

TC6010 Tower Crane

(self-erecting)

Operation Instruction Manual

标准节螺栓安装指导书
Installation instruction of mast section bolt

1、检查螺栓、螺母的配置。标准配置的螺栓副为一栓、两母、两垫，螺栓为 10.9 级，螺母为 10 级，垫圈为 300HV 钢结构用高强度平垫。

Check bolt and nuts configuration. The standard configuration bolt vice is one bolt, two nuts, two pads. the bolt is 0.9 grade, nut is 10 grade, washer is 300HV steel structure with high-strength flat pad.

2、垫圈放置在螺栓头部与连接套之间和螺母与连接套之间，将连接套与螺栓、螺母隔离。装配时垫圈内倒角的一面应对着螺栓六角头下支撑面与六角头下过渡圆弧贴合，以免出现干涉。

The washer is placed between bolt head and connected sets, between nut and connected set, Take connected set, bolt and nut isolated.

3、紧固螺栓副时，应将扭矩扳手的扭矩设定为标准紧固扭矩的 80%，按对角方向顺序对螺栓副进行初次紧固，然后再按对角方向顺序以 4r/min 的紧固速度，将螺栓副紧固到标准扭矩值。

When the bolt vice is tighten, the torque wrench should be set to standard tightening torque of 80%, by diagonal direction sequence to initial tighten for bolt vice, And then according to diagonal direction sequence with 4r/min of tightening speed to fasten the bolt vice to the standard torque valve.

4、采用双螺母防松时，要求用 80% 标准紧固扭矩先拧紧防松螺母（与垫圈接触，靠近连接套的第一个螺母），在用 100% 标准紧固扭矩拧紧紧固螺母（与第一个螺母接触，靠外的第二个螺母）；这样可使螺母与螺栓的螺纹牙紧密贴合，使两螺母充分并紧，增加有效防松摩擦力，共同达到紧固防松的目的。

When use double nuts prevent loosening, require 80% standard tighten torque to fasten locknut first (contact with the washer, close the connection sets of first nut),

Then use 100% standard tighten torque fasten fixing-nuts (Contact with the first nut, rely on outside the second nut); In this way will make the thread of nut and bolt close fit, and two nuts tighten fully, increase effective locking friction, achieve the purpose of tightening locking together.

5、装机使用 100 小时后应对螺栓全部均匀的检查拧紧；以后每 500 小时均应检查一次。发现螺栓、螺母松动或螺栓、螺母损伤，应立即拧紧或更换螺母或螺栓。

Installation machine after use 100 hours should to check and tighten all the bolts; and then every 500 hours should be checked. If found the bolts/ nuts loose or damage, should be tighten or replaced immediately.

6、标准节螺栓、螺母使用后拆下再次使用，一般不得超过 2 次。且拆下的螺栓、螺母必须无任何损伤、变形、滑牙、缺牙、锈蚀等，否则应禁止再次用于受力结构的连接。

When dismantle the bolt and nut of mast section to use again, generally not more than two times. And detached bolts, nuts must be free of any damage, deformation, slip teeth, missing teeth, rust, otherwise should be banned again for connecting the force structure.

7、螺栓有润滑剂时推荐扭矩（无润滑剂时取推荐扭矩的 1.3 倍）；

M30*340-10.9 级，1416N.m。M36*340-10.9 级，2466N.m。

Bolt have lubricant recommended torque (Without lubricant take recommended torque of 1.3 times)

M30*340-10.9 grade, 1416N.m。M36*340-10.9 grade, 2466N.m。

预埋地脚螺栓安装指导书

Installation instruction of embedded anchor bolt

1、检查螺栓、螺母的配置。标准配置的螺栓副为一栓、两母、一垫。

Check bolt and nut's configuration. Standard configuration of bolts vice is one bolt, two nuts and one pad.

2、安装前应确保预埋螺栓位置度正确，螺栓轴线与水平面垂直，以避免螺栓歪斜时受到横向的剪切力作用和螺栓单边受拉力而发生断裂。预埋螺栓安装出现偏差时，严禁采用敲打方式校正预埋螺栓，必须开挖浇注的混凝土予以重新校正安装。

Before install should ensure that foundation bolts position degree is right,

Bots axis keep vertical with ground, in order to avoid bolt skewed by transverse shear force and bolt unilateral pull force and fracture.

3、预埋定位时严禁对预埋地脚螺栓任何部位进行点焊或点焊连接。

When the embedded positioning forbidden to spot welding or spot welding connection for embedded foundation bolts.

4、紧固螺母时应将扭矩扳手的扭矩设定为标准紧固扭矩的 80%，按对角方向顺序对螺母进行初次紧固，然后再按对角方向顺序以 4r/min 的紧固速度，将螺母紧固到标准力矩标准紧固扭矩。

When the nuts are tighten the torque wrench should be set to standard tightening torque of 80%, by diagonal

direction sequence to initial tighten for nuts, And then according to diagonal direction sequence with 4r/min of tightening speed to fasten the nuts to the standard fixed torque.

5、采用双螺母防松时, 要求用 80%标准紧固扭矩先拧紧防松螺母(与垫圈接触, 靠近支撑面的第一个螺母), 在用 100%标准紧固扭矩拧紧紧固螺母(与第一个螺母接触, 靠外的第二个螺母); 这样可使螺母与螺栓的螺纹牙紧密贴合, 使两螺母充分并紧, 增加有效防松摩擦力, 共同达到紧固防松的目的。

When use double nuts prevent loosening, require 80% standard tighten torque to fasten locknut first (contact with the washer, close the connection sets of first nut),

Then use 100% standard tighten torque fasten fixed-nuts (Contact with the first nut, rely on outside the second nut); In this way will make the thread of nut and bolt close fit, and two nuts tighten fully, increase effective locking friction, achieve the purpose of tightening locking together.

6、装机使用 100 小时后应对螺栓全部均匀的检查拧紧; 以后每 500 小时均应检查一次。发现螺母松动或损伤, 应立即拧紧或更换螺母。

Installation machine after use 100 hours all the bolts should to be examine tighten ;and then every 500 hours should be checked. If found the bolts/ nuts loose or damage, should be tighten or replaced immediately.

7、预埋螺栓、螺母为一次性使用产品, 不得拆下后再次使用。

Embedded bolt and nut belong to one-time use products, shall not be used again after removed.

8、螺栓有润滑剂时推荐扭矩(无润滑剂时取推荐扭矩的 1.3 倍);

M42*1500-HB217-255, 2250-2400N.m.

Bolt have lubricant recommended torque (Without lubricant take recommended torque of 1.3 times)

M42*1500-HB217-255, 2250-2400N.m.

安全规则及注意事项

Safety rules and precautions

欢迎您使用本公司生产的塔式起重机, 为了用户的利益、安全及本公司的权益, 特制定以下安全规则及注意事项, 望用户认真阅读并积极实行。

You are welcome to use this company produces the tower crane, for the benefit, security of the users, and the rights & interests of the company, To established the following safety rules and precautions, hope you to read and actively implemented.

1.1 安全规则 Safety rules

1.1.1 用户必须遵守现行的有关法令、规章制度和安全机构规定的安全规则。

User have to comply with

Users must comply with the safety rules which stipulated by the relevant laws, regulations and requirements of the security agencies.

1.1.2 安装和拆卸塔机时, 禁止人员在塔机工作区域内, 特别是塔机下逗留。

When the installation and removal of the tower crane, prohibited personnel working in the area, especially to stay under the tower.

1.1.3 塔机操作者必须保持头脑清醒, 身体健康。

Tower crane operator must keep a clear head and good health.

1.1.4 塔机操作者必须专业培训, 取得合格证后, 方能上机操作。

Tower crane operator must professional training, after obtaining the certificate before they can operate a computer.

1.2 注意事项 Precautions

下列注意事项必须严格执行，若不执行将会对自身安全和建筑工人的安全造成严重危害，对此我公司将拒绝承担任何法律责任。

The following precautions must be strictly enforced, if not, will cause serious harm to their own safety and the safety of construction workers, which our company will refuse to bear any legal responsibility.

1.2.1 安装塔机前，必须保证所选区域的施工现场能允许塔机在不工作时的自由旋转。Before install the tower crane, Must ensure that construction site of selected area the tower crane free rotation when not working.

1.2.2 塔机应安装在理想的水平地面上，并保证其周围的土地不至造成沉降或坍塌，保证整机的稳定。

Tower crane should be installed in the ideal level on the ground, and to ensure that the land around it not cause subsidence or collapse, guarantee the stability of the whole machine.

1.2.3 不要随便改变安全装置。Don't change the safety device.

1.2.4 应定期检查各种安全限位器的准确性能，并按说明的规定进行调试和调整保证其灵敏性，严禁私自拆卸各安全限位装置。

Should regularly check the exact performance of various safety limit device, follow the instructions specified for debugging and tuning to ensure its sensitivity, non dismantle all safety limit device.

1.2.5 禁止斜拉、粘附在地面上或预先以束缚住的重物。

It is prohibited to sew, adhesion on the ground or in advance in order to tie the weight.

1.2.6 在维修操作、安装拆卸时，全体人员必须根据规定的安全规则穿戴和使用安全带、安全帽等保护用品。During maintenance operations, installation and dismantle, all personnel must be in accordance with the rules of wear and use safety belts, helmets and other protective supplies.

1.2.7 严格执行GB5144《塔式起重机安全规则》及JG/T100《塔式起重机操作使用规程》。Strict implementation of GB5144《tower crane safety rules》and JG/T100《tower crane operation uses procedures》。

声明：随着科学技术的发展，产品也在不断更新，我们保留对使用说明书修改的权利。本使用说明书随原机配用，若丢失，再次买或复印本厂家的同型号说明书都仅供参考。

Statement: With the development of science and technology, the products are constantly updated, we reserve the right to revise the manual. This instruction manual with the original machine is equipped with, if lost, again to buy or copy of the manufacturer same type of instructions are for reference only.

1、概述 Overview

QTZ80(6010)塔式起重机是我公司充分利用成组技术、组合设计技术及有限元分析技术，以“塔式起重机微机设计平台”为工具设计的新型起重运输机械。

该机为水平臂架、小车变幅、上回转液压顶升式起重机。该机各项性能参数及技术指标均达到或优于国家标准。最大工作 Jib 为 60m，独立式起升高度为 40m，附着式起升高度可达 150m，额定起重力矩 800 kN·m，最大起重力矩为 876kN·m。

该机参数先进，性能优良可靠，造型美观，质量精良，结构简单实用，设有先进的安全装置，维修方便，使用安全，价格合理，是广大建筑企业理想的建筑施工机械。

2、 起重机技术性能 Tower crane technical performance

Technical drawing of a tower crane, showing side and front views with dimensions.

Side View Dimensions:

- Horizontal distance from the vertical axis to the end of the jib: 60810
- Horizontal distance from the vertical axis to the counterweight: 45122.5
- Horizontal distance from the vertical axis to the top of the mast: 15122.5
- Vertical distance from the base to the top of the mast: 49702
- Vertical distance from the base to the top of the counterweight: 42962
- Counterweight mass: 6000

Front View Dimensions:

- Height of the mast section: 34020
- Height of the counterweight section: 150000

附着式 Attachment 独立式 free standing

图 1

2.2 起重性能表 Tower crane performance table

2.2.1 起重特性表 Tower Characteristics Table

1、起重臂长为 60 米时 Jib length 60m

2 倍率 2 falls

Jib (m)	3-26.9	27	29	31	33	35	37	39	41
Load weight (t)	3.00	2.99	2.74	2.53	2.34	2.17	2.02	1.89	1.77
Jibm	43	45	47	49	51	53	55	57	59
Load weight (t)	1.66	1.56	1.46	1.38	1.31	1.23	1.17	1.11	1.05
Jib (m)	60								
Load weight(t)	1.00								

起重臂长为 54 米时 Jib length 54m

2 倍率 2 Falls

Jib(m)	3-28.38	29	30	31	32	33	34	35	36
Load weight(t)	3.00	2.92	2.80	2.70	2.58	2.49	2.39	2.30	2.22
Jib(m)	37	38	39	40	41	42	43	44	45
Load weight(t)	2.15	2.07	1.98	1.93	1.86	1.81	1.75	1.70	1.64
Jib(m)	46	47	48	49	50	51	52	53	54
Load weight(t)	1.59	1.54	1.50	1.45	1.41	1.37	1.33	1.29	1.255

2、起重臂长为 60 米 Jib length 60m

4 倍率 4 falls

Jib(m)	3-14.61	15	17	19	21	23	25	27	29	31	33
Load weight(t)	6.00	5.83	5.07	4.47	3.99	3.59	3.25	2.97	2.72	2.51	2.32
Jib(m)	35	37	39	41	43	45	47	49	51	53	55
Load weight(t)	2.15	2.0	1.87	1.75	1.64	1.54	1.45	1.36	1.28	1.21	1.15
Jib (m)	57	59	60								
Load weight(t)	1.08	1.03	1.00								

