平台升降系统
Jacking System

上海振华重工(集团)股份有限公司
SHANGHAI ZHENHUA HEAVY INDUSTRIES CO.,LTD.

上海总部联系方式(Shanghai Headquarters)
地址(Add):中国上海东方路3261号
3261 Dong Fang Road，Shanghai，P.R.China
邮编(Post Code):200125
电话(Tel):+86 21 58396666
传真(Fax):+86 21 58399555
互联网页(Webpage):http://www.zpmc.com
电子信箱(E-Mail):mail@zpmc.com
电子信箱(E-Mail):spareparts@zpmc.com

上海振华重工集团（南通）传动机械有限公司
SHANGHAI ZHENHUA HEAVY INDUSTRIES (NANTONG)
TRANSMISSION MACHINERY CO.,LTD.

南通传动联系方式（Nantong Transmission）
地址(Add):南通经济开发区团结河东路1号
No.1 Tuanjie River Road(E) Nantong Economic Development Zone
邮编(Post Code):226017
电话(Tel):0513-85999155
互联网页(Webpage):http://www.zpmcgearbox.com
电子信箱(E-Mail):ntzc@zpmc.net
传真(FAX):0513-85998063

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抬升系统安装现场　　Installation of the scene

Brief Introduction

公司介绍

上海振华重工(集团)股份有限公司(ZPMC)是重型装备制造行业的知名企业，为国有控股A、B股上市公司，控股方为世界500强之一的中国交通建设股份有限公司。

公司总部设在上海，于上海本地及南通、江阴等地设有8个生产基地，占地总面积1万亩，总岸线10公里，特别是长江口的长兴基地有深水岸线5公里，承重码头3.7公里，是全国也是世界上最大的重型装备制造企业。

公司具有强大的资源优势——"场地车间加工实力雄厚、运输有船、停泊有岸线、起重有浮吊"，南通传动机械有限公司是世界知名的减速箱生产企业，因此我们的产品具有可靠性高、质量好、交货期短的特点。ZPMC有信心为用户提供最优的产品。

Shanghai Zhenhua Heavy Industry Co., Ltd. (ZPMC) is a famous heavy-duty equipment manufacturer, and a state holding company listed on A and B shares in Shanghai Stock Exchange. The major shareholder is China Communication Construction Co., Ltd. (CCCC), which is one of top 500 companies in the world.

ZPMC headquarters is located in Shanghai. ZPMC also has 8 production bases located in Shanghai, Nantong and Jiangyin, with total area of 6670 hectares and 10 kilometer coastline, (especially Changxing Base has 5 kilometer deep water coastline), and including heavy-duty dock of 3.7 kilometer. ZPMC is the largest heavy-duty equipment manufacturer in the world.

Relying on ZPMC's resource advantages---"Large-scale workshops, great working capability, vessels for transportation, long deep water coastline and heavy-load floating cranes for lifting", the Nantong transmission Machinery Co., Ltd. is one of the most famous gear-box manufacturer. We can provide products with high reliability and good quality in short delivery time. ZPMC has the confidence to supply jacking system products as custom-made.

1 振华长兴基地
Changxing base

2 振华研制的蓝鲸号7500吨浮吊
Blue Whale developed by ZPMC – 7500T Floating Crane

3 振华自主设计制造的抛石整平船
Self-elevating rubble leveling barge developed by ZPMC

4 振华设计制造的场桥
Yard gantry crane developed by ZPMC

5 振华正在制造的"振海1号"
Super M2 fabricated by ZPMC

6 振华人字齿齿轮的设计制造
Zhenhua herringbone tooth gear design and manufacturing

Base Introduction

生产基地介绍

上海振华重工集团（南通）传动机械有限公司（原名南通振华重型齿轮箱厂）是上海振华重工（集团）股份有限公司下属子公司，坐落于江苏省南通市经济技术开发区团结河东路1号，南面长江，西邻苏通大桥，与沿江、沿海高速公路相通，具有优越的地理位置和交通条件。厂区面积333500平方米，建筑面积179000平方米，制造能力雄厚。

振华南通传动机械有限公司海工产品系列主要有：海洋平台桩腿提升系统、海洋石油平台桩腿齿条、重型锚铰系统、动力定位系统等。

公司以精细化管理作为企业发展的目标。先后通过了ISO9001质量管理体系、OHSAS18001职业健康安全管理体系、ISO 14000 环境管理体系等多项认证，并获得了ABS、GL、KR、BV等多家船级社的工厂认可和产品认可。

Shanghai Zhenhua Heavy Industries (Nantong) Transmission Machinery Co.,Ltd. (the old name is Nantong Heavy Gear Reducer Branch) is a subsidiary of ZPMC. It locates at NO.1 East Tuanjie River Road, Nantong Economic and Technical Development Zone. This company has an excellent geographical and transportation advantage, for it lies south to the Yangtze River, west to the Sutong bridge, and connects with the Coastal highways. Our production base which covers 333500 square meters including 179000 square meters construction area is strong in manufacturing ability.

