



**久和机械，您永远信赖的伙伴！**

**承蒙选用久和塔机机构产品，谨在此致谢！**

为了使该产品更好地为您的主机服务，请仔细阅读此说明书。

本说明书内容若有变更，恕不另行通知。

**Thanks for choosing our products.**

**Please read this manual carefully.**

The contents of this manual are subject to change without notice.



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## 一、概述

本机构主要用于塔式起重机起升或动臂变幅系统。**警告：严禁载人！**

工作温度： $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$  工作噪声： $\leq 90\text{dB}$  (电机额定频率以内)

PFC 系列机构是在吸收国外先进技术的基础上，我公司独立研发的一种塔机起升（DVF 动臂变幅）机构。

该机构由带盘式制动器（支持制动器）的变频三相异步电机、减速器、起升高度限位器、卷筒、机架等五部分组成。电机安装形式有 IMV1（立式）安装或 IMB5（水平悬臂）安装。

- 1、PFC 系列机构的电机为 YZPE2 系列变频调速三相异步电动机，尾部带盘式制动器（支持制动器），该电机具有调速范围广，过载能力强，运行稳定、可靠、效率高，无级调速等优点。
- 2、减速器由一级行星齿轮副和螺旋锥齿轮副构成，减速器的箱体与机架相联。
- 3、起升高度限位装置由行程限位器、尼龙小齿轮、支架、尼龙齿圈组成。行程限位器通过支架安装在机架上，尼龙小齿轮（ $Z=51$ ）与卷筒上的尼龙齿圈（ $Z=124$ ）相啮合，尼龙小齿轮将卷筒的转动传入行程限位器。
- 4、卷筒主要由焊接式卷筒、轴承座组成。采用国际先进的双折线槽卷筒使钢丝绳在多层缠绕时将每层钢丝绳的交叉缠绕点限定在卷筒圆周上相隔  $180^{\circ}$  的两个位置上，其余部分则与侧板平行地缠绕，并确定了下一层钢丝绳的螺旋升角。钢丝绳各圈载荷分布均匀，排绳良好。卷筒轴由机架上的轴承座支承卷筒，并连接卷筒与减速器间的传动。
- 5、机架由型材和钢板组焊而成，整体刚性好，受载时不易变形。
- 6、根据客户需要，机构可在卷筒侧板位置配置安全制动器。安全制动器及液压站的相关使用规范请详见单独的使用说明书。



## 1. General Notes

The mechanism is mainly used for tower crane hoisting or luffing system.

**WARNING: Never manned!**

Operating Temperature:  $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$

Operating Noise:  $\leq 90\text{dB}$  (within the rated power of motor)

PFC series mechanisms are self-designed tower crane mechanisms based on the advanced foreign technologies.

The mechanism is composed of several parts: variable frequency three-phase asynchronous motor with disc brake (main brake), reducer, hoisting limit switch, winding drum and frame, etc. The motor could be installed in vertical (IMV1) or horizontal (IMB5).

1.1 PFC series mechanism adopts YZPE2 series variable frequency three-phase asynchronous motor (with disc brake at the end), with features in large range of speed regulation, strong overload capacity, stable and reliable operation, high efficiency, stepless speed regulation, etc.

1.2 Constituted with a planetary gear pairs and spiral bevel gear pair, the reducer is connected with the frame.

1.3 The lifting height limiter consists of limit switch, nylon pinion, bracket, nylon ring gear. The limiter is fixed on the chassis through the bracket. The nylon pinion ( $Z=51$ ) meshes with nylon ring gear ( $Z=124$ , fixed on the drum). The rotation of the drum is transmitted to the limiter through the nylon gear.

1.4 The hoist drum is composed by the welding drum and bearing pedestal. When wire ropes has to be wrapped around the drum in multiple layers, Lebus grooves limit the crossover points on each revolution at two sections which offset by  $180^{\circ}$  on the drum circumference. The rest of the ropes are parallel with the flanges and determine the pitch angle of the next layer. With Lebus grooves, each layers of rope are under uniformly distributed loading and the ropes can be spooled smoothly and tidily. The reducer drives the drum through the shaft.

1.5 The frame is installed and welded by sectional material and steel plates with characteristics of overall rigidity and resistance to deformation under the load.

1.6 The safety brake can be installed on the drum side plate according to customers' requirement. For details, please see the operating instructions of safety brake and pumping station.

## 二、性能参数 Performance Parameters

### 1. 起升机构 Hoisting Mechanism

型号 Type	工作级别 Classification of Mechanism	利用等级 Service Classification of Mechanism	载荷状态 Condition of Stresses	电机 (额定频率 50Hz) Motor			额定单绳 线速度 Rated Single Rope Speed (m/min)	单绳额 定拉力 Rated Single Rope Tension (kN)	容绳量 Drum Capacity (m)	钢丝绳公 称直径 Rope Nominal Diameter (mm)	重量 Weight (kg)	
				型号 Type	额定功率 Rated Power (kW)	额定转 速 Rated Speed (r/min)						
24PFC15F	M5	T5	L2	YZPE2-180L-4JH	24	1470	80	15	400(5层)	Φ12	974	
24PFC15B												1050
24PFC20W				YZPE2-180L-4JH	24	1470	65	20	340(5层)	Φ14	815	
30PFC15Y				YZPE2-200L1-4H	30	1470	89	15	550(7层)	Φ12	1147	
30PFC20												1250
30PFC20L				YZPE2-200L1-4H	30	1470	80	20	500(5层)	Φ14	1455	
30PFC20B												1804
30PFC20A				YZPE2-200L1-4H	30	1470	80	20	404(5层)	Φ14	1015	
45PFC25												1435
45PFC25L				YZPE2-200L3-4H	45	1470	80	25	500(5层)	Φ14	1485	

注：本表电机均为按宜宾电机型号，实际订货以合同为准。

Note: The motor model in the table is Yibin model, the actual order is subject to contract.