起重臂长为 54 米 Jib length 54m

4 倍率 4 falls

Jib(m)	3-15.58	17	19	21	23	25	27	29	31	33	35
Load weight(t)	6.00	5.44	4.80	4.27	3.84	3.48	3.17	2.90	2.67	2.47	2.28
Jib(m)	37	39	41	43	45	47	49	51	53	54	
Load weight(t)	2.12	1.98	1.85	1.73	1.62	1.52	1.43	1.35	1.27	1.235	

2.3 起重特性曲线 Tower crane performance curve

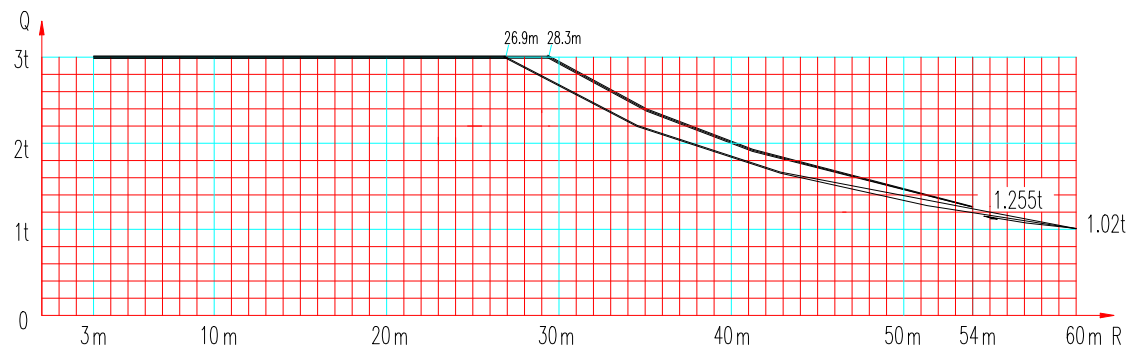


图 2 二倍率起重力矩曲线 2falls lifting moment curve

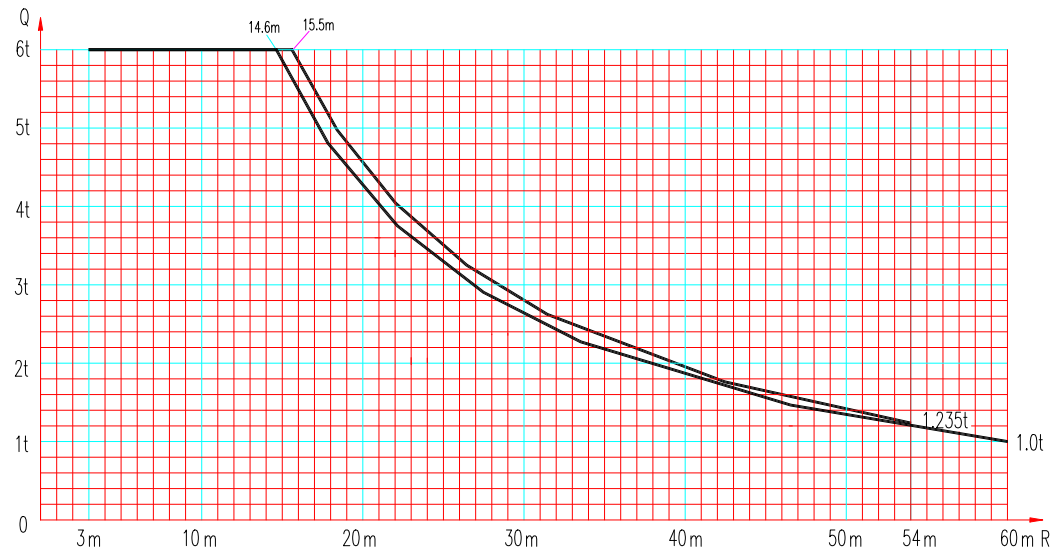


图 3 四倍率起重力矩曲线 4falls lifting moment curve

2.4 技术性能表 Technical performance table

额定起重力矩 Rated lifting moment	kN.m	800
最大 Max.Load weight	t	6

工作 Jib length		m	3～60			
起 升 高 度 Lifting height	独 立 式 Free stand height		40			
	附着式		150			
起 升 速 度 lifting speed	二 倍 率 2 Time Multiplying Power	m/min	74/38/8			
	四 倍 率 4 Time Multiplying Power		37/19/4			
回转速度 Slewing Speed		r/min	0.63			
变幅速度 Trolleying speed		m/min	40/22			
顶升速度 Jacking speed			0.4			
平衡重 Counterweight			60m	14.8t	54m	12.53t
标准节截面尺寸 Mast section dimension		mm	1835×1835×2500			
电机总容量 Total power		kW	40.3			
允许工作温度 Allowable working temperature		℃	-20～+40			
供电参数 Power supply parameter		50Hz	～380V±10%			

2.5 主要技术数据 Main technical specs

Hoisting Mechanism 起升机构	Motor	型号 Model		YZTD2-2/4/16	
		功率 Power(kW)		24/24/5.4	
	高度限制器 Height limit	型号 Model		DXZ	
		钢丝绳 Steel wire rope		6X19+FC-12.5-1770- I 甲 镀 右 铰	
	倍率 Fall	a=2		a=4	
	起升速度 Lifting speed(m/min)	74	38	37	19
	额定 Load weight(t)	1.5	3	3	6

	最低稳定下降速度 Lowest rate steady decline	m/min	≤7
Slewing (swing) Mechanism 回转机构	Motor	型号 Model	YZR132M ₂ -6
		功率 Power(kW)	3.7×2
		转速 rotate speed(r/min)	908
	减速机 Reducer	型号 Model	XX ₄ -80.180
		传动比 Drive Ratio	180
	液力耦合器 Hydraulic coupler	型号 Model	YOX250A
	Slewing pinion 回转小齿轮	模数 Module m	12
		齿数 Number of teeth z	15
		变位系数 modification coefficient	+0.5
	回转速度 Slewing speed	r/min	0.63
Slewing bearing 回转支承	单排四点接触球式 回转支承	型号 Model	011·45·1250
		模数 Module m	12
		齿数 Number of teeth z	118
液 压 顶 升 机 构 Hydraulic jacking Mechanism	Motor	型号 Model	Y132M-4B5
		功率 Power (kW)	5.5
	油缸额定工作压力 Oil cylinder rated work pressure	Mpa	25
	最大顶升力 Max. jacking Force	t	50
	油缸行程 Oil Cylinder Trip	mm	1600
	安装距 mounting distance	mm	2070
	油缸缸径 Oil cylinder bore	mm	φ160
	油缸活塞杆径 Oil cylinder piston rod diameter	mm	φ125
	顶升速度 Jacking speed	m/min	0.4

变幅机构变幅 机构 Trolleying Mechanism	Motor	型号 Model	YEZS112M-4/8
		功率 Power(kW)	3.3/2.2
	钢丝绳 Steel wire rope	规格 Specification	6×19-7.7-1550-Armor plating right hinge
		型号 Model	XX2-12-38
	减速机 Reducer	传动比 Drive Ratio	38
		变幅速度 Trolleying speed	m/min 40/22

3. 起重机构造简述 Crane Structure description

3.1 总体布置 General arrangement

3.1.1 独立式 Free standing type

起升高度 40 米，可采用二倍率或四倍率钢丝绳起升，塔身由方管主肢及无缝钢管组成整体结构，塔身下部通过底架与基础相连，上部通过下支座及回转支承与上支座相连，上支座上面与回转塔身相连，回转塔身上面与塔帽相连，前端与起重臂相连，后端与平衡臂相连。司机室位于回转塔身右侧前方，起升机构设在平衡臂后部，回转机构对称置于上转台两侧，变幅小车由变幅机构牵引，沿臂架来回运动。起重臂、平衡臂均用刚性拉杆与塔顶连接。Jacking height is 40 meters,using 2 falls or 4 falls steel wire rope to lift,the tower is composed of square tube main limbs and seamless steel tube structure, the lower part of the tower through Under frame linked with foundation,the upper part through lower socket and slewing bearing linked with upper socket,upper bracket linked with slewing tower,slewing tower connected with tower cap,front end connected to the crane boom,back end connected to balance jib.

Cab position in front of the right side of rotating tower, hoisting mechanism located in the rear of the balance jib, placed symmetrically on both sides of the rotary turntable mechanism, luffing trolley pulled by luffing mechanism, along the back and forth movement of the boom. Boom, the balance jib are connected by a rigid rod and tower.

在下转台下端是顶升套架，围在塔身四周，塔机视施工的需要由顶升机构可顶起塔身以上部分，引进标准节，以升高塔机的高度。

Below the lower turn table is jacking frame,and around the tower,
The tower crane depending on the needs of the construction can by lifting mechanism can jack up the tower section above, the introduce standard the mast section, to increase the height of the tower.

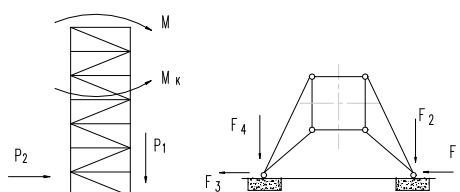
3.1.2 附着式 Attached type

最大起升高度 150 米，在工作高度达 45 米前，可采用二倍率或四倍率钢丝绳起升，当工作高度超过 50 米时，只能采用二倍率钢丝绳起升，附着式的结构布置与独立式相同，此时为提高塔机的稳定性和刚度，在塔身全高内设置五套附着装置。为此要求塔身中心线距建筑物的距离为 4 米，附着装置之间的距离尺寸必须严格按图 1 所示要求布置。塔机不允许超过最上面附着加固位置以上 25 米高的自由高度下使用，在起升高度没达到 150 米时，允许在 25 米时进行顶升升塔，但要求顶升后立即附着。

Max.lifting height is 150 meters,before working height up to 45 meters,using 2 falls or 4 falls steel wire rope to lift.When the working height over 50 meters,only can use 2 falls steel wire rope to lift,
Attached structural arrangement is same as free standing one.

3.1.3 塔机固定式基础载荷及附着载荷

Tower crane stationary base load and attachment load



P1: 基础所受垂直力

Basic suffered Vertical force

P2: 基础所受水平力

Basic suffered horizontal force

图 4 QTZ80(6010)塔机基础及附着载荷图

Figure 4 Tower crane basic and Attachment load draw

表 5 基础及附着载荷表 Table 5 basic and attachment load table

载荷 Load 工况 Working condition	基 础 载 荷 Basic load				建筑物载荷 Building load			
	P ₁ (t)	P ₂ (t)	M (t·m)	M _k (t·m)	F ₁ (t)	F ₂ (t)	F ₃ (t)	F ₄ (t)
工作状态 working state	68.4	2.9	169.9	30.47	12.7	15.5	2.35	4.6
非工作状态 Non-working state	58.4	8.4	228.9	0	13.4	16.15	5.9	6.45

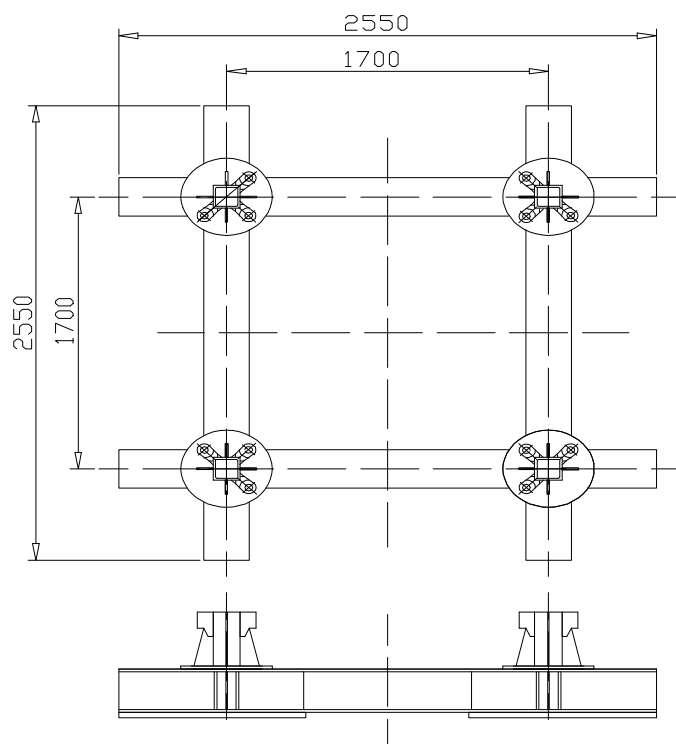
3.2 金属结构部分 Metal structure part

金属结构主要包括底架、塔身、套架、上下支座、回转塔身、吊臂、平衡臂、塔顶及附着装置等。Metal structure main including chassis,tower body,frame,up and down support,slewing tower body,jib,balance jib,tower top and attached device,etc.

