bolts (totally 8 pieces on both sides.) on the diaphragm pack.

Prior to place the assembled motor (with half coupling) in right position, proper distance L_{-6}^{+4} (see Fig.4) shall be considered for coupling's axial size according to

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Gear Reducer Outline Diagram and Installation Diagram.

(3) 电机轴线和减速机轴线的对中找正 (如图 4), 精度推荐按表 1 进行。找正不良将引起震动, 发热, 噪声, 影响轴承的寿命和齿轮的正常啮合, 严重时损坏减速机。

(3) Alignment of motor axis and reducer axis (see Fig.4) as per Table 1. Improper alignment shall cause vibration, heating and noise, which affect bearing's service life and gear's normal meshing, and even damaging the reducer.

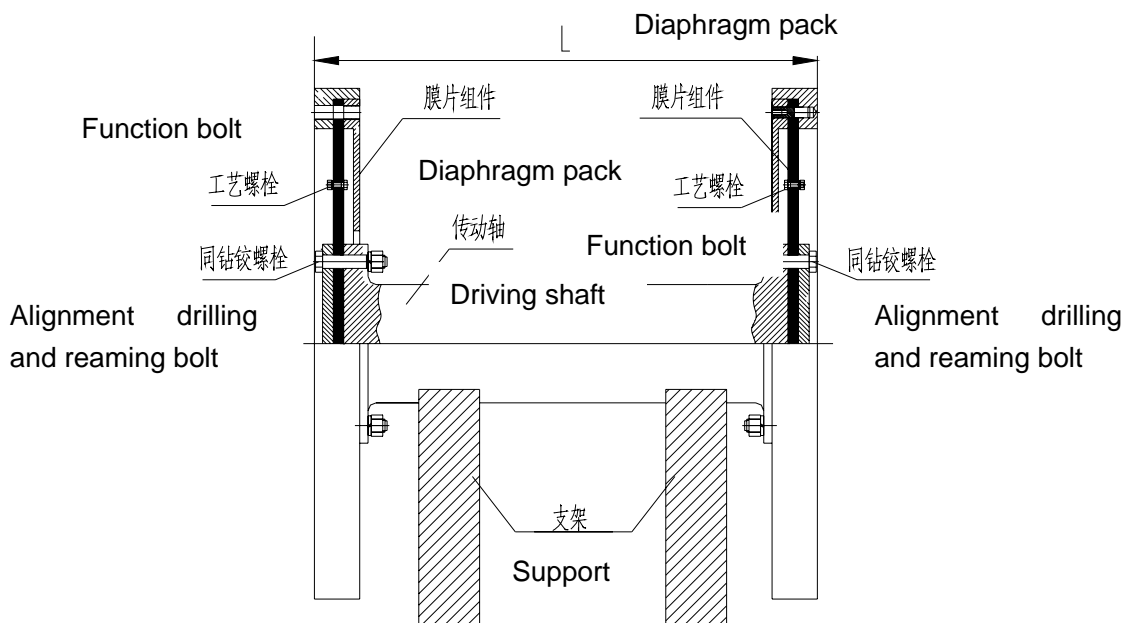


图 3

Fig.3

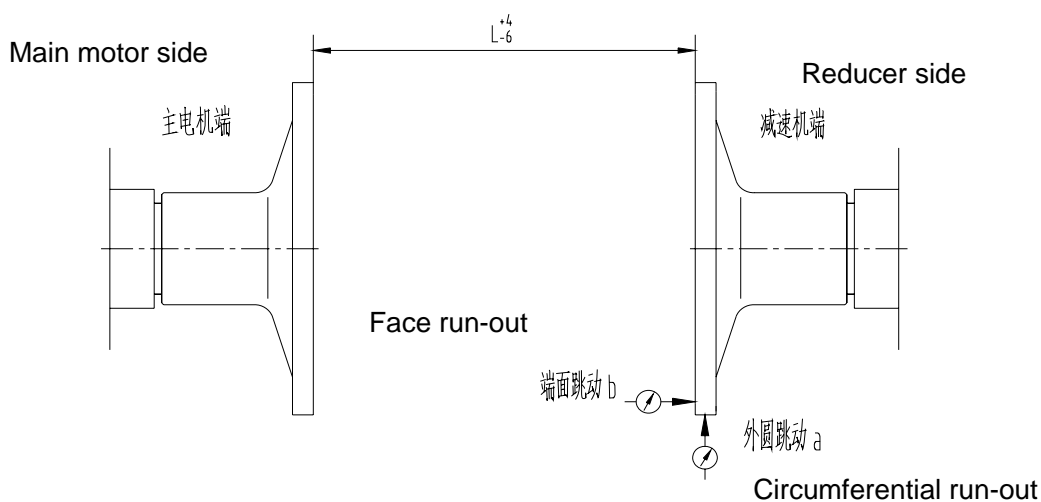


图 4

Fig.4



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	$\leq 0.08/100$ mm

(4).找正好后复查减速机法兰与电机法兰间的空间L尺寸是否在 L_{-6}^{+4} 范围内 (电机轴处于中间位置), 并测出实际尺寸。按图 5 方式吊入膜片组件, 根据实测的L尺寸与膜片联轴器组件L尺寸差在膜片联轴器间增加相等厚度的间隙调整片 (两侧均可加垫片)。就位后拧紧螺栓, 拧紧前在螺纹上涂抹厌氧胶防松。