## 2. 动臂变幅机构 Luffing Mechanism

型号 Type	工作级别 Classification of Mechanism	利用等级 Service Classification of Mechanism	载荷状态 Condition of Stresses	电机 (额定频率 50Hz) Motor			额定单绳 线速度 Rated Single Rope Speed (m/min)	单绳额 定拉力 Rated Single Rope Tension (kN)	容绳量 Drum Capacity (m)	钢丝绳公 称直径 Rope Nominal Diameter (mm)	重量 Weight (kg)
				型号 Type	额定功率 Rated Power (kW)	额定转 速 Rated Speed (r/min)					
24DVF25B	M5	T5	L2	YZPE2-200L1-6H (B5)	24	980	42	25	200(5层)	16	
24DVF25B1				YZPE2-200L1-6H (B5)	24	980	42	25	200(5层)	16	1300
24DVF25B2				YZPE2-200L1-6H (B5)	24	980	42	25	220(5层)	14	1300
24DVF32BL				YZPE2-200L1-6JH (V1)	24	980	42	32	200(5层)	16	1375
30DVF20BL				YZPE2-200L1-4JH (V1)	30	1470	63	20	230(5层)	14	1325
30DVF32B1				YZPE2-200L2-6H (B5)	30	980	42	32	180(5层)	18	1410
30DVF32B2				YZPE2-200L2-6H (B5)	30	980	42	32	180(5层)	18	1360
30DVF32BL				YZPE2-200L2-6JH (V1)	30	980	42	32	180(5层)	18	1440

注：本表电机均为按宜宾电机型号，实际订货以合同为准。

Note: The motor model in the table is Yibin model, the actual order is subject to contract.



### 三、安全说明

- 只能由经过授权或培训的素质合格的人员对机构进行使用、维护保养和维修。
- 请严格按本说明书的要求进行安装和操作使用!
- 请必须使用本公司提供或推荐的设备配件,以保证设备的各项性能!
- 如果设备出现重大故障,请及时与本公司联系!
- 凡是旋转的零部件必须防止人员的意外接触,这包括排绳装置、限位器传动装置、卷筒及钢丝绳等。
- 在组装拆卸工作中,损坏的螺栓等其他标件,一定要采用同等强度和类型的新标件更换。

### 3. Safety Notes

- The operation and maintenance of the mechanism must be performed by the authorized or eligible personnel.
- Please strictly follow the manual during installation and operation.
- Please apply fittings provided or recommended by our company to ensure good performance of the facilities.
- If the facility has critical failure, please contact us in time.
- Any personnel must keep away from all the rotating parts including rope arranging device, transmitting device of limit switch, drum, rope, etc.
- In the process of assembly or disassembly, the damaged bolt or other standard part must be replaced by the new one with the same strength and type.



#### 四、工作原理

电源输入，常闭支持制动器(电机上自带的电磁制动器)打开(配置安全制动器的机构，安全制动器应先打开，常闭支持制动器再打开)，电动机通过花键套与减速机输入轴连接，减速后由输出轴将动力传给卷筒，完成提升和下降。行程限制器控制起升(或动臂变幅)钢丝绳放出和绕入长度以控制起升高度(或动臂变幅幅度)。电动机断电，常闭支持制动器制动(配置安全制动器的机构，支持制动器应先制动，安全制动器再制动)。

该系列机构通过变频器改变电机输入电源的频率来改变起升速度；电源频率等于或小于额定频率时，机构能起吊额定起重量；电源频率大于额定频率时，机构起吊的起重量随速度的上升而逐步下降。

推荐采用减速制动，即重物起升或下降时宜减速到停止或者减速到一个较低的速度时，机构支持制动器制动(支持制动器一般配置常闭式电机盘式制动器)。

动臂变幅机构和安全性要求特别高的起升机构，应配置安全制动器，推荐配置超速开关监测卷筒转速。当卷筒转速达到限定转速(推荐1.3倍额定转速，且不超过电动机和传动链的极限转速)前安全制动器应自动制动。

安全制动器与电动机之间应设联锁保护装置，使安全制动器在撤去制动力矩前，机构不能起动。





#### **4. Working Principle**

When the power is turn on, the normally closed main brake (electromagnetic brake of motor) will be opened (for mechanism which equipped with a safety brake, the safety brake should be opened first). The motor is connected with the input shaft of the reducer through splined sleeve. The drum is driven by the output shaft, and the weight can be lifted up and down. The limit switch control the releasing length and wounding length of the rope, so the lifting height (or luffing rangeability) will be limited. When the power is turn off, the normally closed main brake works (for mechanism which equipped with a safety brake, the main brake should be closed first).