3.2.1 底架 Chassis

底架为“井”字梁结构，由钢板焊成“工”字形梁，上面焊有四个支腿，用 12 个 M36×345 高强螺栓与标准节相连，整个底架用 16 个 M45 的地脚螺栓固定在基础上方。

Chassis beam structure is "well" word,The steel plate welded"work"beam,there weld four legs,with 12 pcs M36×345 high-strength bolts and standard section, the entire chassis with 16 M45 are anchored at the top of the foundation.



3.2.2 塔身 (见图 6) Tower body (As shown in figure 6)

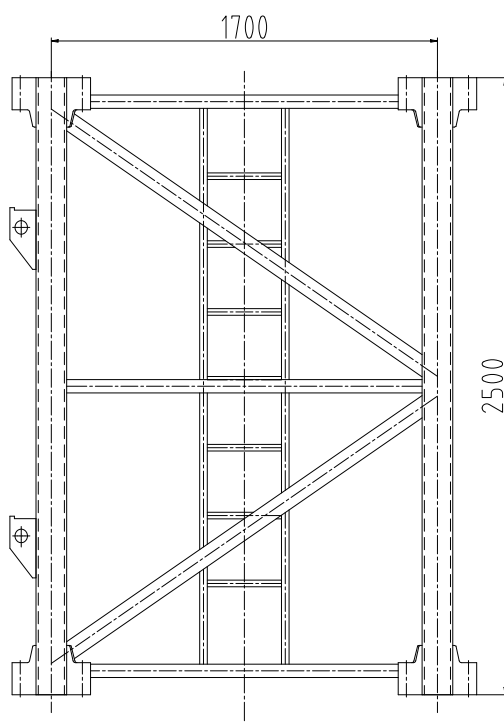


图 6 标准节示意图 figure 6 mast section sketch

塔身有标准节 15 节，每节高 2500mm，截面最大尺寸 1835×1835 (mm)。主弦杆材料全部为 Q235B 方管

135×135×12mm, 上下端面各用 8 个 M36×4×340 (10.9 级) 高强度螺栓联接。各标准节均设有供人上下的爬梯, 并在部分标准节内设有供人休息的平台, 休息平台从下往上数第四节标准节开始设置, 以后每三节设一个。

The tower body have 15 sets mast section, each section height is 2500mm, the section dimension is 1835×1835 (mm). The main chord material is Q235B square tube 135×135×12mm, up and down end both use 8 pcs M36×4×340 (10.9 grade) high strength bolt connection.

3.2.3 顶升套架(见图 7)Jacking frame (As shown in figure 7)

套架主要由套架结构、平台及液压顶升系统、标准节引进装置等组成, 塔机的顶升动作主要靠此部件完成。

Jacking frame main set by frame structure, platform and hydraulic jacking system, mast section introduce devices and other components section, the tower crane lifting operation mainly depends on this part.

套架在塔身的外部, 上端用四根销轴与下转台相连, 套架前方的上半部设有引进窗口, 以便标准节引入, 顶升油缸安装在套架后侧的横梁上, 液压泵站放在液压缸一侧的平台上, 套架内侧有 16 个滚轮支承于塔身主弦杆外侧, 起导向支承作用。

Frame set outside of tower body, the upper end with four pins to connect with lower turntable, the front of frame upper part set the introduction window, so that the introduce mast section, Jacking cylinders mounted on the rear cover frame beams, hydraulic pumping on the platform side of the hydraulic cylinder, the inner frame has 16 roller frame is supported on the outside of the tower main chord played the supporting role of a guide.

为了便于顶升安装和安全需要, 套架设有二层工作平台, 顶升时, 工作人员站在平台上, 操纵液压系统实现顶升, 引入标准节和固定塔身螺栓。

In order to facilitate jacking install and security needs, the frame erecting two-story platform, when jacking, the staff standing on the platform, operated hydraulic jacking system implementation, introduce mast section and fixed tower bolts.

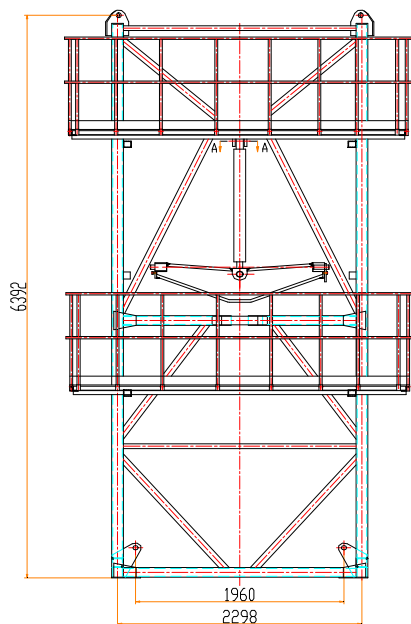


图 7 顶升套架示意图 Figure 7 Jack frame diagram

3.2.4 下支座(见图 8)Lower Socket(As shown in figure 8)

下支座为整体箱形结构, 下支座下部分别与塔身标准节和套架相连, 上部平面与回转支承不转动的外圈下平面通过高强度螺栓相连接。

Lower socket is whole box structure, lower socket bottom are connected with tower body mast section and frame, the upper plane with slewing bearing non-rotate outer ring through high-strength bolts connect.

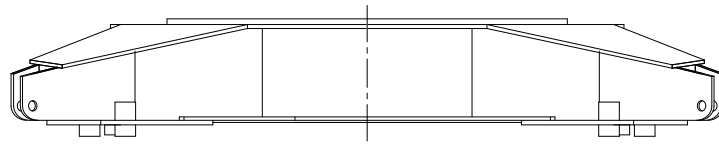


图 8 下支座 Figure 8 Lower socket

3.2.5 上支座(见图 9)Upper bracket(as shown in figure 9)

上支座为板壳结构,其左、右两侧焊有安装回转机构的法兰盘,上支座的三面设有工作平台,右侧工作平台的前端,设有与司机室连接的支耳,前方设有安装探照灯的灯座以及安装回转限位器的支座,上支座的上平面通过 4 个支腿与回转塔身连接。

Upper bracket is shell structure, and its left and right sides welded mount slewing mechanism flange plate, upper bracket three side have working platform, right working platform front end, setting ear connect with cab, in front have lampholder of mount searchlight, and installation of rotary stopper bearing, bearing on the plane are connected by four legs and swivel tower.

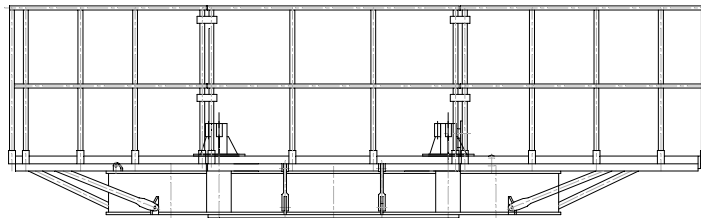


图 9 上支座 Figure 9 upper bracket

3.2.6 司机室(见图 10)Drive Cab

司机室为薄板结构,侧置于上支座右侧平台的前端,四周均有大面积的玻璃窗,前上窗可以开启,视野开阔,美观舒适,内设有联动操纵台。

Drive cab is thin-slab structure, placed on the side of upper bracket right platform, surrounded by a large area of windows, the front up windows can be opened, vision, beautiful and comfortable, equipped with linkage console.

3.2.7 回转塔身(见图 11)Slewing tower body

回转塔身为整体框架结构,其主弦为 Q235B 方管 $135 \times 135 \times 12\text{mm}$,上端面四角有双耳板分别与塔顶及起重臂、平衡臂用销轴联接,下端面四角有 8 个连接套与上转台相连。

Slewing tower body is whole frame structure, its major chords is Q235B square tube $135 \times 135 \times 12\text{mm}$, on the end of four face corners have double ears connect tower top, boom, balance jib with is coupled with axis pin. the pin, the lower end four corners has eight connection set connect with upper turntable.

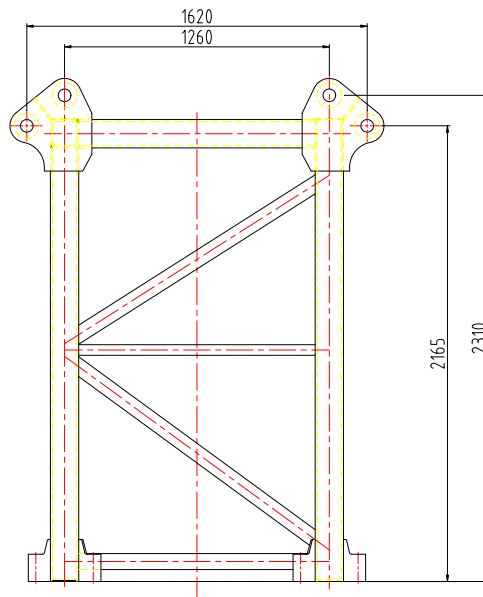


图 11 回转塔身 Figure 11 slewing tower body

3.2.8 起重臂(见图 12) Boom(As shown in figure 12)

起重臂上、下弦杆均是用角钢对焊成的方管，整个臂架为等腰三角形截面，共分为十节，节与节之间用销轴连接，拆装方便，为了提高起重性能，减轻起重臂的重量，吊臂采用双吊点、下弦变截面空间桁架结构，（起重臂上弦为 Q345B $\angle 80 \times 80 \times 6 \text{mm}$ 角钢扣方，下弦也为 Q345B 角钢扣方，其中第 1-2 节为 $\angle 90 \times 90 \times 8 \text{mm}$ 扣方，第 3-4 节为 $\angle 80 \times 80 \times 8 \text{mm}$ 扣方，第 5-10 节为 $\angle 75 \times 75 \times 6 \text{mm}$ 扣方。在起重臂第二节放置牵引机构，小车设有吊篮，便于安装与维修，臂架根部第一节与回转塔身用销轴连接。本机在设计起重臂时，客户在工地可以自己按照变臂说明由 60m 变为 54 米臂使用。如果遇到特殊情况时，请联系生产厂家。

The boom upper and lower chord both are welded with angle into the square tube, whole boom frame is an cross section of an isosceles triangle, totally ten sections, Between section and section connect with pin shaft, that is easy to install or dismantle, in order to improve lifting performance, and reduce the weight of boom, lifting arm using dual handing point, lower chord cross-section space truss structure, (Boom upper chord is Q345B $\angle 80 \times 80 \times 6 \text{mm}$ angle steel Q square, lower chord also is Q345B Q square, and the first and second section are $\angle 90 \times 90 \times 8 \text{mm}$ Q square, the third and fourth are $\angle 80 \times 80 \times 8 \text{mm}$ Q square, From fifth to tenth sections are $\angle 75 \times 75 \times 6 \text{mm}$ square.)

The traction mechanism set on the second section of boom, the trolley has a basket for easy installation and maintenance, the boom roots first section and slewing tower body connected by pins. When the designed boom, the client can own accordance with instructions change boom length from 60m to 54 meters. If in special circumstances, please contact the manufacturer.

在第三节、第八节上设有两个吊点，通过这两点用拉杆与塔帽连接。

起重臂组装时，必须严格按照每节臂上的序号标记组装不允许错位或随意组装。**起重臂销轴见附页！**

In the third section and eighth section setting two suspending points, through those two points use pull rod connect with tower cap.

When assemble boom, must be according to the sequence number on each jib, Assembly is not allowed to dislocation or assembly arbitrary.

Boom pin roll see attachment.

注意： Notice:

起重臂上弦、下弦及拉杆销轴均为专用特制零件，不得代换。

The upper chord and lower chord of boom, and pull rod pin roll all of them are dedicated special parts, shall not be substitution.

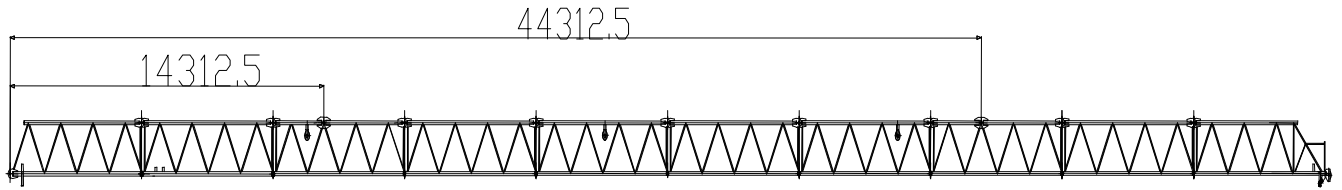


图 12 起重臂(吊点位置) figure 12 boom(suspending point position)

3.2.9 塔顶(见图 13) Tower top

塔顶为前倾式四棱锥形结构,主弦为 Q235B \angle 90x90x10mm 角钢扣方,顶部焊有拉板架、起重臂拉板、平衡臂拉板,通过组合刚性拉杆及销轴分别与起重臂、平衡臂相连,为了满足安装各拉杆的需要,塔帽上部设有工作平台,工作平台通过螺栓与塔帽相连,运输时可拆下平台,塔帽上部设有起重钢丝绳导向滑轮座和塔顶顶部设有安装吊臂拉杆用的滑轮,塔帽前侧中部设有力矩限制器,后侧设有带护圈的扶梯用于通往塔顶便于安装、维护,塔帽下端用四个销轴与回转塔身相连。

Tower top is forward type four sprayed structure, Main chord is Q235B \angle 90x90x10mm angle steel Q square, Top welded with pulling plate frame, boom pulling plate, balance jib pulling plate, through combining rigidity pull rod and pin roll connect with boom and balance jib respectively, In order to meet the requirement of install pull rod, upside of tower cap setting working platform, Work platforms connected with tower cap by bolts, and it can be removed when transport, the upper part of the tower cap has install lifting arm pull rod guide pulley, the front side of the central tower cap has a torque limit, The back is equipped with belt retainer escalator used to lead to tower top and convenient for installation and maintenance. The lower end of tower cap use four pin connected with rotating tower.