(4) After alignment, re-inspect if the distance L between reducer flange and motor flange is within L_{-6}^{+4} (the motor shaft in the middle position) and measure its actual distance. Lift the diaphragm pack as shown in Fig.5; mount same-thickness clearance adjusting shims onto the diaphragm couplings based on the dimension difference between measured dimension L and specified dimension (shims can be added on both sides). Once positioning, tighten the bolts. But remember to coat ANAEROBIC GLUE before tightening.

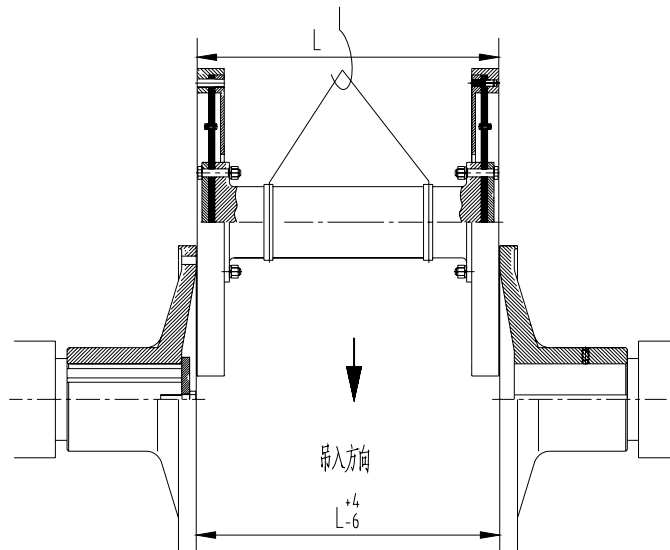


图5

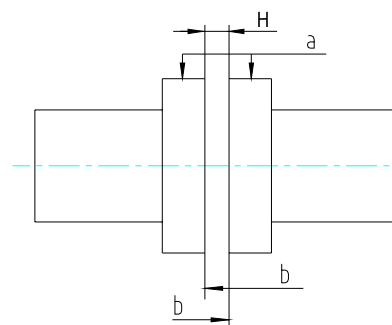
Fig.5



2.2.3 弹性柱销联轴器的安装

(1). 将装好半联轴节的主电机安装就位前，应保证联轴器的轴向间隙尺寸 $H=10\sim 15\text{mm}$ （具体间隙要求见联轴器装配图）。电机轴线和减速机轴线的对中找正（如图 6），精度推荐按表 1 进行。找正好后，固定主电机并按以上要求复查合格后，装弹性销部件。

图 6
Fig.6



2.2.3 Installation of elastic pin coupling

Prior to place the assembled motor(with half coupling) in right position, ensure the axial dimension $H=10\sim 15\text{mm}$ (specific clearance see coupling's assembly drawing) of coupling.

Alignment of motor axis and reducer axis(see Fig.6) as per Table 1. After alignment, fix the motor and re-inspect in accordance with above-mentioned requirements. If it is acceptable, assemble the elastic pin.