Our main marine engineering products are ocean platform spud leg, offshore oil platform leg rack,heavy duty anchor hinge system, dynamic positioning system, etc.

Our company regards Delicacy Management as the development goal. It has passed the ISO9001 quality management system, OHSAS 18001 occupational health and safety management system, ISO14000 environmental management system, etc. It also obtains lots of acceptance of the classification societies, such as ABS, GL, KR, BV, etc.

1 量产桩腿齿条出口国外
Export abroad

2 抬升齿轮探伤检验
Flaw detection

3 齿条焊接线
Welding line

Core Competitive Strength

核心竞争力

升降系统是典型的机、电、液一体化作业系统。ZPMC拥有2000余名专业工程师从事机械、电气、液压方面的工作。ZPMC自成立以来一直从事于机械装备的设计和制造，积累了丰富的实践经验，也为ZPMC对升降系统的研发打下了非常扎实的基础。振华重工于09年开始研发升降系统，截止目前，已出口650套升降装置，以及20套平台的电控系统，另外还有风电安装船和抛石整平船等项目使用。

Jacking system is the typical system of mechanical, electrical, hydraulic integration operating. ZPMC has more than 2,000 professional engineers engaged in the work of the mechanical, electrical, hydraulic. ZPMC since its inception has been engaged in the design and manufacture of machinery and equipment, and accumulated a wealth of practical experience and also laid a very solid foundation for the research and development of the jacking system for ZPMC. ZPMC in 2009, began the development of the jacking system, until now, Up to now, Up to now, have been exported 12 sets of platform jacking system, a total of 650 sets of jacking unit, as well as 20 sets of platform electronic control system, in addition to Wind-farm Installation Platform and Self-Elevating Rubble Leveling Barge.

ABS专家来公司技术交流
ABS experts come for technical communication

中石油专家授课现场
CNPC experts on site courses

振华重工升降系统的成功研发不仅填补了国内空白，而且主要技术性能指标达到了国际领先水平，其中最主要的关键技术及创新点有：

The successful development of ZPMC jacking system not only fills the domestic gap, and main technical performance indicators have reached the international advanced level, but also the main technical performance indicators have reached the international advanced level, and the following is the most important key technology and innovation points:

1. 载荷的科学分配与减重：通过研究各级齿轮的配比及等效寿命原则，科学的载荷分配与减重；
2. 大模数齿轮、齿条高精度加工技术：预考虑制作中的误差，使产品成形后，精度达到国外企业的先进水平；
3. 超大速比高可靠行星齿轮设计与制造技术：在要求大扭矩的减速箱的后两级采用优化的行星传动；
4. 升降系统的同步控制技术：通过桩腿高度指示、爬升齿轮载荷检测装置、平台水平检测装置、自动调平系统等实现各抬升机构的同步；
5. 单元外形尺寸的优化：通过优化设计，在满足规范的前提下，载荷提高了13%以上，寿命延长了4倍，达到国际领先水平。

1. Load scientific distribution and weight reduction: Through the study of gear ratio at various levels and equivalent life principle, scientific load distribution and weight reduction;
2. Big modulus gear, rack high precision processing technology: preliminary consider the production error. After the product forming, the accuracy is reached the advanced level of foreign enterprises;
3. Large ratio high reliable planetary gear design and manufacturing technology: in the requirements of high torque reducer of the two levels of the optimization of the planetary transmission;
4. Lifting system of synchronous control technology: Through the RPD + leg height ,the pinion load testing device, the platform level detection device, automatic leveling system to realize the synchronization of the jacking units;
5. Optimizing of the size of jacking units: Meet the standard in the premise, through the optimization design, load up by more than 13%, prolonging the four times, reached the international advanced level.