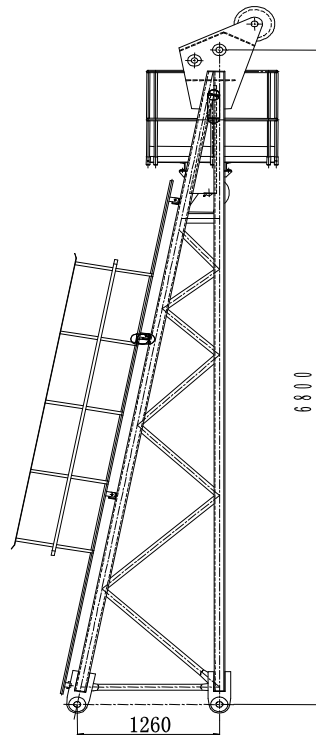


图 13 塔顶 Figure 13 Tower top

3.2.10 平衡臂(见图 14) Balance jib

平衡臂是由槽钢及角钢组焊成的整体平面结构,平衡臂上设有栏杆及过道,尾部设置工作平台,平衡臂的一端用两根销轴与回转塔身相连,另一端则用两根组合刚性拉杆同塔帽相连,尾部装有平衡重和起升机构,电阻箱和电气控制

箱布置在前端，起升机构本身有其独立的底架，用四组耳板及销轴固定在平衡臂上，平衡重共 7 块总重 14.8 吨。永久性标识焊在前部横梁上面中部。

The balance jib is made up of a channel steel and Angle steel compound flat structure as a whole. Balance jib with railings and aisle, Rear setting working platform, the end of balance with two pin rolls connect with tower body, and the other end use two combining rigidity pull rod connect with tower cap, the rear mounted counterweight and hoisting mechanism, resistance and electrical control box putting on the front, hoisting mechanism itself has its independent chassis, using four groups ear plates and pin roll tighten on the balance jib, balance jib total have seven and total weight is 14.8 T. Permanent identity central weld on the front of the bar.

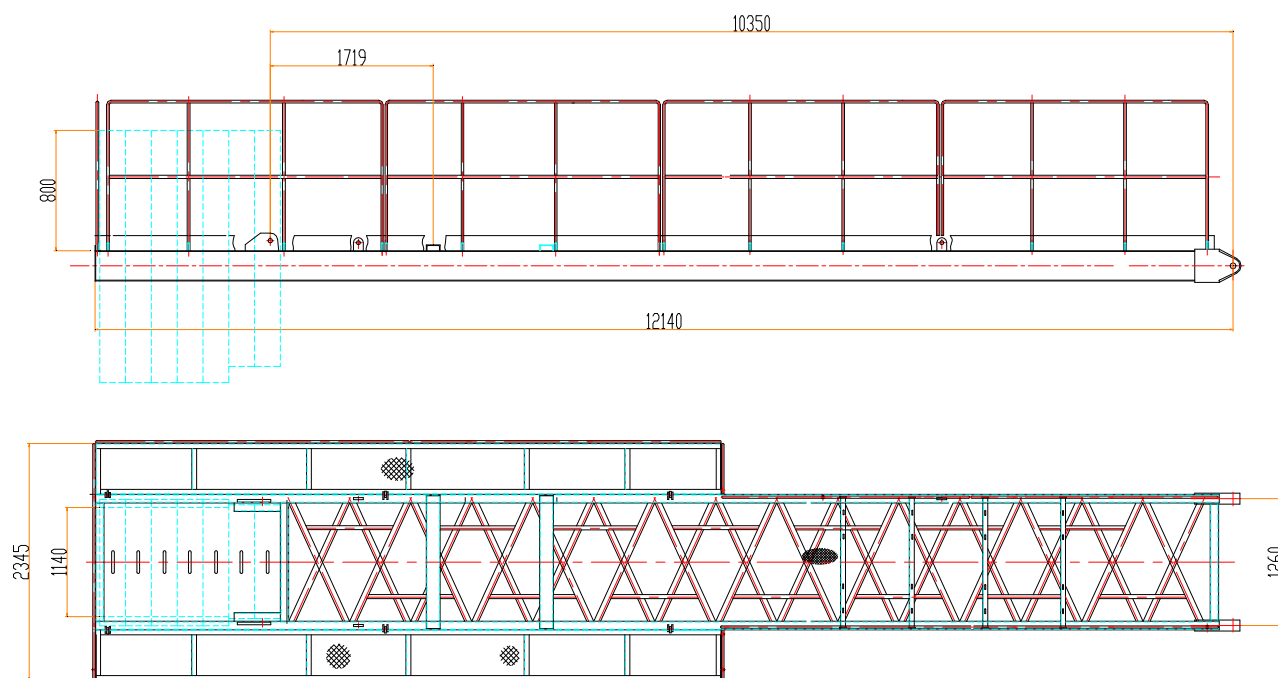


图 14 平衡臂 Figure 14 Balance jib

3.2.11 附着装置(见图 15) Attachment device (As shown in figure 15)

当塔机的工作高度超过其独立高度时，必须进行塔机附着。具体附着的位置见第二页（图 1）。

When the working range of tower crane exceed the free standing height, must to install tower crane attached device. details attachment position as shown in the second page (see figure 1)

每套附着装置由附着框架和四根撑杆组成，附着框架是由两套半环梁及 16 套 M27 螺栓、螺母、垫圈紧固而成。附着框架四顶点处有四根撑杆与之铰接，四根撑杆在附着框架铰接点处设置有调节丝杠，用以调整撑杆长度，四根撑杆的端部有大耳环与建筑物附着处的连接基座铰接，四根撑杆应保持在同一水平面内，通过调节螺栓可以推动顶块固定塔身四根主弦（参见图 15）。附着框架应安装在标准节有平撑处。

Each attachment device consists of attached frame and four poles, attached frame is composed of two semi-ring beams and 16 sets of M27 bolts, nuts, washers fastened together. Attached frame at the apex of four with four poles, four poles attached to the framework set point with the adjustment screw to adjust the length of the strut, strut ends of four big earrings and buildings connection at the base hinged attachment, four pole should be kept in the same horizontal plane, by adjusting the bolt can push the top of the tower blocks of fixed four main strings (see Figure 15). Attached to the frame should be installed in mast section flat place.

附着架按照塔机中心线距离建筑物 4 米的距离设置，若实际使用时与设计值不符，可适当加长或减短撑杆但必须进行严格计算，撑杆与建筑物的连接方式可以根据实际情况而定。

Attached frame according to tower crane center line setting 4 meters distance from building, If the actual

value does not match with the design, may be appropriate to lengthen or shorten the jackstay, but must be strictly calculated,the pole and the building connection according to the actual situation.

用户和安装单位应按照工程需要，根据附着装置的尺寸、结构和提供的强度载荷数据，妥善安排塔吊和建筑物的附着工作。

Users and installers need to be in accordance with the project, according to the size, structure and provide strength load data of attached device to proper arrangements tower cranes and building attachment work.

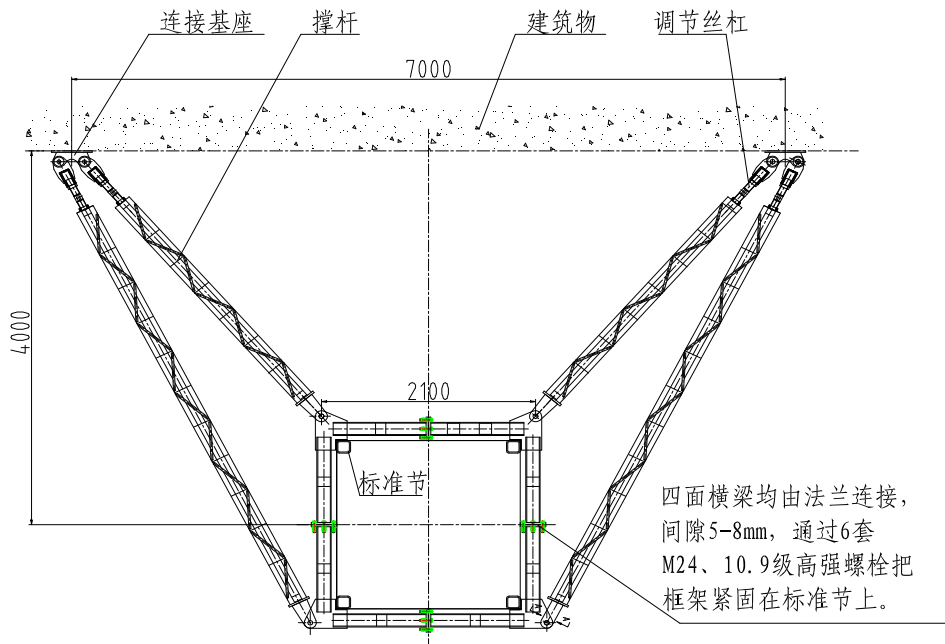


图 15 附着装置 Attachment device

3.3 工作机构 Working mechanism

起重机的工作机构包括：起升机构、回转机构、小车牵引机构及顶升机构，分别简介如下：

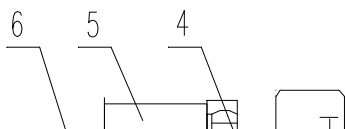
The working mechanism including hoisting mechanism,slewing mechanism, trolleying mechanism and jacking mechanism,introduce respectively as follows:

3.3.1 起升机构(见图 16) Hoisting mechanism(see figure 16)

该起升机构电机型号为 YZTD2-200L2—2/4/16，24/24/5.4kW，减速机总速比为 15.294，制动器型号为 YWZ3-250/45-10，通过电机变极可获得轻载高速，重载低速的起重性能，在卷筒的末端装有起升高度限位器，型号为 DXZ，当吊运物品达最高位置时，起升机构能自动停车。

This hoisting mechanism motor model is YZTD2-200L2—2/4/16，24/24/5.4kW, reducer total speed ratio is 15.294, the brake model is YWZ3-250/45-10, through motor change pole can obtain light load high speed, heavy load low speed performance, at the end of the reel is equipped with lifting height limit, model is DXZ, when lifting items up to the highest position, the hoisting mechanism to stop automatically.

- 1、电动机Motor
- 2、联轴器coupler
- 3、减速机Reducer
- 4、制动器brake
- 5、卷筒drum
- 6、高度限制器height limit



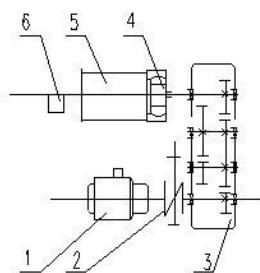


Figure 16 hoisting mechanism drive system diagram

图 16 起升机构传动系统图

3.3.2 回转机构(见图 17)Slewing mechanism

回转机构为双驱动，对称布置在回转支承两旁，电机型号为 YZR132M₂-6，3.7KW,液力耦合器型号为 YOX250A，电磁制动器型号为 QTH-TB3，减速机型号为 XX4-80.180 回转限位器安装在上支座上，通过小齿轮与回转齿圈相啮合，可以控制吊臂在左、右 540°内回转，以防止绞坏电缆。

Slewing mechanism is dual drive, symmetrically arranged on both sides of slewing bearing, motor model is YZR132M₂-6, hydraulic coupler model is YOX250A, Electromagnetic brake model is QTH-TB3, the reducer model is XX4-80.180, slewing limit installed on the upper support base, through small pinion engaged with the swing ring gear, the boom can be controlled around 540 degree turn, that can prevent twist bad cable.