2.3 安装注意事项 Precautions

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。

2.3.1 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.

3. 稀油润滑装置的安装及控制要求

Installation of oil lubricating device and control requirements


3.1 稀油润滑装置的安装 Installation of oil lubricating device

JLXM 系列减速机根据传递功率以及用户的要求,配置有低压稀油润滑装置。

JLXM series gear reducer is equipped with low pressure oil lubricating device on the request of customer and based on transmitted power.

稀油润滑装置的安装按使用说明书要求进行,现将主要程序说明如下:

Oil lubricating device shall be installed as per this manual and the main

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procedure is described as follows:

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。

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

3.1.2 安装稀油站与仪表盘联接的 $\phi 10 \times 1$ 紫铜管;稀油站,仪表盘与电控柜联接的线路;按电控原理图安装电气元件。

3.1.2 Install $\phi 10 \times 1$ red copper tubes connecting the oil lubricating station and instrument panel; run the wiring for the oil lubricating station, instrument panel and electrically controlled cabinet; install electronics according to electrically controlled diagram.

3.1.3 安装稀油站与减速机的进油管 and 回油管。回油管的斜度应保证油回流通畅;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,外表面涂防锈漆,管与管的法兰联接处用耐油橡胶垫防漏。

3.1.3 Install the oil feed line and return line for the oil lubricating station and gear reducer. The return line shall be properly sloped to allow smooth return of oil. Properly fitup lines 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 oil-proof rubber gasket against leakage

3.1.4 按多路温度巡检仪使用说明书要求,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, run wiring of signal on output alarm contact for oil lubricating station 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互锁控制线路。

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

Requirements on controls of oil lubricating device

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。

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.



油站的详细控制要求见所配油站的使用说明书。Regarding the detailed control requirements for the oil station, please see the relevant 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 shutdown (indication lamp off).

3.2.2 当油箱油温达 25℃ 时,油泵才可以启动,并自循环,以防止润滑油局部过热。油箱温度 38° 时,主电机才可以启动。出口油温高于 55℃ 时报警。

3.2.2 Oil pump will not startup until the oil temperature in the oil sump reaches 25℃,and then self-circulate. Only when the oil temperature in the oil sump reaches 38℃, motor can start. Alarm is activated when oil outlet temperature is above 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 lubricating station 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 lubricating station 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。

3.2.6 When filter DP is higher than 0.08Mpa for the oil lubricating station, acousto-optic alarm will be activated.

3.2.7 输入 1 或者 2 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 65℃ 时报警,高于 75℃ 主电机停止工作;上箱体油池温度高于 55℃ 时报警,高于 60℃ 时停止主电机。

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 65℃, an alarm will start and meanwhile above 75℃ main motor stops work; In case of oil reservoir temperature in the upper casing above 55℃ alarm will start meanwhile above 60℃ main motor stops work

3.2.8 当稀油站出油口油温高于 45℃ 时,声光报警(此时自动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(此时自动关闭冷却器供水开关)。

3.2.8 When the discharge oil temperature is above 45℃ for the oil lubricating



station, acousto-optic alarm will be activated (now automatically startup cooler water supply switch). When the temperature is below 38°C for the oil lubricating station, acousto-optic alarm will be activated (now automatically shutdown cooler water supply switch).

4. 安装施工中的注意事项 Precautions on the installation

4.1 减速机应存放在干燥、防晒、防潮的库房内。设备油封有效期为半年。超过油封有效期，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。

4.1 Gear reducer shall be stored in a dry, sunshine shield, damp-proof warehouse. Grease seal for the equipment can last for 6 months, beyond which gear reducer shall be checked, particularly gear, shaft, bearing, etc. to prevent rust.

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，应使用煤油或汽油。清洗时禁用棉纱擦拭，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 Kerosene oil or gasoline oil 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.

5. 试运转、使用及维护 Commissioning, 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.

5.1 串油清洗 Oil batching cleaning

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 and 回油管，向油箱内注入其容积约 60% 的 N320 或 N220 工业闭式齿轮油，在稀油站低压法兰处放置铜滤网。

It is crucial to guarantee that the lubricating system for the gear reducer is clean. Thus oil batching cleaning must be carried out prior to operation. Properly get connected oil feed line and return line between oil lubricating station and gear reducer so as to feed N320 or N220 industrial closed type gear oil into the oil sump up to 60% of oil sump capacity. Install copper strainer between LP discharge flange for oil lubricating station.