1 钢结构均在大跨度室内车间制作冲砂、成型、油漆
all treatment of main structure, such as sand blast, welding, painting etc. can be finished inside wide span workshop (P5)

2 加工完成，等待检验的抬升装置减速箱及小齿轮
the reducers and pinions of the jacking system, completed the processing, waiting for the inspection

3 平台升降系统原型试验台
Jack Up Prototype Test Platform

1

2

3

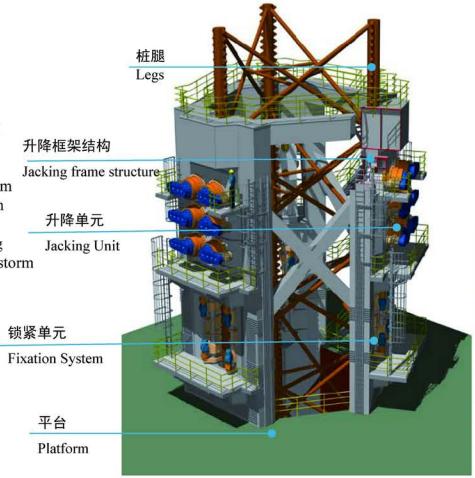
Jacking System

升降系统概述

- 公司生产的升降系统主要包括：升降装置，锁紧装置，高度检测装置，升降结构，电控系统，齿条等整套系统。驱动方式、结构形式和功能设定等可根据用户实际情况和要求进行最优方案设计。
- 目前公司生产的升降系统负载能力有多种选择，单套机构的额定抬升载荷从200吨～500吨之间均可供用户选择，并可提供CCS, ABS, DNV等各国船级社的证书。
- The Jacking system manufactured by ZPMC mainly includes: jacking unit, fixation unit, leg height + RPD, jack-case, control system, rack and etc. We can supply optimized design (different drives, structures, function and etc.) to meet different customer's requirements.
- As present, there are a lot of choices for the load of jacking system, and the capacity for the normal jacking can be 200 ~ 500 t. We also can provide certificates (of CCS, ABS, DNV etc.) as required.

主要功能：
1）抬升平台
2）固定平台
3）抬升桩腿
4）预压
5）风暴下支撑

main function：
1)Lifting platform
2)Fixed platform
3)Lifting legs
4)Pre-machining
5)Survive from storm



- 振华重工已经先后成功研发出3种型号规格的升降单元，分别可用于300英尺、350英尺和400英尺平台，其额定升降负载为200-385MT，最大风暴支撑负载为454-646MT，升降单元采用变频控制，可实现无极调速，升降速度从0-2m/min。
- 公司生产的3种型号升降单元均已通过原型机试验，取得了ABS和CCS认可证书。其中F&G项目升降单元获得ABS在中国大陆地区颁发的第一张用于海洋平台升降系统证书。
- 振华重工下一步还要开发适用于500英尺平台的新一代超大型平台升降系统，完善产品的型号规格。本项目也被上海市列为"产业化重大项目"，已获7项国家专利。
- ZPMC has successfully developed jacking units of 3 types and specifications, applied for 300-feet, 350-feet and 400-feet platforms respectively. The normal jacking load is 200-385 tons, and the maximum normal holding load is 454-646 tons. The jacking units adopt frequency control, which can realize the stepless speed adjustment with the jacking speed from 0 to 2m per min.
- Three types of the jacking units produced by the company have passed the prototype test, and gained the ABS and CCS Certificate of Approval, of which the jacking units of the F&G project gained the ABS first certificate of ocean platform jacking system which issued in China mainland region.
- ZPMC the next step is to develop a new generation super large platform jacking system suitable for 500-feet platforms, to complete the types and specifications of the products. The project was also listed as one of the important projects for industrialization of Shanghai and has received 7 national patents.

1 2009年3月成立海洋工程设计研究院
ZPMC marine engineering design department was established in march of 2009

2 ABS验船师现场检验
The ABS surveyor scene inspection

3 自升式钻井平台升降系统专利证书
Patent certificate from the jack-up drilling platform lift system

Jacking Unit
升降单元

- 简介：升降系统用于自升式平台的升降，常规配备32～72套，额定载荷从200～500MT不等。
- ZPMC研制的抬升系统主要应用：
  - 各类自升式钻井平台，如：SuperM2，JU2000E等；
  - 各类特种工程船，如：风电安装船、抛石整平船等。
- ZPMC配套开发了抬升系统试验台，可用于各种船级社认证所需。同时也可对产品进行疲劳，破坏等试验，为后续产品取得更多有利数据。
- Introduction: The jacking system is designed for elevating and lowering the platform. Conventional equipped with 32~72 sets per rig and the normal jacking capacity is 200~500 MT.
- Main application:
  - The drilling platforms such as Super M2, JU 2000 etc.
  - Wind-farm installation platform, self-elevating rubble leveling barge etc.
- ZPMC developed jack up system prototype test platform to meet the requirements from different classification societies. It can run fatigue test and destructive test to get more available data for further improvements.