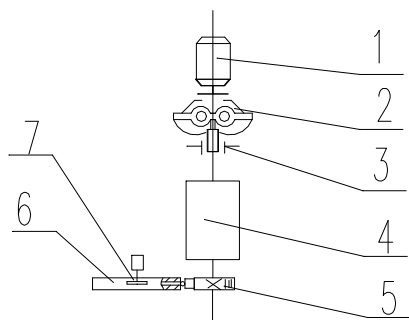


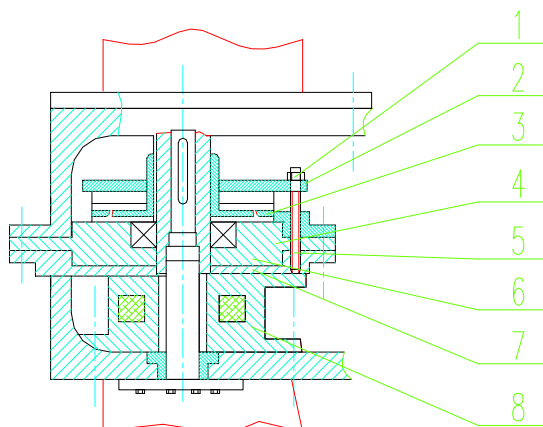
图 17 回转机构传动系统图

figure 17 slewing mechanism drive system diagram

- 1、电动机 Motor
- 2、液力耦合器cylinder
- 3. 电磁制动器Electromagnetic brake
- 4、减速机 reducer
- 5、小齿轮 small pinion
- 6、回转支承 slewing bearing
- 7、回转限制器 slewing limit

回转制动器的调整方法(见图 18)如下:

adjustment method of slewing brake (see figure 18)



- 1. 调整螺母 Adjust nuts
- 2. 制动压盘 The brake pressure plate
- 3. 摩擦片 friction plate
- 4. 复位弹簧return spring
- 5. 导向螺柱 导向螺栓
- 6. 中间体 midbody
- 7. 衔铁 armature
- 8. 电磁铁 electromagnet

图 18 回转制动器示意 figure 18 slewing brake diagram

根据应用中实际的制动效果，制动力矩不足时，调整螺母（件 1）使制动压盖（件 2）和摩擦片（件 3）之间距离缩小，制动力矩过大时，则调整螺母（件 1）使制动压盖和摩擦片之间距离增大，每次调整后，试动作数次，应保证件 4.6.7 在导向螺栓（件 5）上滑动无阻，吸合及脱开动作准确无误弹簧（件 5）锈蚀严重时，应予更换。

According to the actual application of the braking effect and braking torque is insufficient, the adjusting nut (1) make the braking gland (2) and friction plate (3) the distance between the brake torque is too large, the adjusting nut (1) and increase the distance between the friction plate braking gland, after each time adjustment, try several times, should guarantee a 4.6.7 in guide bolt (5) sliding, absorb and release action accurate spring (5) corrosion seriously, should be replaced.

3.3.3 小车变幅机构 trolleying mechanism

小车变幅机构通过 YEZS112M-4/8 电机带动置于卷筒内部的减速装置使小车以 40/22m/min 的速度作变幅运动。整体结构紧凑。两根变幅绳分别一端缠绕后固定在卷筒上，另一端则固定在载重小车上，变幅时一收一放来保证载重小车正常工作。

Trolley mechanism by YEZS112M-4/8 motor driven reducer device placed inside the drum with 40 / 22m / min speed for luffing movement. Compact whole structure. After two luffing rope wrapped around one end fixed on the drum respectively, and the other end is fixed to the load small trolley, when the amplitude of a collection of a place to work to ensure the trolley, When the amplitude to ensure the load trolley working normally.

3.3.4 顶升机构(见图 19)Jacking mechanism(See figure 19)

该顶升机构由液压系统泵站，顶升油缸，高压软管及专用液压油组成，它可顶升和下降塔机套架以上部分，并使其停留在任何位置，以便塔身标准节的装拆。Jacking mechanism by the hydraulic system pumping stations, lifting cylinder, high pressure hoses and special hydraulic oil composition, it can jack and descend above part of tower crane frame ,

It can stay in any position, in order to dismantle the tower mast section.

该液压装置结构紧凑，效率高，使用维修方便，安全可靠。

This hydraulic device structure tight, high efficiency, easy maintenance, safe and reliable

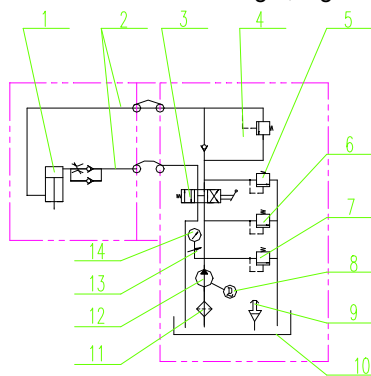


图 19 顶升液压系统图 figure 19 jacking hydraulic system diagram

1. 带双向锁、节流阀的顶升油缸jacking cylinder with two-way lock and throttle
2. 高压胶管总成 High pressure hose assembly
3. 手动换向阀hand-operated direction valve
4. 平衡阀 Balance valve
5. 低压溢流阀 Low pressure relief valve
6. 高压溢流阀 High pressure relief valve
7. 安全阀 safty valve
8. 交流电动机 AC Motor
9. 空气滤清器 air cleaner
10. 油箱 Oil box
11. 粗滤油器The crude oil filter
12. 高压泵high-pressure pump
13. 缓冲阀trimmer valve
14. 压力表Pressure gauge

3.3.4.1 液压系统主要参数 hydraulic system main parameters

工作压力 H (MPa) working pressure	流 量 flow (L/min)	Motor power 电机功率 (KW)	配高压胶管 Match high pressure hose GB9065.3	油箱容积 oil tank capacity(L)	用 油 Oil
					N32 抗磨液压油 N32 anti-wear hydraulic oil 北方：合成锭子油（GB442） North:Synthesis of spindle oil(GB442)
25	14.5	5.5	10N-3MA	100	

3.3.4.2 顶升油缸主要技术参数 Jacking oil cylinder main technical parameter

额定压力 rated pressure (Mpa)	缸径 cylinder diameter r	杆径 Rod diameter r	行程 Route	安装距 Mounting distance	顶升速度 Jacking speed (m/min)	最大顶升力 Max.jacking force (t)
25	160	125	1600	2070	0.4	50

3.3.4.3 液压系统的使用、维护、保养、注意事项详见配套件说明书。

Hydraulic systems maintenance, service, attention to see fittings instructions.

3.4 绕绳系统 Rope system

本塔机有两套绕绳系统：起升钢丝绳系统和小车变幅钢丝绳系统。

The tower has two roping system:Hoisting steel wire rope and trolley rope systems.

3.4.1 起升钢丝绳系统(见图 20)Hoisting steel wire rope system(see figure 20)

起升钢丝绳由起升机构卷筒放出，经塔顶导向滑轮，位于起重臂根部的重量限制器滑轮及吊钩滑轮组，最后将钢丝绳用绳卡固定于吊臂头部的防扭装置上，小车和吊钩上分别设有 3 个定滑轮，这些设施构成起升钢丝绳系统。

Lifting steel wire rope released by the lifting mechanism, through tower top guide to pulley, located at the base of the boom limit pulley and hook pulley, and finally the steel rope with rope cappel to fixed to the boom head of the anti-twist device,the pulley and hook set three fixed pulley ,these facilities constitute hoisting steel wire rope systems.

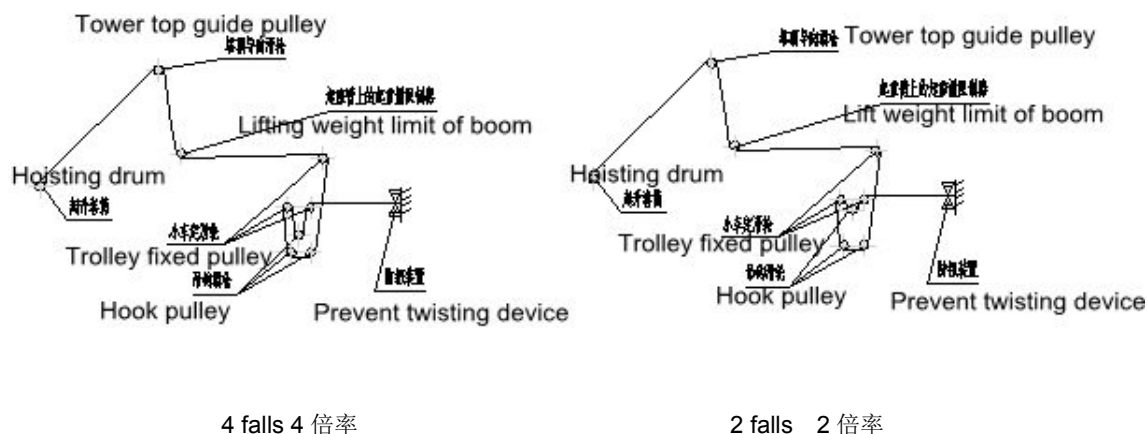


图 20 起升钢丝绳绕绳示意图 figure 20 hoisting steel wire rope roping diagram

3.4.1.1 起升钢丝绳的倍率装置(见图 20)Hoisting steel wire rope fall device

3.4.1.1 起升钢丝绳的倍率装置(见图 20)

Hoisting steel wire rope multiplying power device

(As shown in figure 20)

滑轮倍率装置的目的，为的是使起升机构的起升能力提高一倍，而起升速度降低一倍，这样，起升机构能够更加灵活地满足施工需要，通过改变活动滑轮的位置，即可把吊钩滑轮组的倍率变 2 或 4，小车和吊钩滑轮出厂状态为倍率 4。

The purpose of the pulley multiplying power device is to increase the lifting capacity two time,and lifting speed slow two time,in this way,the hoisting mechanism can more flexibility to meet the needs of the construction,through change activity pulley position,please change hook pulleys fall from 2 to 4,The leave factory state of trolley and hook pulley are 4 falls.

更换倍率的方法如下：Method of change fall as follows:

吊钩降至地面或套架平台上，取出中间的销轴，然后开动起升机构，将上滑轮夹板提升到载重小车下部顶住，这时，吊钩滑轮由 4 倍率变为 2 倍率。利用同一原理，若需要从 2 倍率变成 4 倍率，只需将吊钩落至套架平台上，继续开动起升机构，使起升钢丝绳不断放出，这时原顶在小车横梁下部的活动滑轮就下降，降到套架平台上后，用销轴把滑轮与吊钩夹板固定住即可。

Take the hook down to ground or frame platform,take away the pin roll,then start hoisting mechanism,upper pulley pallet lift to load pulley top to resist,at this time,hook pulley from 4 falls to 2 falls.

Using the same principle,if want to change multiplying power from 2 falls to 4 falls,just need take the hook down to frame platform,continue to start hoisting mechanism, the hoist steel wire rope release,Then the original stand up to trolley lower beam of pulley will descend,until descend to frame platform,using pin roll connect pulley with hook plate together.

3.4.2 小车变幅钢丝绳系统(见图 21)Trolley steel wire rope system

小车变幅机构设于起重臂根部，变幅卷筒绕出两根钢丝绳，一根通过臂根导向滑轮固定于小车后部，另一根通过起重臂中间及头部导向滑轮，固定于小车前部，在小车后部设有 3 个绳卡，绳卡鞍座应在钢丝绳长头一边，绳卡间距不应小于钢丝绳直径 6 倍，钢丝绳与小车的后端设有调整机构，如果牵引钢丝绳松弛，小车运动时会引起物品的摆动，此时在固接钢丝绳的绳夹无松动的情况下，调整小车前端的张紧装置，即可将钢丝绳张紧。

Trolleying mechanism located in the root of the boom,trolley drum reel around two steel wire rope, one via root of boom guide pulley fixed to rear of the car, and another by the middle boom and head guide pulley fixed to front of the car, at the rear of the car set three rope cappel, rope cappel saddle should be long head side,the distance between rope cappel should not less than six times than diameter of steel wire rope, steel wire rope and the front trolley have adjustment mechanism, if the traction rope relaxation, adjust the car front end tensioning device, the wire rope can be tension.

紧固钢丝绳的绳夹在实际使用中，变载一、二次后应作检查。在多数情况下，螺母需要进一步拧紧。

Fastening steel wire rope caught in actual use, after one or two time variable load, the rope clip should be checked later. In most cases, then nuts need further be tighten.

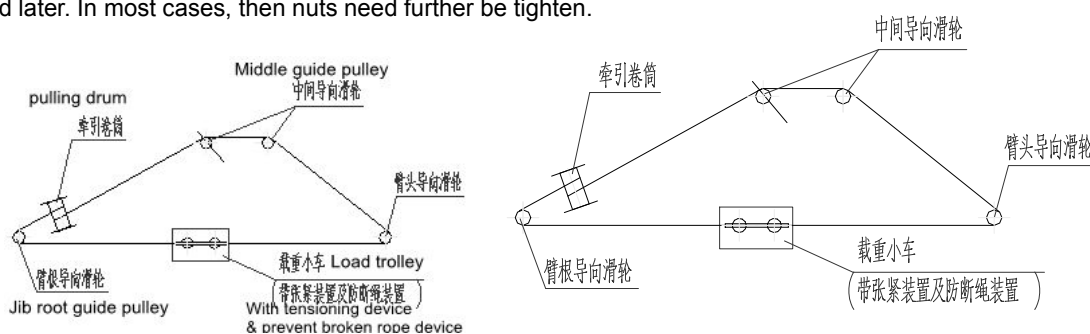


图 21 变幅钢丝绳绕绳示意图 Figure 21 trolleying steel wire roping diagram

注意：在放绳时应使前后两绳之间空出 2-3 个螺旋槽位置，避免两绳相互摩擦，造成磨损。

Notice:

When put the rope should take 2-3 spiral groove position between the two ropes, avoiding those two ropes rub each other, causing wear and tear.