清洗前，将清洗油加热到 50℃（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 50℃ (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 batching operation.

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置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，直到安置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 2hr after 4 hours' operation. After oil batching operation for 12hr, 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，取出稀油站出油口法兰处安置的铜滤网，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 batching operation, remove the copper screen at oil discharge flange of oil lubricating station 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 the oil batching operation, 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 Commissioning of gear reducer



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5.2.1 试运转前的准备和检查项目

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。

5.2.1 Preparations and checks prior to commissioning

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 lubricating station 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。下箱体装润滑油(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 lubricating station and immediately check that oil sump level in oil lubricating station is above the specified level, otherwise continue feeding until the specified oil level. The same method will be adopted for the gear reducer with lower casing filled with lubricating oil (no oil tank for the lubricating station) to assure the 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 lubricating station 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 360min，运行中每 30min 检查记录内容如下：

Gear reducer shall be operating for 360min 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 (°C)	主电机转速 (r/min)
Ambient temperature (°C)	main motor rpm (r/min)
润滑油出口温度 (°C)	主电机电压 (V)
Outlet temperature of lubricating oil (°C)	main motor voltage (V)
润滑油低压出口压力 (Mpa)	主电机电流 (A)
LP outlet pressure of lubricating oil (Mpa)	main motor current (A)
各轴承处温度 (°C)	



temperature at each bearing (°C)

5.2.3 负荷试运转 Commissioning with load

减速机负荷试运转按表 1-2 进行:

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	1/4P	25	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	1/2P	50	16	
3	额定转速 Rated speed	3/4P	75	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 (m³/h)

冷却水出口温度 (°C)

Cooling water flowrate (m³/h)

Cooling water outlet temperature (°C)

冷却水进口温度 (°C)

减速机噪音及振动

cooling water inlet temperature (°C)

gear reducer noise and vibration

5.2.4 试运转的注意事项 Precautions for commissioning

每次主电机停止运行时, 在 5 分钟后, 方可关闭稀油站。

Each time stop oil lubricating station 5min after main motor stops.

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。

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

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。

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.

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。

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.



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5.2.5 检查和验收 Inspection and acceptance

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。

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.

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。

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

5.3 使用维护 Operation and maintenance

JLXM 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。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。

JLXM 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. Equipment serving people shall analyze the operation condition of gear reducer according to operation records. 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

每次启动主电机前, 必须先启动稀油站向减速机供油, 先启动压油泵 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。

5.3.1 Preparations before startup and operation procedure

Each time before main motor startup, it is required to startup oil lubricating station 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.

5.3.2 停机操作程序 Shutdown procedure


5.3.2.1 每月检查内容

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。

5.3.2.1 Monthly checks

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 lubricating station until gear reducer comes to a full stop. Otherwise, bearing pad may be burned or even gear reducer is damaged.

5.3.3 运行中的检查 Checks during operation

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5.3.3.1 每日检查内容 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.

5.3.3.2 每月检查内容

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。

5.3.3.2 Monthly checks

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.

5.3.3.3 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，以利于新油的工作寿命。检查控制系统的准确可靠性。

5.3.3.3 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.

5.3.3.4 定期检查及维护（详见表 1-3）Regular check and maintenance (see table 1-3)

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	各联轴器同轴度误差及轴向间隙 co-axial error and axial clearance of each coupling	



outside	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 lubricating station	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	

5.3.3.5 特别注意事项及建议

减速机运行 1 年后，应重新对磨机与减速机中心线的同轴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 1.3.3 和 2 的规定重新调整。

5.3.3.5 Special precautions and proposals

After the gear reducer is working for a year, it is required to re-check co-axial alignment both for roller mill and gear reducer central line and 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 1.3.3 and 2.

减速机首次使用的润滑油应半年进行更换，以后换油期为 15000h。

The lubricating oil used for the gear reducer shall be replaced every half a year for the first time and later the interval is 15000h.

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


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.