For this series mechanism, the frequency converter changes the frequency of motor's input power to achieve the speed change of the mechanism. When the power frequency is equal to or less than the rated frequency, the rated weight can be lifted. When the power frequency is higher than the rated one, the lifting weight will be decreasing along with the increasing of the speed.

Deceleration braking is recommended. The speed of lifting or falling of the weight should be reduced to very low or zero, then the main brake works (the main brake is usually normally closed motor disc brake).

The luffing mechanism and hoisting mechanism which has high safety requirements should be equipped with safety brakes. To monitor the drum speed, the mechanism is recommended configuring with overspeed switch. Before the drum speed reaches the limit (1.3 times rated speed is recommended, but not exceeding the limit speed of the motor and the driving chain), the safety brake should be automatically worked.

Interlocking protector should be installed between the safety brake and the motor. The mechanism should not be operated before the brake torque is removed.

## 五、安装与调试

在机架梁上有四处吊耳作为运输吊装之用。起吊应注意保持机构的平衡，起吊过程中人员不得靠近机构及站在机构上方或下方。

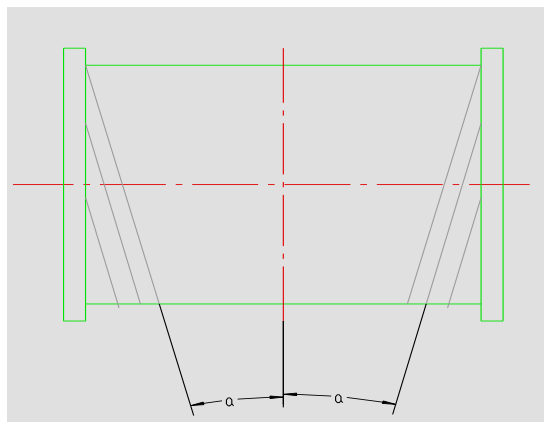
用户在安装时应参见安装尺寸图，用  $4-\Phi d(h9)$  的销轴将机构固定在塔机上。

若由主机厂装配电机，则装配前应检查减速器端面的 O 型密封圈是否完好，端面无毛刺；电机的接合端面是否平整，端面无毛刺。之后再行电机与减速器连接装配，装配质量要求为：接合面无漏油现象。

安装前，应将起升钢丝绳一端用楔块和楔套（或螺栓副和压板）固定在卷筒侧板外壁上。然后约用  $1/10$  的单绳额定牵引力拉紧钢丝绳。电机通过减速器传动卷筒并使钢丝绳逐层绕紧在卷筒上。当卷筒绳槽方向为左旋时，建议选用右捻多层股不扭转钢丝绳（钢丝绳实际直径为钢丝绳公称直径的  $1.02 \sim 1.04$  之间），钢丝绳的安全系数不得小于 4.5。

使用前应调整装在机架上的挡绳杆，使其不会阻碍钢丝绳的运动，也能保证其挡绳作用。挡绳杆与卷筒侧板的外缘之间的间隙不应大于钢丝绳公称直径的 20%。

在没有使用排绳装置时，为使钢丝绳在卷筒上多层缠绕顺利，推荐钢丝绳偏离与卷筒轴垂直平面的角度（如下图 a 值）应不大于  $1.5^\circ$ ，但应大于  $0.5^\circ$ 。





**警告：严禁不按规定加注润滑油或未加注润滑油就开机使用！**

**警告：严禁将手伸向正在运行的机构运动部分。**

**警告：严禁不同油品的润滑油（脂）混杂使用！**

**警告：钢丝绳必须按 GB/T 5972 的规定进行检验和报废！**

## 5. Installation and Adjustment

There are four lifting lugs on the frame beam, which can be used for lifting position. Keep balance of mechanism when lifting. Any staff should not be close to the machine or standing above/under the machine when lifting.

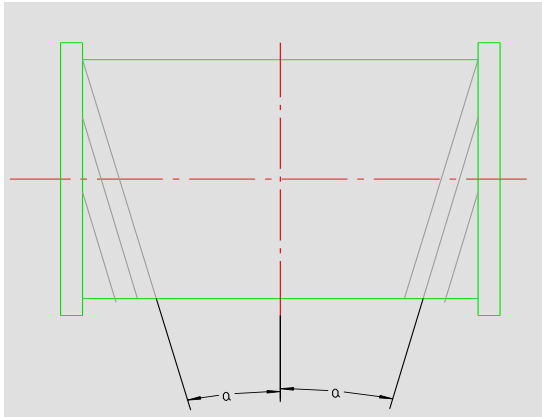
Directed by the dimension fig, the mechanism is fixed on the counter-jib of the tower crane with 4- $\Phi d$  ( h9) pins.

If the motor is installed by the tower crane plant, make sure the O-seal ring on the end face of the reducer is in good condition before installation. There should be no burr on the end face. The joint face of the motor should be flat and without burr. Then connect the motor and the reducer, there should be no oil leakage at the joint.