4. 起重机的安装 Installation of tower crane

用户在安装塔机前应熟读该使用说明书，以便正确迅速安装塔机。

Users should be familiar with manual before installing the tower crane, for proper install the tower crane quickly.

安装塔机时，需一 25t 汽车吊，如能妥善协调各种安装和组装步骤，合理配置塔机安装人员，来往通道及组装现场之间的关系，则能将使用汽车吊的时间减到最少。

When you install the tower crane, need a 25t truck crane, If can properly coordinate the installation and assembly steps, the rational allocation of tower crane installers, access routes and assembly relationships between site, you can minimize the time of use truck crane .

4.1 组装注意事项 Assembly considerations

a.塔机安装工作应在风级小于 4 级时进行;

The tower crane install work the wind grade should be smaller than 4 grade.

b.必须遵循立塔程序; Must follow established tower procedures.

c.注意吊点的选择,根据吊装部件选用长度适当,安全可靠的吊具;

Note choose the select hanging point, according to hoist part to choose appropriate length, safe and reliable lifting appliance.

d.塔机各部件所有可拆的销轴,塔身连接的螺栓、螺母均是专用特制零件,用户不得随意代换;

Tower crane all removable pin roll, tower body connecting bolts and nuts are specially dedicated components; users are not free to substitute;

e.安装时应备齐防护装置，必要时进行安全检查;

When installation should prepare protection device, when it is necessary please to security check;

f.标准节的安装不得任意交换方位,否则无法进行;

Installation of mast section can't be exchange position, otherwise will not continue to install

g.塔机安装场地的参考尺寸(图 22) Tower crane installation site reference size(figure 22)

h.塔机在施工现场的安装位置，必须保证塔机的最大旋转部分吊臂、吊钩等要求离输电线 5 米以上的安全距离;

The installation site of tower crane,you must ensure that the max.rotating part boom and hook require away from power lines more than 5 meters distance.

i.准备辅助吊装设备、枕木、索具、绳扣等常用工具。

Prepare auxiliary lifting equipment, sleepers, rigging, cable loop,and other commonly used tools.

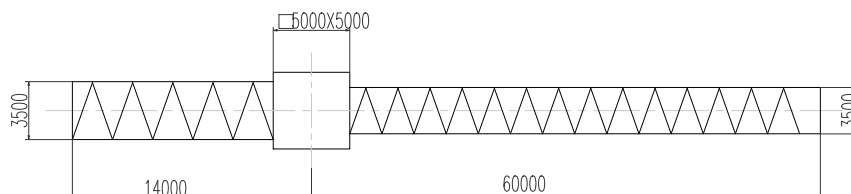


图 22 安装塔机场地的参考尺寸

Figure 22 installation tower crane site reference size

4.2 地基基础及压重 Foundation and weight

本机采用混凝土整体基础或与压重并用。地基土质应坚实牢固，地耐力应不小于 200kN/m²，砼基础砼强度等级不小于 C30(GB50164-92)，混凝土基础的承压力不小于 30t/m²，混凝土基础表面平面度误差不大于 1/1000。压重可用铸铁件也可用混凝土浇注，但无论用何种压重必须保证基础与压重总重不小于 100 吨。

The machine uses the whole foundation of concrete or with weights together. The foundation soil property should be strong enough, endurance should not be less than 200kN / m², concrete foundation and concrete strength grade not less than C30 (GB50164-92), concrete foundation bearing pressure not less than 30t / m², concrete foundation surface flatness error not more than 1 / 1000. The weight can also be pouring concrete, but no matter what kind of ballast weights must ensure that the foundation and weights the total weight not less than 100 tons.

4.3 接地装置 Grounding device

塔机避雷针的接地和保护接地要求应符合相关规定：接地材料安装和维护等不由厂家提供。

Tower crane lightning grounding and protection requirements should comply with the relevant provisions: installation and maintenance of ground material not provide from manufacturers.

4.3.1 将接地保护装置的电缆与任何一根主弦杆的螺栓连接并清除螺栓及螺母的涂料。

The cable grounding protection device with any one of the main chord bolt connection and clear coating of bolts and nuts

4.3.2 置于地基锚固联接的底架决不作接地避雷器用。

The chassis on the foundation anchor connection never for grounding lightning arrester.

4.3.3 接地保护避雷器的电阻不得超过 4 欧姆。

The resistance of the grounding protection shall not exceed 4 ohms

4.3.4 接地装置应由专门人员安装，因为接地电阻率视时间和当地条件不同而有很大变化，而且测定电阻时要高效精密的仪器，定期检查接地线及电阻。

Grounding device should be installed by specialized personnel, for grounding resistance rate depending on the time and different local conditions have great changes, when the resistance is measured using high precision instruments, and regularly check the ground wire & resistance.

4.4 塔机组装 Tower crane assembly

4.4.1 安装底架 install Chassis

将底架井字梁组装好放置于混凝土基础平台上，装上压板，拧紧地脚螺栓，测量底架上支腿的水平度，其误差应在 1.6 毫米内，若超差则在底盘与基础的接触面间用楔形调整块及铁板等垫平，注意垫块必须垫实、垫牢，不允许垫块有任何可能的松动，再次拧紧地脚螺栓（双螺母防松）。

The chassis is assembled placed on a concrete foundation platform, replace the plate, tighten the foundation bolt, measuring the level degree of the bottom shelf legs, the error should be within 1.6 mm, if exceed the error, between contact area with wedge adjustment plate or iron plate to level up, and note the pads must padded, firmly, does not allow any possible loose, tighten the bolt (double nut Anti-loose) again.

注意:1、在利用人工拧紧地脚螺栓时，不许用大锤敲打扳手。

Notice:1. When artificial tighten the bolt, not allowed to use a sledgehammer beat wrench.

2、地脚螺栓只能使用一次，不许挖出来重新使用。因地脚螺栓为重要受力件，我们建议用户到塔机制造处购买。用户自制地脚螺栓时，一定要符合图纸要求，由用户自制的地脚螺栓所引发的一切事故，我公司概不负责！2. The anchor bolts can only be used one time, as anchor bolt is important mechanical parts, we recommend that users to the tower crane manufacturing purchase. Users making anchor bolt, must conform to the requirements of the drawings, the accident caused by users themselves made the anchor bolt, our company is not be responsible.

4.4.2 安装标准节、套架(见图 24) Frame and mast section of install

将标准节吊装到井架梁上，用 12 件专用螺栓和 16 件专用螺母将底架与标准节连接，再吊装 2 件标准节，（塔身节上有踏步的一侧应与建筑物垂直），用 M36×340 的高强螺栓连接好后吊装套架，使套架上的爬爪放在加强标准节的踏步上。在吊装套架前注意应把 16 个爬升导轮的调整尺寸放到最大。

Taking the mast section on chassis beam, with 12 pieces of special bolts and 16 special nut connect chassis and mast section, then lifting 2 mast section, (tower body have step side should vertical with building), use M36 x 340 high strength bolt connection then lifting frame, the frame climbing claws put on the strengthen mast section step. Before lifting frame should pay attention to put 16 climbing wheel adjustment the size to largest.

所有高强度螺栓的预紧扭矩应达到 2000 N.m，每根高强螺栓均应装配两个垫圈和二个螺母，并拧紧防松。双螺母中防松螺母扭矩应稍大于或等于 2000 N.m（请仔细阅读见附件）。

All the high strength bolt pre-tightening torque should reach 2000 N.m, each high strength bolts shall be assembly two gaskets and two nut, and tighten Anti-loose. In the double nut locknut bath towel should be slightly greater than or equal to 2000 N.m (please read them carefully and see attachment)

注：可将液压顶升泵站放在靠近顶升油缸的套架平台上。

Notice: hydraulic jacking pump station can be placed near to the jacking cylinder frame platform.

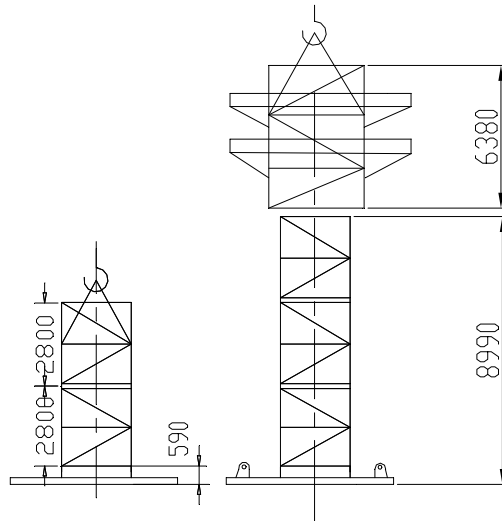


图 24 安装标准节、套架

Figure 24 Install mast section and frame

4.4.3 安装回转总成(见图 25)Install slewing assembly

下支座、回转支承、上支座（包括回转机构）出厂时已用螺栓连为整体，在上支座上设有 4 个安装吊耳，将该组件吊装到套架上，对正下支座上四根主弦杆与标准节上的止口，用销轴与套架连接起来，并用 8 件 M36×345 的高强螺栓将下支座与标准节连接，然后安装上支座的工作平台。高强螺栓的预紧见附件！

Lower socket, slewing bear, upper bracket (including slewing mechanism) have connected by bolts when left factory. On upper bracket set 4 install lifting ears, this component assembly to frame, four main chord on lower socket and mould on the mast section, use pin roll to connect, and with 8 pieces M36×345 high strength bolt take lower socket and mast section connect tougher, then installed platform of upper bracket. High strength bolt pre-tightening see attachment.

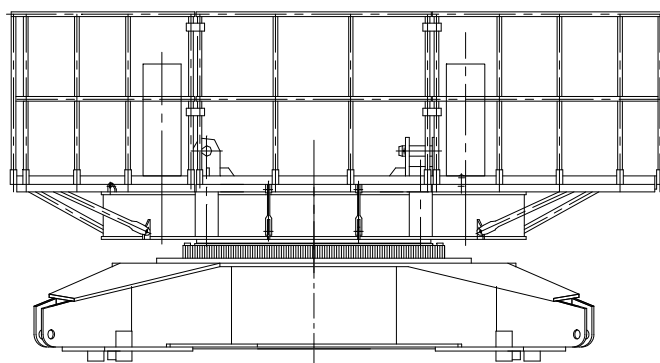


图 25 回转总成安装 Figure 25 Install slewing assembly

4.4.4 安装回转塔身(见图 26)Slewing tower body of install

吊起回转塔身，安装时注意安装平衡臂铰点的一方在标准节有踏步的一侧，使靠近 Load weight 限制器一边的支耳与准备安装起重臂的方向一致，4 个销轴将回转塔身与上转台联接好并穿好开口销。

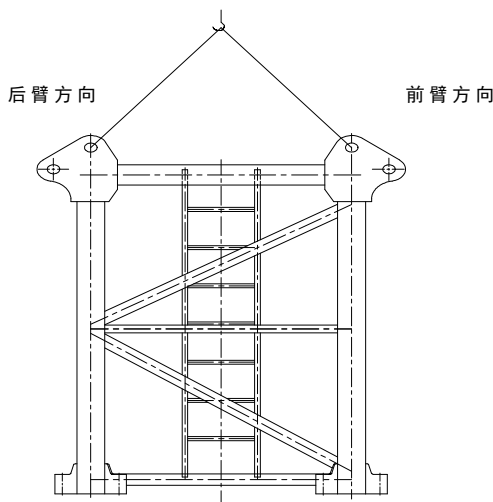
Lift slewing tower body, In the side of the mast section step, pay attention to the installation of balance jib hinge point when installation, the ear close to the side of load weight limit keep same direction with ready install boom. Slewing tower body and upper turn plate connect with 4 pin rolls, and wear cotter.

调整 16 件爬升导轮与塔身主弦杆之间的间隙 2—3 毫米。

Adjust 2-3 space between 16 pcs climbing wheel and tower body main chord.

注：爬升导轮与标准节间隙的调整工作必须在安装塔顶之前进行。无法调整时应采用更换滚轮的方式保证间隙。

Notice: The work of adjust space between climbing wheel and mast section have to start before install. if can't adjust, please use replace wheel to make sure the space.