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

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 T&L GE PGP320CG、T&L GE SYN320CG 全合成齿轮油，生产厂家推荐特浦朗克化工。

Quality of lubricating oil is one of the factors contributing to the safe operation of gear reducer. We recommend T&L GE PGP320CG、T&L GE SYN320CG Synthentic gear oil. The ideal manufacturer is T&L Chemical.

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。

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

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.

5.4 故障的分析及排除 Troubleshooting and elimination

减速机发生故障的原因往往比较复杂,需要作多方面的调查了解分析研究。这里讲述的是一般的现象与初步原因的分析。(详见表 1—4)。

Since there may be complex causes for the problem associated with gear reducer, it is required to carry out diverse investigations for troubleshooting. Listed below is the common problems and preliminary troubleshooting.

表 1—4 故障原因及排除措施

Table 1-4 Troubleshooting and elimination

现象 Phenomenon	故障原因 Cause of problem	采取措施 Measures to be taken
减速机轴承温度升高 Gear reducer bearing temperature increases.	1. 轴承损伤 bearing damaged	检查滤网有否合金碎屑, 检查轴承合金瓦面 Check filter screen for any alloy chips and check bearing alloy bush.
	2. 润滑油质量发生变化 quality of lubricating oil changed	观察和化验润滑油质 Observe and test lubricating oil
	3. 过载荷 overloaded	检查电动机电流、电压(输出功率) Check motor current, voltage (output power)
	4. 温度传感器失真 temperature sensor distorted	校验或更换 Calibration or replacement
	5. 供油量不足 insufficient oil supply	检查供油压力和润滑管路畅通情况 Check oil supply pressure and lubricating oil piping
	6. 供油温度过高 high temperature of oil supply	检查冷却器供水情况和水温 Check cooler water supply and water temperature
减速机异常噪音或振动 Gear reducer abnormal noise or vibration	1. 齿轮或轴承损伤 gears or bearings damaged	开盖检查 Open cover for inspection
	2. 过载荷或冲击载荷 overloading or impact load	检查磨机或电动机是否有故障 Check roller mill or motor for problem
	3. 轴承松动 bearing becomes loose	检查并紧固轴承盖的锁定螺栓 Check and tighten lock bolts for bearing cover
	4. 磨机端或电动机中心线偏移 mill side or motor central line displacement	校正中心线并检查偏移原因 Align central line and check why displacement happens.
减速机漏油 Oil leakage happens to gear reducer	1. 油封和垫片损坏或安装不当 oil seal or gasket damaged or improper installation	检查或更换油封、垫片 Check or replace oil seal, gasket
	2. 联接螺栓松动 connection bolts become loose	拧紧螺栓 Tighten bolts



	3.通气帽堵塞 vent cap blocked	检查并排除堵塞物 Check and get rid of blockage
减速机供油压力跌落 Oil supply pressure drops for gear reducer	1.油泵或油泵电机损坏 oil pump or pump motor damaged	检查、修理或更换 Check, repair or replace
	2.油站旁通阀未关严 bypass valve for the oil station not closely shut	检查并调整旁通阀 Check and adjust bypass valve
	3.管路或冷却器漏油 piping or cooler leaking	检查并排除 Check and repair
	4.油泵吸油管吸入空气 oil suction tube for the oil pump happen to air intake	检查油站的油位 Check oil level for oil station
	5.压力表失灵 pressure gauge fail	检查校验压力表 Check and calibrate pressure gauge
减速机供油压力陡升 Oil supply pressure rises for gear reducer	1.油管或轴承进油口堵塞 . piping or cooler leak	检查并排除 Check and repair
	2.油的粘度过高 oil viscosity too high	检查供油牌号和供油温度 Check oil designation and oil temp. supplied
	3 压力表失灵 pressure gauge fail	检查校验压力表 Check and calibrate pressure gauge
膜片联轴器摇晃和噪声 Diaphragm coupling becomes unsecured and noisy.	1.膜片联轴器联接螺栓松动 connection bolts for the diaphragm coupling become loose	检查并排除 Check and repair
	2.基础下沉引起对中偏差 misalignment due to foundation settlement	采取措施校正中心线 Align the central line
	3.膜片损坏 diaphragm damaged	更换膜片 Replace diaphragm
油泵异常噪音或振动 Oil pump happen to noise or vibration	1.油泵过载,油的粘度过高 oil pump overloaded and oil viscosity high	油泵齿轮被杂质咬住 Oil pump gears are seized by foreign matters.
	2.油泵轴和电机轴不同心 oil pump shaft and motor shaft eccentric	校验同轴度 Calibrate co-axial level
	3.联轴器损坏 coupling damaged	检查并更换橡胶圈 Check and replace rubber ring
	4.油泵轴承、齿轮和泵体损坏 oil pump bearing, gear and pump casing damaged	检查、修理或更换 Check, repair or replace
油泵漏油或端盖发热 Oil pump leak or end cover overheated	1. 油泵轴和电机轴不同心 oil pump shaft and motor shaft eccentric	校验同轴度 Calibrate co-axial level
	2.端盖内的油封损坏 oil seal in the end cover damaged	检查并更换填料 Check and replace filling
油箱的油位增高或降低 Oil	1.冷却器损坏或漏水 cooler damaged or water leak	对冷却器泵压试验,检查油中水份 Pressure test on cooler pump and check water content in oil