•升降系统产品系列表

系列号	正常抬升载荷(t)	预压载荷(t)	速度(m/min)	暴风载荷(t)	功率(KW)	减速箱速比	爬升齿轮模数
ZP200	200	300	0.457	454	22	5996	80
ZP200-R	200	300	0.8	454	37	1965	80
ZP275	275	375	0.3	560	25	6685	97.02
ZP300	300	450	0.457	720	30	6589	97.02
ZP340	340	522	0.457	646	50	8175	97.02
ZP385	385.5	522	0.457	646	50	8175	97.02

1 抛石整平船上的平台升降系统
Self-elevating rubble leveling barge

2 平台升降系统原型试验台
Jack Up Prototype Test Platform

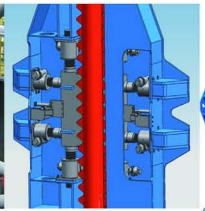
Fixation System
锁紧系统

ZPMC自主研发的锁紧系统有如下特点：

1. 结构简单、操作方便；
2. 锁定可靠，完成锁紧后，对动力的需求不再是必需的，安全性高；
3. 齿条方向调整能力强，不再受累积齿距误差的影响；
4. 承载能力范围广，每套锁紧系统的垂直承载能力从4000t～10000t，水平承载能力从2000t～5000t；
5. 环境适应能力强，-20度～＋50度。

ZPMC's fixation device has the following features:

1. Simple structure and easy operation;
2. High reliability and safety. No drive is required once the fixation operation is finished.
3. Great rack direction adjustment eliminates the effects caused by cumulated rack pitch deviation.
4. Large load capacity. Each fixation system has vertical load capacity of 4000~10000 ton and horizontal load capacity of 2000~5000 ton.
5. Great adaptability to the environment. The temperature range from -20℃~+50℃.



锁紧系统关键设备——蜗轮蜗杆顶升器试验台，确保每台蜗轮蜗杆顶升器安全可靠、符合设计预期，同时也可满足各船级社认证所需。
Key equipment of fixation system is test platform of screw jack, which ensures the reliability and high performance, and meets requirements of classification society.

- 锁紧系统业绩
  Achievement

序号 Num	项目名称 Project name	结构形式 Structure form	套数 Set
1	振海一号	全顶升式	3
2	振海二号	全顶升式	3
3	抛石整平船	顶升器与楔块组合式	4

Electrical control system

电控系统

- 简介：电气控制系统包括一个中央控制台、马达控制柜以及本地操作柜。系统使用独立变频驱动控制系统。同时，该控制系统包括桩腿高度指示、爬升齿轮载荷检测装置、平台水平检测装置、自动调平系统、控制台和显示屏等单元，通过这些单元实现各抬升机构的同步。
- ZPMC可提供整套升降系统的控制系统。
- Introduction: The electrical control system consists of one Jacking Central Control Console (CCC), Jacking Motor Control Centers (MCC) and Local Control Console (LCC). The system will be based on individually Variable Frequency Drive (VFD) control system.
- ZPMC provides the whole electrical control system.

1 马达控制柜 Motor Control Center (MCC)

2 中央控制台 Central Control Console (CCC)

3 马达驱动柜 Variable Frequency Drive (VFD)

ZPMC抬升电控特点

ZPMC jacking system electronic control characteristics

1. 操作简单完善 Simplicity of operator
   - 中控台操作 Central control console operation
   - 冗余备份操作 redundant backup operation
   - 桩腿应急操作 Leg emergency operation
2. 安全保护可靠 Safety and reliable
   - RPD保护 RPD protection
   - CPU热备冗余 CPU hot standby redundancy
   - 受力速度监控 Monitoring
   - 谐波抑制 Harmonic restrain
3. 故障诊断功能 Fault diagnosis function
   - CPU诊断 CPU diagnosis
   - 通讯诊断 Communication diagnosis
   - 操作诊断 Operate diagnosis
   - 回放记录 Playback record

RPD+ Leg height

高度检测装置

- 简介：用于检测桩腿的插泥深度和平台的实际高度。通过多套装置可检测弦杆的相对高度差。简介：用于检测桩腿的插泥深度和平台的实际高度。通过多套装置可检测弦杆的相对高度差。
- Introduction: To measure and detect the insert leg depth in the mud and the actual height of the platform. It can detect relative height difference of chords by multiple Leg Height devices.