Before installation, one end of the hoist rope should be fixed at the side plate of the drum with the wedge and wedge sleeve (or bolt set and pressing plate), and tightened with 1/10 single rope rate traction. The motor being fed, drum rotates, the rope would be wound up tightly on the drum layer to layer. When the direction of drum groove is left-hand, right-hand lay multilayer strand non-torsion ropes are recommended (the actual rope diameter is 1.02-1.04 times of its nominal diameter). The design safety factor should not be less than 4.5.

Before operating, adjust the rope guard rod which fixed on the chassis. It should not hinder the rope movement and prevent the rope running out from the flange. The clearance between the rope guard rod and the outer edge of the flange should not be greater than 20% of the nominal rope diameter.

If there is no rope guide unit, in order to spool the wire smoothly, the fleet angle  $\alpha$  must be kept between  $0.5^\circ$  and  $1.5^\circ$  ( $0.5^\circ < \alpha \leq 1.5^\circ$  ,see the fig. below).



**Warning: The lubricants must be applied correctly! Don't start the machine without lubrication!**

**Warning: Keep hands away from the operating parts of the mechanism!**

**Warning: Different types of grease mixed are forbidden!**

**Warning: The rope must be checked and scrapped according to the provisions of GB/T 5972!**



## 六、维护保养

工作 50 小时后需要检查安装螺栓是否有松动。

减速器首次换油的时限为工作 200 小时。

首次更换润滑油后，每工作 2400 小时更换润滑油或取决于应用情况。也可半年换一次油。然而，必须每班检查油面并按规定填油。

安装前，应按电机说明书要求检查或调整电磁制动器的制动气隙。

安装前应给减速器加注 GL-4 中负载车辆齿轮油至油位，油面高度详见外形安装图。使用 2400 小时后应将油排空，清洗并重新注满油。

卷筒尾部轴承座上外侧面有一个润滑油嘴，出厂时已注满 2 号极压锂基润滑脂。每使用 1200 小时后请检查并视情况加注满 2 号极压锂基润滑脂。

常检查各部位紧固件的紧固情况，如有松动应及时紧固。重点检查卷筒轴与减速器轴向固定的圆螺母。

常检查机构是否有渗漏油现象，如有，应及时维修排除。重点检查减速器的润滑油位，及时添加润滑油，保持正确油位。

常检查电机、卷筒轴与减速器的联接花键的润滑及磨损情况，如有偏磨或严重磨损则应停机换件。卷筒轴与减速器的联接花键，每次检查后要视情况补充 2 号极压锂基润滑脂。由于电机的花键轴浸泡在润滑油中，所以，电机与减速器的联接花键，每次检查后要视情况补充 GL-4 中负载车辆齿轮油。

检查工作过程中的声响和发热情况，如有异常，应停机排除。

强制保养的内容和周期见下表：

保养次数	周期或 工作时间 (以先到为准)	保养内容
第一次	1 个月 或 200 小时	1. 排空减速器内旧油，清洗内腔，重新注满润滑油。 2. 检查或调整电机上电磁制动器的制动间隙（详见电机使用说明书）
第二次	4 个月或 1500 小时	1. 添加减速器润滑油至油位 2. 检查制动器瓦块（或摩擦片、制动盘）的磨损情况，视情况更换 3. 检查安装螺栓是否有松动 4. 检查花键轴及相配花键磨损情况

		5. 检查并拧紧卷筒轴上固定减速器的圆螺母
以后间隔时间	6 个月或 2400 小时	1. 排空减速器内旧油, 清洗内腔, 重新注满润滑油 2. 检查制动器瓦块 (或摩擦片、制动盘) 的磨损情况, 视情况更换 (详见电机使用说明书) 3. 检查卷筒与减速器连接轴的花键磨损情况并补充润滑脂或润滑油 4. 检查并拧紧卷筒轴上固定减速器的圆螺母 5. 检查电机与减速器的联接花键磨损情况并补充 GL-4 中负载车辆齿轮油。(电机花键轴浸泡在润滑油中)

螺纹规格 (强度级别 8.8)	紧固力矩 (N·m) ( $\mu = 0.14$ , 无油)	紧固力矩 (N·m) ( $\mu = 0.1$ , 有油)
M10	50	30
M12	85	60
M14	135	90
M16	220	140
M18	310	200
M20	460	290

螺纹规格 (强度级别 10.9)	紧固力矩 (N·m) ( $\mu = 0.14$ , 无油)
M12	113
M14	175
M16	273
M18	375

**注意:** ●用扭矩扳手检查各个紧固螺栓及螺母的紧固程度。

★损坏的螺栓要用同等规格和强度的螺栓替代。



## 6. Maintenance

After 50 hours' operation, check the mounting bolts and tighten any that are loose, make sure all the bolts and fasteners are securely mounted.

After 200 work hours, change the oil for the first time.

Then, change the oil every 2400 hours. The oil can also be changed every six months, that depends on the frequency of using. However, the oil level must be checked and refilled every work shift.

Before installation, check or adjust the air gap of electromagnetic brake according to the motor instruction.

Fill GL-4 medium load vehicle gear oil into reducer to the level (See the installation diagram) according to the instructions before installation. After 2400 work hours, drain the oil out of the reducer, clean it and refill the oil to the level.