前臂方向 Front jib direction

后壁方向: Back jib direction

图 26 安装回转塔身 Figure 26 install slewing tower body

4.4.5 安装塔顶(见图 27) Install tower top

吊装前在地面上先把塔顶上的平台、栏杆、扶梯装好（为使安装平衡臂方便，亦可在塔顶的左右两边各装上两根平衡臂拉杆），随后把塔顶吊到回转塔身上，用 4 件销轴将回转塔身与上转台联接。吊装时应将塔顶垂直的一侧朝向吊臂

方向。

如果条件允许，也可在地上先将回转塔身与上支座装好。

The platform, rail, floor on top of the tower should be installed before lifting, (In order to easy install balance jib, also on tower top two sides install two balance jib pull rod.), then take tower top lift to tower body, with four pins rolls connect turntable and slewing tower body. When lifting the tower top vertical side should face to boom.

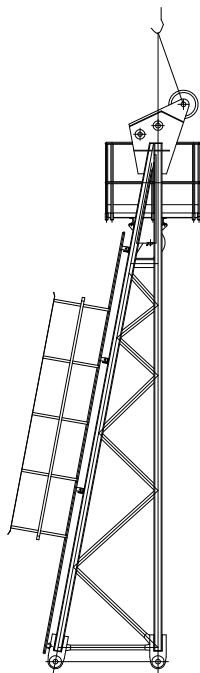


图 27 安装塔顶 Figure 27 install tower top

4.4.6 安装平衡臂总成(见图 28)Install balance jib assembly

在地面上把平衡臂组装好，将起升机构、电控箱、电阻箱、平衡臂拉杆装在平衡臂上，并固接上，吊起平衡臂（平衡臂上设有 4 个安装吊耳）。

用销轴将平衡臂与回转塔身铰接并穿好开口销，然后将平衡臂逐渐抬高直到将平衡臂拉杆用销轴铰接并穿好开口销，然后缓慢地将平衡臂放下，再吊装 2 块 2.27 吨重的平衡重安装在平衡臂尾部。图 29 为平衡臂拉杆示意图，图 30 为平衡重块示意图。

First the balance jib is mounted on the ground, take hoisting mechanism, electric control box, resistance box, balance jib pull rod mounted on the balance jib, and solid connected, lifting the balance arm (balancing arm has four mounting lugs).

Connect balance jib and slewing tower body with pin rolls and wear cotter, then gradually raise the balance arm until the balance arm pull rod with pin hinge and put the cotter pin, then slowly down the balance arm, then lifting 2 block 2.27 tons counterweight mounted on the rear of balance jib. Figure 29 is balance jib pull rod diagram, Figure 30 is counterweight diagram.

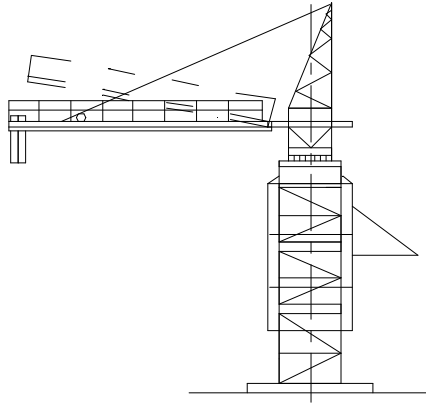


图 28 安装平衡臂 Figure 28 install balance jib assembly

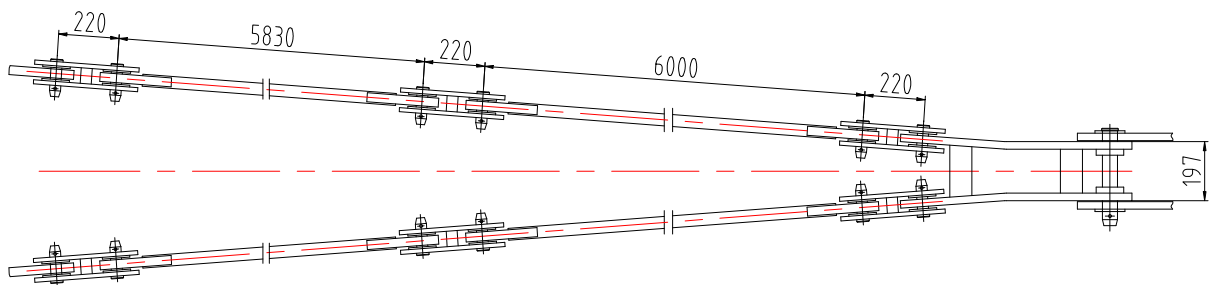
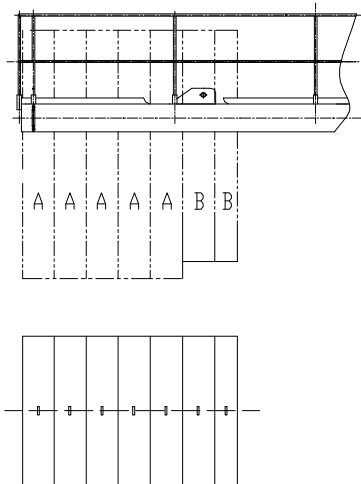


图 29 平衡臂拉杆示意图 Figure 29 Balance pull rod diagram



平衡重共 7 块 counterweight total 7 pcs: 14.8t

A 块 5 块 A type 5pcs: 每块重 2.27t each 2.27t

B 块 2 块: 每块重 1.725t

B type 2 pcs, each 1.72t

图 30 平衡重示意图 Figure 30 counterweight diagram

4.4.7 安装司机室 install Driver Cab

司机室内的电气设备安装齐全后，把司机室吊到上转台靠右平台的前端，对准耳板上孔的位置，然后用三根销轴联接并穿好开口销。

After the driver cab electrical equipment installation is complete, Take the cap lift to upper turntable right side platform front end ,

And aim the position of ear plate hole. then with three pins connect and wear cotter.

4.4.8 安装起重臂总成(见图 31)Install boom assembly(See figure 31)

在塔机附近平整的枕木上，拼装好起重臂，把起重臂停靠在约 0.6 米高的支架（枕木）上，将变幅小车装在起重

臂根部最小 Jib 处，并用铁丝捆扎牢固，收紧变幅小车的钢丝绳。

Near the tower crane smooth sleeper,assembly boom,take boom parked at around 0.6m support frame(sleeper),And pulley install on minimum jib of boom root,and use iron wire tightly, tighten steel wire rope of pulley.

在载重情况下不松弛为宜（出厂时变幅机构已装在起重臂根部节上），再将起重臂拉杆按图 32 拼装好后与起重臂上的吊点用销轴铰接，（起重臂刚性拉杆上吊点应在从起重臂根部起数的第三和第八节臂上），穿好开口销，放在起重臂上弦杆的定位托架内，并用铁丝捆扎牢固，检查起重臂上的电路是否完善，然后将起重臂吊起与回转塔身用臂根销轴铰接，穿好开口销把起重臂起吊位置（如下图 34）做标记以备拆塔时使用，

Under the load conditions not loose is good(Slewing mechanism already installed on mast section of boom root when left factory)Then boom pull rod according to Figure 32 assembly then connect lifting point with pin roll(boom rigid pull rod lift point should from boom root count the third and eighth section jib),wear cotter,putting it on positioning bracket of boom upper chord,and use iron wire tightly,

Check the circuit of boom whether complete or not,then use boom root pin roll connect boom and slewing tower body,wear cotter and take boom lift position (as following figure 34) make mark and that will be used when dismantle.

此时接好平衡臂上起升机构的电路，并将起升机构上的钢丝绳穿过塔帽安装滑轮与起重臂外侧长拉杆上的连接耳板用绳卡连接牢固，用汽车吊将起重臂缓慢翘起，同时开动起升机构缓慢将外拉杆吊起到塔帽拉板位置，将拉杆与拉板用销轴铰接，穿好开口销，然后将绳卡去掉解下钢丝绳使其垂落到起重臂内侧短拉杆处，并用绳卡与短拉杆连接耳板固定牢固，再次缓慢开动起升机构将短拉杆吊起到塔帽拉板位置，此时汽车吊应视情况调整起重臂翘度使拉杆与拉板用销轴铰接，穿好开口销，然后缓慢将短拉杆放下使其受力均匀，解下绳卡将钢丝绳抽出，到此起重臂与拉杆安装完毕。

At this time the circuit of balance is finished,The steel wire rope of hoisting mechanism through tower top install pulley connect with link ear plate of lateral pull rod tightly,With mobile crane lift boom slowly,meantime start hoisting mechanism lift lateral rod to tower cap pull rod position,pull rod and pull plate connect with pin roll,wear cotter,then remove rope cappel anf off steel wire rope and make it fall to boom inside short pull rod,use rope cappel connect with short pull rod tightly,Start the hoisting mechanism slowly again,and take short pull rod to tower cap position,at this time truck crane should according to situation adjust boom raise degree and make pull rod and pull plate connect with pin roll,wear cotter,then put down short pull rod slowly and make its force uniform, off rope cappel and draw out steel wire rope, Now,the installation of boom and pull rod is finish.

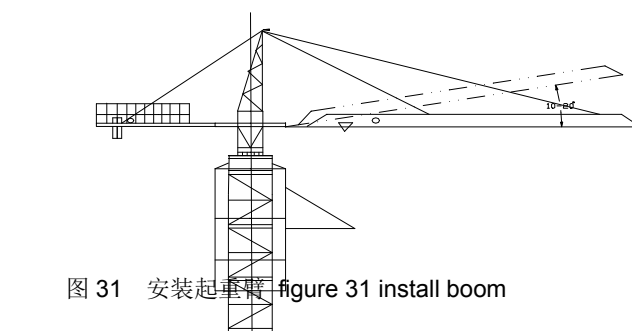


图 31 安装起重臂 figure 31 install boom

G (Kg)	4815	4418
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2.组装好的起重臂用支架支承在地面时，严禁为了穿绕小车牵引钢丝绳的方便仅支承两端，全长支架不应少于 5 个，且每个支架均应垫好受力，为了穿绕方便允许分别支承在两边主弦杆下。

2.When the assembled jib was supported on the ground, only support the two ends for the convenience of the attraction wire steel of the trolley, no less than 5 support for the whole distance,and every support must be evenly stressed, for the convenience of wire, support can be under the two main cords.

3.按图 34 挂绳，试吊是否平衡，否则可适当移动挂绳位置（记录下吊点位置便于拆卸时使用），起吊起重臂总成至安装高度，用销轴（见 8.4）将塔帽与起重臂根部连接固定。

3.Hang the rope like Diagram34, and test the balance, or else the position of the rope can be adjusted accordingly(mark the hanging position for the dismantlement), lift the jib assembly to the height of installation, use bolt(see 8.4)to connect the tower cap and bottom of the jib.



图 35 安装吊臂拉杆时起升钢绳穿绕图

Figure 35 Install boom pull rod hoisting steel wire roping diagram.

注：本塔机可根据现场情况实现起重臂变臂功能，可有 60m 变为 54m。在出厂的情况下，如果客户有要求的话，还可以进行其他变臂。

Attention: This tower crane's jib can be adjusted according to actual situation, from 60m to 54m. Other jib adjustment can be realized according to the clients' requirements.

当起重臂变为 54m 时，即去掉臂端数第 2 节，臂端节直接与第 3 节相连。

When the jib is 54m, that is cut the 2 sections of the jib, the tip section connect with the jib directly.

4.4.9 安装平衡重(见图 30)

4.4.9 Balanced weight installation

平衡重总重 14.8 吨，共有七块，1.725 吨的 2 块、2.27 吨的 5 块。平衡重的配置及安装位置严格按要求安装。

The total weight is 14.8t, seven pieces, 1.725t for 2 pieces, 2.27t for 5 pieces. The installation position of the balanced

weight and configuration must be strictly according to the requirements.

注：1、起重臂长度变为 54m 时去掉远离塔身的一块配重即 A 块-2.27t 此时总重为 12.53t，并将剩余 6 块固定牢固。

Remark: 1. When the jib is 54m, remove the weight which is on the far end of the tower crane body, that is A block 2.27t, the total weight is 12.53t for the moment, and fix the other 6 blocks.

吊装完毕后，按 3.4.1 条图 20 的要求，进行起升钢丝绳的穿绕，钢丝绳从起升机构卷筒上放出，绕过塔顶上部导向滑轮向下，经过起重臂根部滑轮，再绕到变幅小车和吊钩滑轮组，最后将绳头固定在吊臂头部的装置上。

After the installation, cross the lifting steel wire according to 3.4.1 Diagram20, the steel wire released from the hoisting mechanism coiling block, by pass the guild pulley and down, via pulley on the bottom of the jib, and cross the trolley and hook pulley group, finally fix the rope end to top of the jib.