level in the oil tank increase or decrease	2.管路漏油 piping happen to oil leak	检查进回油管 Check oil feed and return line
油站供油温度过高 too high temperature of oil supply in the oil station	1.冷却水温度过高 cooling water temperature high	采取措施降低水温 Take measures to reduce water temperature
	2.冷却水水量不够 insufficient cooling water supply	加大供水量 Increase water supply
	3.冷却器管路积垢 cooler piping fouling	去积垢 Remove fouling
	4.管路内留有空气 air in the piping	开启放气塞 Open air relief plug
油站磁过滤器发现金属碎屑 Metal scrap is found at magnetic filter in the oil station.	1. 串油清洗不彻底 oil batching operation not properly carried out	
	2.齿轮或轴承损伤 gears or bearings damaged	检查、修理或更换 Check, repair or replace

附表一：联接螺栓的拧紧力矩

Annex table I: Tightening torque of connection bolts

螺栓直径 dia. of bolt	扭力扳手力矩 torque of torque spanner	冲击扳手力矩 torque of impact spanner	螺栓直径 dia. of bolt	扭力扳手力矩 torque of torque spanner	冲击扳手力矩 torque of impact spanner
D (mm)	Dr (N*m)	Sch l(N*m)	D	Dr(N*m)	Sch l(N*m)
M6	8.5	7.9	M45	4263	3936
M8	21	19.6	M48	5145	4728
M10	42	39	M52	6615	6174
M12	73.5	67.6	M56	8232	7644
M14	114.7	101.8	M60	9996	9310
M16	176.4	166.6	M64	12348	11466
M18	250.8	233.2	M68	13456	
M20	480	441	M72	14689	
M24	617	568	M76	17235	
M27	902	843	M80	20368	
M30	1215	1137	M85	24327	
M33	1686	1539	M90	29492	
M36	2126.6	1969.8	M95	35421	
M39	2127	1970	M100	41122	
M42	3391	3146	M110	54799	

注：表中所列拧紧力矩数值为螺栓强度为8.8级的拧紧力矩，若螺栓强度等级为10.9级时，在以上数值基础上乘以1.41系数即可得所需拧紧力矩要求。

若不此表所列范围内可按下进行计算：

$$\text{应力面积 } A_s = \pi/4 (D - 0.93820 p)^2$$

其中，D=螺栓的公称直径

p=螺距

螺栓预紧载荷=弹性极限应力×应力面积 $A_s \times 0.75$

8.8级螺栓的屈服强度为:640 N/mm²

Note:

Tightening torques values listed in the table are corresponding to that of bolts with strength of grade 8.8. In case of bolts of strength grade 10.9, the tightening torque values will be obtained by multiplying vales listed above by 1.41.

For bolt strength beyond the table above, calculate as follows:

$$\text{Stress area } A_s = \pi/4 (D - 0.93820 p)^2$$

Where: D = nominal diameter of bolt

p= pitch

pre-tightening load of bolt = Limited stress of elasticity × stress area $A_s \times 0.75$

Yield strength for bolt with strenght grade 8.8: 640 N/mm²