A lubricating nipple is located at the outside of the bearing pedestal which is at the end of the drum. Lithium grease NLGI 2 has been filled in the bearing pedestal before delivery. Check the lubrication after 1200 hours work and refill lithium grease NLGI 2 if necessary.

All nuts and bolts must be checked regularly. If the nuts and bolts come loose, tighten them. Pay particular attention to the round nut which connect drum shaft and reducer in the axial direction.

Check leakage regularly, if necessary, repair it immediately. Pay special attention to the oil level of the reducer. The lubricating oil must be refilled to the level in time.

Often check the lubrication and wear of the splines which connect the motor, drum and reducer, if there is severe wear, stop the machine and replace or repair the parts. The splines between drum shaft and reducer should be refilled with 2 extreme pressure lithium grease if necessary after each inspection. The splined shaft between motor and reducer should be refilled with GL-4 medium load vehicle gear oil if necessary after each inspection. The splined shaft should be soaked in the oil.

Inspect noise and heat of the machine regularly. If there is any abnormal noise or overheating, stop the machine, eliminate the source of the noise and overheating.



The table below shows the contents of mandatory maintenance:

Items	Time Interval (Whichever comes first)	Maintenance
First time	One month Or 200 hours	1.Drain the oil out of the reducer, clean it, refill oil to the level. 2.Check and adjust the gap of electromagnetic brake of motor. (For details, see the manual for brake).
Second time	Four months Or 1500 hours	1.Refill reducer oil to the level. 2.Check the wear of the brake shoes (or friction disc, brake disc ). Replace it if necessary. 3.Check and tighten the installation bolts. 4.Check the wear of the splined shaft and matched internal spline. 5. Check the round nut which connect drum shaft and reducer.
After the second time	Every six months Or every 2400 hours	1.Drain the oil out of the reducer, clean it, refill oil to the level. 2.Check the wear of the brake shoes (or friction disc, brake disc ). Replace it if necessary. 3.Check the spline between drum shaft and reducer, refill oil or grease if necessary. 4. Check the round nut which connect drum shaft and reducer. 5. Check the wear of splined shaft between motor and reducer, refill with GL-4 medium load vehicle gear oil (The splined shaft should be soaked in the oil).

Tightening torques for bolts and studs (classes 8.8)		
Thread (classes 8.8)	Tightening torques (N • m) ( $\mu=0.14$ , without oil)	Tightening torques (N • m) ( $\mu=0.1$ ,with oil)
M10	50	30
M12	85	60
M14	135	90
M16	220	140
M18	310	200
M20	460	290





Tightening torques for studs (classes 10.9)	
Thread (classes 10.9)	Tightening torques (N • m) ( $\mu=0.14$ , without oil)
M12	113
M14	175
M16	273
M18	375

- Note: ● Check the fastening degree of bolts and nuts with torque wrench.  
★ The damaged bolt must be replaced by the new one with the same strength and type.



## 七、润滑油

### 1. 减速器润滑油

GL-4 中负载车辆齿轮油 (GB/T 13895)

该油以矿物油或合成油为基础油, 加有极压、抗氧、防锈、抗磨等添加剂。推荐使用 80W/90, 其运动粘度 (100℃)  $13.5 - < 24 \text{ mm}^2/\text{s}$ 。

### 2. 轴承座润滑脂

产品出厂前, 卷筒两端轴承座均填好 2 号极压锂基润滑脂 (GB/T 7323)。

用户补油时应符合以下条件:

润滑脂的稠度等级 (NLGI) 应为 2 号;

油品的性能指标应不低于 GB/T 7323 的要求。

## 7. Lubricating Oil

### 7.1 Grease for reducer

The recommended oil is GL-4 medium load vehicle gear oil (GB/T 13895). The basic oil is mineral oil or synthetic oil, with extreme-pressure, anti-oxygen, rust prevention, anti-wear additives in it. 80W/90 is recommended, its kinematic viscosity (100℃) is  $13.5-24 \text{ mm}^2/\text{s}$ .

### 7.2 Grease for bearing pedestal

The bearing pedestal (on the end of the drum) has been lubricated with lithium grease NLGI 2 (GB/T 7323) before delivery.

The oil replenishing should meet the following conditions:

Grease consistency level (NLGI) should be 2;

Oil performance should comply with (no less than) the requirements of GB/T 7323.