Rack

齿条

- 简介：ZPMC可提供多种型号规格的成形齿条以及各种形式桩腿的设计与制造。
- Introduction: ZPMC provides various types of rack, and design and fabrication of all types of leg.

1 齿条的高精度加工技术 The high-precision processing technology of racks

2 焊接完成的齿条 The racks and chords after welding

3 船级社在检查齿条 Authority is checking the racks

RPD+ Leg height

设计输入参数表

序号 No.	项目 Item	输入参数值 Input parameters
1	升降装置类型 Type of jacking unit	□ZP200 □ZP200-R □ZP275 □ZP300 □ZP385 □other
2	装置数量 Quantity	___台 sets
3	基本设计参数 Optional design parameters	额定抬升载荷Normal jacking ____ ；寿命Life ____ 预压抬升载荷Preload jacking ____ ；寿命Life ____ 最大静载荷 Normal holding ____ ； 风暴载荷 Storm holding ____ ； 升降速度 Lift speed ____ ；
4	驱动类型 Type of drive	□电机 Motor □液压马达 Hydraulic motor
5	船级社认证 Class	□ABS □CCS □其他 other
6	基本配置选择 Optional configuration	高度检测装置Leg height □Yes □No 齿条相位差检测RPD □Yes □No 现场安装辅助工具Special tools □Yes □No 制动器带手动释放Manual releasing □Yes □No 泡式倾角仪Bubble Inclinometer □Yes □No 电子倾角仪Electronic Inclinometer □Yes □No 升降结构Jack-case □Yes □No 电控系统Electrical control system □Yes □No
7	其他相关参数 Other design parameters	桩腿类型Type of leg: □三角桁架式Triangle Truss □圆柱式 Cylinder ； 桩腿数量 Quantity of leg ____ ； 桩腿长度 Length of leg ____ ； 齿条模数 Rack module ____ ； 压力角 Pressure angle ____ ； 齿条宽度 Width of rack ____ ； 设计温度 Design temperature____ ℃
8	交货期 Delivery	____个月 Months
9	尺寸限制 Size limit	长Length __ m * 宽Width __ m * 高Height __ m
补充说明 Supplement:		

Main achievement

成果及业绩

专利情况 Patent situation

序号	专利名称	申请号	专利类型	状态
1	将带状厚钢板工件制成齿条的加工方法	200910048283	发明	授权
2	将厚钢板制成齿条的加工方法	200910048284	发明	已受理
3	自升式钻井平台升降机构	200920210266.3	实用新型	授权
4	自升式工程平台及其锁紧装置	200920075042.6	实用新型	授权
5	自升式工程平台锁紧装置	200920211771.x	实用新型	授权
6	用于自升式工程平台定位的锁紧装置	201120083770.9	实用新型	授权

升降系统业绩 Lifting system performance

序号 No.	项目名称 Project Name	用户 End User	船级社 Class	额定升降能力 Normal jacking	数量 Q'ty
1	800吨风电安装船 800 MT wind-farm installation platform	龙源振华 Long Yuan Zhenhua, China	ABS CCS	275 MT*0.3 m/min	40
2	抛石整平船 Self-elevating rubble leveling barge	中交一航局 CCCC	CCS	200 MT*0.457 m/min	32
3	F&G 7796.18 F&G JU2000E Rig	Jurong Shipyard PTE Ltd.	ABS	385 MT*0.457 m/min	54
4	F&G 7799.18 F&G JU2000E Rig	Jurong Shipyard PTE Ltd.	ABS	385 MT*0.457 m/min	54
5	F&G 7813.18 F&G JU2000E Rig	Waigaoqiao Shipyard .	ABS	385 MT*0.457 m/min	54
6	振海1号 Super M2 Jack-up rig	振华重工 ZPMC	ABS	200 MT*0.457 m/min	54
7	F&G 7811.18 F&G JU2000E Rig	Dalian Shipyard .	ABS	385 MT*0.457 m/min	54
8	F&G 7815.18 F&G JU2000E Rig	Jurong Shipyard PTE Ltd.	ABS	385 MT*0.457 m/min	54
9	F&G 7816.18 F&G JU2000E Rig	Jurong Shipyard PTE Ltd.	ABS	385 MT*0.457 m/min	54
10	F&G 7821.18 F&G JU2000E Rig	Waigaoqiao Shipyard .	ABS	385 MT*0.457 m/min	54
11	阿联酋IMCC	阿联酋起重船	GL	200 MT*1 m/min	54