## 八、故障原因和措施

故障		原因	措施
减速机	在减速机的紧固 件处有大的噪声	紧固件松动了	将螺栓/螺母拧到规定扭矩 更换损坏了的螺栓/螺母
	减速机噪声变化	齿轮的轮齿发生了损坏	检查所有的齿轮,更换损坏了的 零件
		轴承间隙过大	调整轴承间隙
		轴承损坏	更换损坏的轴承
		减速器内部轴向无间隙	检修并更换零件
	减速机工作温度 过高	箱体里面的油面过高	检查油面的高度, 并进行调整
		箱体里面的油面过低, 影 响散热	检查油面的高度, 加至规定高度
		油过于陈旧	检查上一次换油的时间, 并换油
		油受到严重污染	换油
		减速器内部轴向无间隙	检修并更换零件
	渗漏油	箱体及箱体盖铸造缺陷	更换箱体、箱盖或用修补剂补缺 陷处
		箱体盖连接处的密封不良	检查密封和连接处, 重新在结合 面打上密封胶
		油封失效或损坏	更换新的油封
	轴承处的温度过 高	减速机箱体里面的油面过 高或过低	在室温下检查油面的高度并按 需加油
		油过于陈旧	检查上次换油时间, 并换油
		轴承损坏	检查并更换轴承
	轴承处的振幅升 高	轴承损坏	检查并按需更换轴承
		齿轮损坏	检查并按需更换齿轮
卷筒	钢丝绳乱绳	钢丝绳变形、断股	检查并更换钢丝绳
		卷筒绳槽磨损严重	检查并更换卷筒
		钢丝绳偏离与卷筒轴垂直 的平面的角度大于 1.5°	改进塔式起重机的设计
	钢丝绳松动	钢丝绳螺栓及压板未紧固 好	检查并紧固好螺栓及压板; 螺栓拧紧力矩达规定值
		固定螺栓/螺母损坏	检查并更换螺栓/螺母
	侧板与卷筒固定 处有大的噪声	紧固件松动了	将螺栓/螺母拧紧到规定扭矩; 更换损坏了的螺栓/螺母

轴承座	渗漏油	轴承座盖连接处密封不良	检查密封和连接处,重新在结合面打上密封胶
		油封失效或损坏	更换新的油封
	温度过高	轴承座里缺润滑脂	加注润滑脂
		润滑脂过于陈旧	检查上次换脂时间
电机	电机异常	详见电机说明书	详见电机说明书
机构	溜钩	超载,塔机的力矩限制器损坏	更换塔机的力矩限制器
		电机的制动力矩不够	调整制动器摩擦片间的间隙
		电机的制动器损坏	更换电机的制动器
		电机与减速器连接的花键损坏	更换花键套或电机花键轴
		卷筒轴与减速器连接的花键副损坏	更换相应已坏件
安全制动器	制动失效	制动器失效	详见液压钳、液压站的使用说明书

## 8. Causes and Measures

Faults		Causes	Measures
Reducer	Loud noise in the area of the fastening.	Fastening has worked loose.	Tighten bolts/nuts to specified torque. Replace damaged bolts/nuts.
	Changes in noise.	Damage to gear teeth.	Check all toothed components; replace any damaged parts, if necessary.
		Excessive bearing play.	Adjust bearing play.
		Bearing defective.	Replace defective bearings.
		No axial play in reducer.	Check and replace parts if necessary.
	Increased temperature.	Oil level in housing too high.	Check oil level at room temperature.
		Oil level in housing too low.	Check oil level at room temperature; if necessary, top up oil.



		Oil too old.	Check date of last oil change; if necessary, change oil.
		Oil is seriously contaminated.	Change oil.
		No axial play in reducer.	Check and, if necessary, replace parts.
	Oil leakage.	Casting defects at housing and cover.	Replace housing, cover or mend the defects with sealant.
		Inadequate sealing of housing covers and/or joints.	Check and, if necessary, replace seals. Seal joints and/or housing cover.
		Seal defective.	Check and, if necessary, replace seals.
	Increased temperature at the bearing points.	Oil level in housing too low or too high.	Check oil level at room temperature; if necessary, top up oil.
		Oil too old.	Check date of last oil change; if necessary, change oil.
		Bearing defective.	Check and, if necessary, replace bearings.
	Increased amplitude at the bearing points.	Bearing defective.	Check and, if necessary, replace bearings.
Gear defective.		Check and, if necessary, replace gears.	
Drum	Rope spooling not smooth and stable.	Rope deformed and/or strands broken.	Check and replace rope.
		Drum groove wear seriously.	Check and replace drum.
		The fleet angle is larger than 1.5°	Improve the design of the tower crane.
	Rope loose.	Rope is not pressed tight.	Check and tighten bolts to specified torque.
		Bolts/nuts defective.	Check and, if necessary, replace bolts/nuts.
	Loud noises in the area of the side plate and drum.	Fastening has worked loose.	Tighten bolts/nuts to specified torque. Replace damaged bolts/nuts.
Bearing Pedestal	Oil leakage.	Inadequate sealing of pedestal covers and/or joints.	Check and seal joints.
		Seals defective.	Replace seals.
	Temperature too high.	Lack of grease in bearing pedestal.	Refill grease.
		Grease too old.	Check date of last grease change; if necessary, change grease.
	Bearing defective.	Check and, if necessary, replace bearings.	
Motor	Motor abnormalities.	See operating instructions of motor.	
Mechanism	The weight in a straight free fall.	Overload. The torque limiter for tower crane damaged.	Replace the torque limiter for tower crane.
		The braking torque of the motor is not large enough.	Adjust the brake gap.
		Motor brake defective.	Replace the brake.
		Spline (connectiong motor and reducer) defective.	Replace the spline sleeve or the motor splined shaft.



		Spline (connecting the drum shaft and reducer) defective.	Replace damaged one.
		Reducer gear defective.	Replace damaged gears.
Safety Brake	Brake failure.	Brake failure.	See operating instructions of hydraulic arm and pumping station.

## 九、易损件

### 9. Wearing Parts

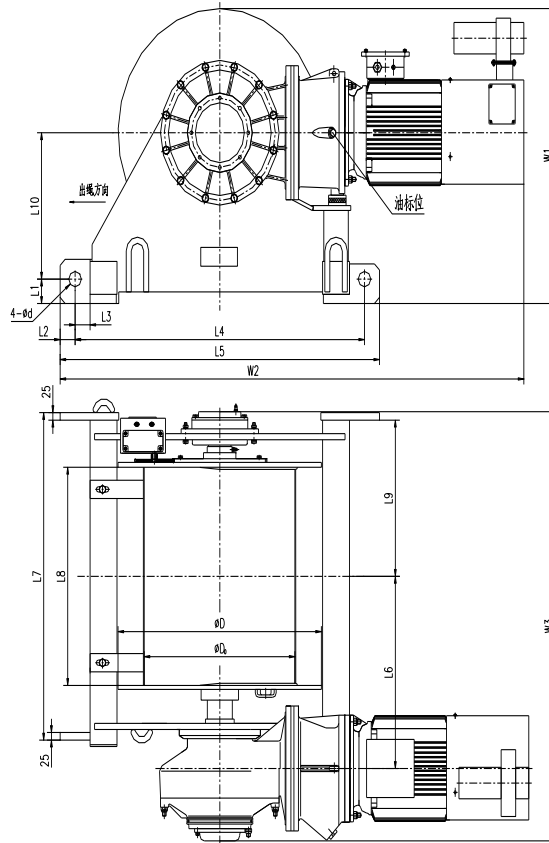
序号 / Item	名称 / Description	所用部位 / Location	备注 / Remarks
1	花键套 Splined sleeve	减速器与电机的连接部位 Connecting reducer and motor	
2	油封 Seal	减速器 Reducer	
3	摩擦片 Friction plate	电机的盘式制动器 Disc brake of motor	
4	油封 Seal	轴承座 Bearing pedestal	
5	摩擦片 Friction plate	安全制动器 Safety brake	

## 十、机构外形安装示意图

### 10. Installation Diagrams

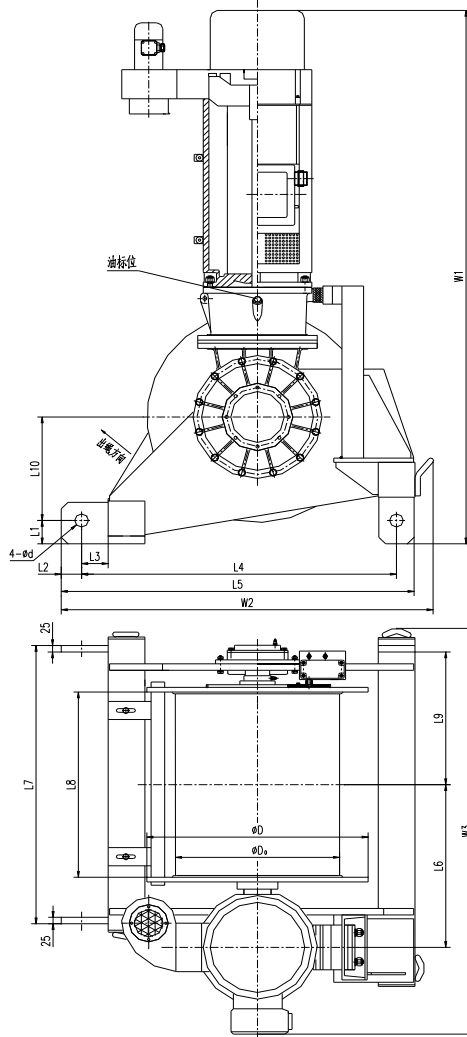
PFC 系列起升机构外形安装图（卧式）

### PFC series hoisting: Installation Diagram (Horizontal)



$\frac{r}{\phi}$	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	$\phi D_0$	$\phi D$	$\phi d$	W1	W2	W3	备注
24PFC15F	80	60	60	900	1020	498.5	925	542	437.5	365	561	750	40.5	824	2129	1205	
30PFC20 45PFC25	80	60	60	1160	1280	630.5	1075	716	512.5	480.5	605	815	50.5	968	2441	1451	
30PFC20A	80	60	60	900	1020	670.5	925	761	437.5	320	450	646	40.5	723	1901	1491	
24PFC20W	80	60	60	900	1020	654.5	925	731	425	323	368	570	40.5	688	1839	1451	
30PFC15Y	80	60	60	1160	1280	505	1000	453.6	475	480.5	652	868	50.5	994.5	1961	1268	

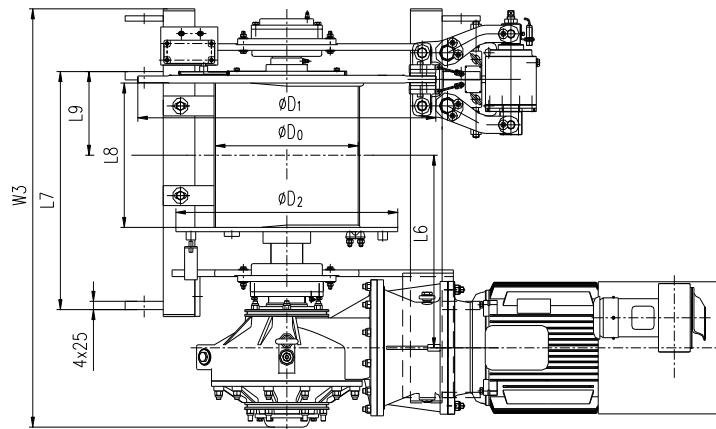
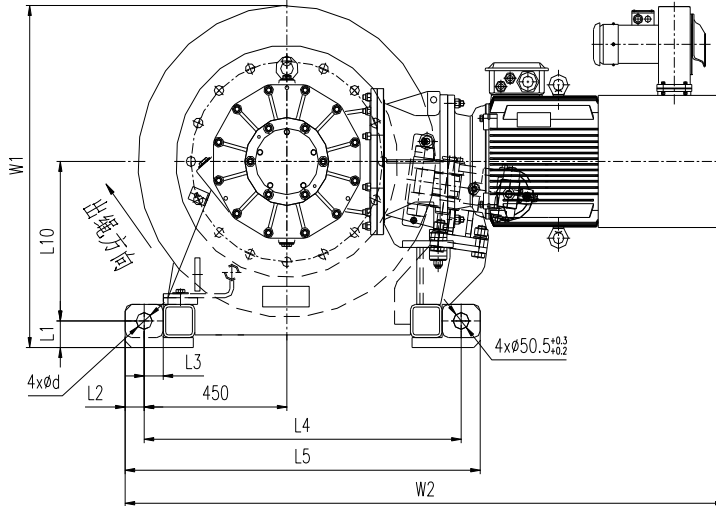
PFC 系列起升机构外形安装图（立式）  
**PFC series hoisting: Installation Diagram (Vertical)**



序 号	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	$\phi D_0$	$\phi D$	$\phi d$	W1	W2	W3	备注
24PFC20L (24PFC20L)	80	60	60	900	1020	660.5	925	731	437.5	323	368	570	40.5	1732	1020	1451	
30PFC20L (30PFC20L) (45PFC25L)	90	75	98	1160	1303	632	1075	716	512.5	400	605	815	50.5	2061	1370	1568	

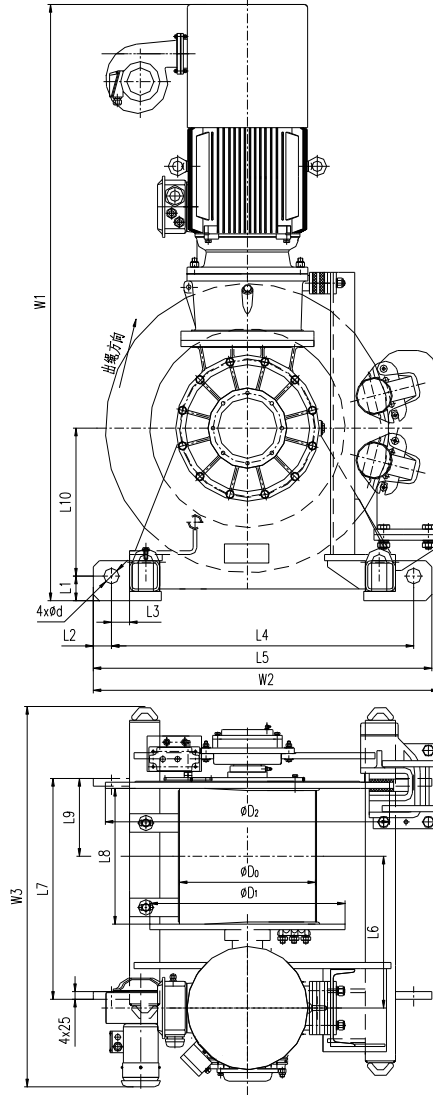


DVF 系列动臂变幅机构外形安装图 (卧式)  
**DVF series luffing: Installation Diagram (Horizontal)**



机 型 号	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	øD <sub>0</sub>	øD <sub>1</sub>	øD <sub>2</sub>	ød	W1	W2	W3	备注
240VF258	80	60	60	1000	1120	578	925	436.8	462.5	480.5	450	940	675	50.5	1031	1893	1260	
240VF2581	80	60	60	1000	1120	578	717	436.8	254.5	480.5	450	940	675	50.5	1031	1893	1260	
240VF2582	80	60	60	1000	1120	583	717	426.3	249	480.5	450	940	675	50.5	1031	1893	1260	
300VF3281	80	60	60	1000	1120	580	717	434.7	252	480.5	450	940	700	50.5	1031	1893	1260	
300VF3282	80	60	60	1000	1120	580	717	434.7	252	480.5	450	940	700	50.5	1031	1893	1260	

DVF 系列动臂变幅机构外形安装图 (立式)  
**DVF series luffing: Installation Diagram (Vertical)**



代 号	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	$\phi D_0$	$\phi D_1$	$\phi D_2$	$\phi d$	W1	W2	W3	备注
300DF20BL	80	60	60	1000	1120	493	717	441	252.5	480.5	450	646	940	50.5	1937	1144	1235	
240DF32BL	80	60	60	1000	1120	491	717	436.8	254	480.5	450	675	940	50.5	1937	1144	1235	
300DF32BL	80	60	60	1000	1120	491	717	434.7	254.5	480.5	450	700	940	50.5	1937	1144	1235	



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