4.4.10 电气安装及调试

4.4.10 Electric installation and debugging

4.4.10.1 电气安装

4.4.10.1 Electric installation

a. 电气安装应在塔机安装完毕后(塔机处于安装高度时)进行, 参看原理图, 外部接线图及控制接线图, 联接各控制及动力电缆, 制动器电缆, 及安全装置、接地装置、障碍灯、探照灯、风速仪等的线路;

a. Electric installation should after the installation of tower crane (tower crane in the height of installation), refer to principle diagram, outside wire diagram and control wire diagram, connect with all control and power cable, brake cable, and safety device, ground connection device, obstruction light, search light, anemograph line.

b. 送电之前对电气系统进行检查, 符合要求后方可通电;

b. Check the electric before power supply, supply the power after meeting the requirements.

c. 所有线路联接必须正确无误, 该固定的电线电缆应有可靠的固定, 防止塔机在运行时损伤电缆;

c. All the wires must be connected correctly, the fixed wire and cable should be in proper position, in case of cable damage.

d. 在通电之前应对电气进行绝缘检查, 主回路控制回路对地绝缘电阻不应小于 0.5 兆欧, 塔身对地的接地电阻应不大于 4 欧;

d. Insulation check must be conducted before power supply, resistance of main circuit and control circuit to ground

insulation is less than 0.5 megohm, the resistance of tower body to the ground is no more than 4 ohm.

e.主电缆（地面加司机室电缆）在进入司机室前应穿入电缆保护圈后再进入司机室，并留适当长度，保证塔机在左右一圈半的旋转时不致损坏电缆，且保证爬升时不损伤电缆；

e.Main cable(ground and driver cab cable)should cross the cable protection ring then to the driver cab, and keep a proper length, to ensure there is no cable damage when the tower crane turning one and a half circle, and no cable damage when lifting.

f.将司机室所有操作机构放置在安全位置，主开关放在断电位置，最后联接好地面电源电缆。

f.Put all operation mechanism in a safe position, main switch on the power cut off position, finally connect the ground power cable.

4.4.10.2 通电调试

4.4.10.2 Power supply debugging

a.将地面电源开关合上，送电到司机室，检查三相电源应三相平衡，且电压应为 $380V \pm 10\%$ （地面电网应能提供足够的容量，以保证电机正常启动和运转）；

a.Switch the ground power supply, supply electricity to driver's cab, make sure the three phase power is three phase balanced, and voltage is $380V \pm 10\%$ (ground electricity net should provide enough capacity to ensure the start and running of the engine);

b.松开高度限位器，幅度限位器，配合机械安装，穿好起升小车的钢丝绳；

b.Unloose the height limiter, range limiter, coordinate with the machine installation, and put the lifting trolley steel wire properly.

c.起升机构的调试

先操作起升手柄，观察起升运转情况，当起升手柄向内拉时，吊钩应向上运动，向外推时，吊钩应向下运动，否则应调整接至起升电机的电源的相序，以符合以上要求；

c.Hoisting mechanism debugging

Operate the hoisting handle first, observe the hoisting running situation. When pull the handle inside, the hook should move upward, while push outside, the hook should move down, or else the power phase order of hoisting engine should be adjusted.

d.起升调试完毕后，分别操作回转和变幅手柄，变幅手柄向内拉时小车向内走，手柄向外推时，小车应向外走，否则应调整接至各电机电源线的相序，以符合以上要求。

d.After the hoisting debugging, operate slewing handle and reolleying handle respectively, while pulling the trolleying handle inside the trolley would go inside, while push outside, the trolley would go outside, or else the phase order of the all the engines should be adjusted to meet the requirements.

4.4.10.3 使用注意事项

4.4.10.3 Usage attention

a.电送到司机室后（空气开关合上之前）障碍灯和司机室照明可通过操作台上的开关送电，插座上也有电，可供插风扇之用；

a.After the electricity supplied to driver cab(before switch the air switch)obstacle light and cab light can be operated via operate panel switch, the electric socket has power too, it can supply the electric fan.

b.按启动按钮时，各操作手柄必须归零位，总接触器 2C 才可得电自保；

b.When press the start button, all the handle must be switch to zero, the main contactor 2C can self supply power.

c.在吊臂向右（向左）转后，不能马上向左（向右）转，须有 8 秒的间隔，回转手柄归零后踩下刹车踏板不能马上刹车，须有 8 秒延时才能刹住。

c.After the jib turn right(left),there is a 8 seconds interval, slewing handle must be switched to zero, then stamp the brake, there is a 8 seconds interval to brake.

4.4.11 顶升两个标准

4.4.11 Jacking two mast sections

顶升过程应在风级小于 4 级下进行，顶升前应使上部回转机构处于制动状态，并不允许有回转运动。

The jacking process must in less 4 grade wind, the upper slewing mechanism must be in brake before jacking, and slewing movement is not allowed.

顶升过程中，塔机除自己安装需要吊装外不得进行吊装作业。若液压顶升系统出现异常，应立即停止顶升，收回油缸，检查有无顶升障碍和油路系统故障。

In the process of jacking, no hoisting work is allowed except self installation. If there is abnormal situation of hydraulic jacking system, it should be stopped immediately, and retract the oil tank, to check jacking obstruction and oil system malfunction.

4.4.11.1 顶升前的准备

4.4.11.1 Prepare before jacking

a. 按规定的泵站用油给液压泵油箱加油；

a. Fill the hydraulic oil tank according to the requirements.

b. 清理好各个标准节，在标准节上端连接处涂上黄油，将待顶升加节用的标准节在顶升位置时的吊臂下排成一排，这样能使塔机在整个顶升加节过程中不用回转机构，能使顶升加节过程所用时间最短；

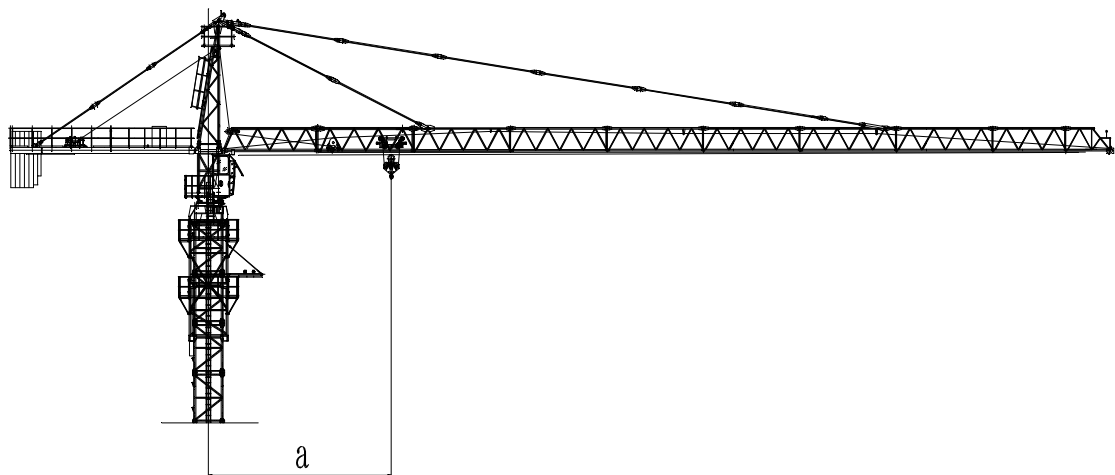
b. Clean all the mast sections, put grease on the upper connection part of the mast section, put the ready-to mast sections in a row in the position of jacking-up, this can ensure the whole tower crane do not need to slewing during the process of adding mast sections, and make sure the time is the short.

c. 将吊臂旋转至顶升套架的前方，平衡臂处于套架的后方（顶升油缸在套架后方）。

c. Turn the jib in the front of jacking frame, the balanced jib is in the back of the frame (jacking oil tank in the back of the frame).

4.4.11.2 顶升操作

4.4.11.2 Jacking operation



a. 在地面上先将四个引进滚轮固定在塔身标准节的四个角上，然后吊起标准节并安放在引进平台外伸框架上（见图 36）。

a. Fix the 4 introduced idler wheel on the four corners of the tower body on the ground, then hoisting the mast section and put it on the extension introduced platform. (see Diagram 36)

图 36 顶升示意图

Diagram 36 Jacking diagram

b. 卸下下支座与标准节之间的八条高强螺栓，将顶升横梁两端的轴头准确的放入踏步槽内；并扶正。使顶升横梁尽

可能靠近塔身，与油缸纵轴线尽可能在同一平面内。开动液压系统使活塞杆伸出 20-30mm，使下转台与标准节结合面刚刚分开，然后吊钩从臂根处向外运行，同时观察套架四周 16 个导轮与塔身间的间隙基本均匀（约 2mm）时变幅小车即停住（司机应记准此平衡点位置）。

b.Dismantle the 8 enhanced bolts between the down chassis and mast section, put the two ends of jacking beam in the stamping groove correctly, and adjust it. Make the jacking beam near the tower body as possible, try to make it in the same flat surface of longitudinal axis. Start the hydraulic system to make the pistol get out 20-30mm, make down turntable and mast section separate, then the hook move outside from the bottom of the jib, observe the surrounding 16 guide wheel of frame and tower body gap is even (about 2mm), the trolley stopped (driver should remember this balance point).

c.继续开动液压系统使活塞杆全部伸出，稍缩活塞杆，使爬爪搁在标准节的踏步上，然后油缸活塞全部缩回，重新使顶升横梁的轴头在标准节的踏步槽内准确就位扶正后，再次伸出油缸活塞杆，直至塔身上方恰好能有装入一个标准节的空间，利用引进滚轮在外伸框架上滚动，把标准节引至塔身正上方，对正标准节上的定位凸台，缩回油缸至上下标准节的凸台对正接触时，用 8 件 M36 的高强度螺栓将上、下标准节连接牢靠（预紧力矩不小于 $2\text{kN}\cdot\text{m}$ ）。

卸下引进滚轮，调整油缸的伸缩长度，将下转台与标准节连接牢固，即完成一节标准节的加节工作，若连续加几节标准节，则可按照以上步骤重复几次即可。

c.Continue the hydraulic system and make the pistol get out completely, then retract the pistol slightly, put the claw in the mast section, then retract the pistol completely. Reset the end of jacking beam in the mast section stamping groove, and push out the pistol again, until the upper tower body can fit a mast section. Use the running of extension of introduced platform to put the mast section right in front of the tower body. Adjust to the position platform of mast section, retract the oil tank to while position platform of the upper and down mast section connected. Use 8 M36 enhanced bolts to connect the two mast sections (pre-tightening torque is no less than $2\text{kN}\cdot\text{m}$). Dismantle the introduced idler wheel, adjust the length of the oil tank, fix the mast section and down turntable, the the work of mast section adding is completed. Repeat the procedure if want to add more.

注意：

Attention:

(1)顶升过程中必须利用回转机构制动器，将起重臂制动住，严禁起重臂回转，保证起重臂与引入标准节方向一致；
(1) In the process of jacking-up, slewing mechanism brake must be used, to brake the jib. Jib slewing is forbidden, to ensure the same direction of jib and introduced mast section.

(2)若要连续加几节标准节，则每加完一节后用塔机自身起吊下一节标准节前，塔身各主弦杆和下支座必须有一个 M36×340 的高强螺栓连接。如不再继续加节，则下转台与标准节之间的八条高强螺栓必须全部连接好；

(2) If adding the mast section continuously, then after adding of every mast section tower body self hoisting another mast section. Main chord of tower body and chassis must be connected by a M36X340 enhanced bolt. If adding mast section is not needed, then the 8 enhanced bolts between the down turntable and mast section must be all connected.

(3)所加标准节上的踏步必须与已有标准节对正。

(3) The stamping pf the adding mast section must be comply with the previous mast section.

(4) 设专人在顶升过程中注意扶正顶升横梁并注意轴头在踏步槽内准确就位以确保安全。

(4) Specialized personnel must be in charge of the adjustment of jacking beam and mind the end of jacking beam in the stamping groove is correct during the process of jacking-up.

塔机加节完毕，应旋转臂架至不同的角度，检查塔身各接头处和底架与加强标准节和地脚螺栓的紧固状态（哪一根主弦杆位于平衡臂正下方时就拧紧正下方的螺母，就此把这些螺母从下到上的所有螺母拧紧，上述连接处均为双螺母防松）。

After adding mast section is completed, turn the jib frame to different angle, check the conditions of tower body

connections and chassis between mast sections and enhanced bolts(screw tightly the nut of the main chord which is under the balanced jib directly, and screw the up and down nuts, the mentioned connection are all double nuts in case of losing ends).

至此塔机才算安装完毕，此时应检查塔身的垂直度，允差为 $4/1000$ ，然后经过调试后即可进入正常工作状态。若还须加节按上述方法进行即可。顶升工作全部完成后按道理应将顶升套架降到塔身底部或最上一道附着架处并固定牢。

By now the installation of tower crane is completed, check the perpendicularity of tower body, tolerance is $4/1000$, then it can work after debugging. If adding mast section is needed, do it as the mentioned procedure. After the complete of jacking-up, jacking frame and the bottom of tower body or the last anchor should be fixed together.

5、 安全保护装置及调试

5.Safety protection and debugging

安全保护装置主要包括起重力矩、起重量、起升高度、回转和幅度限制器及风速仪。具体调试方法详见其使用说明书。

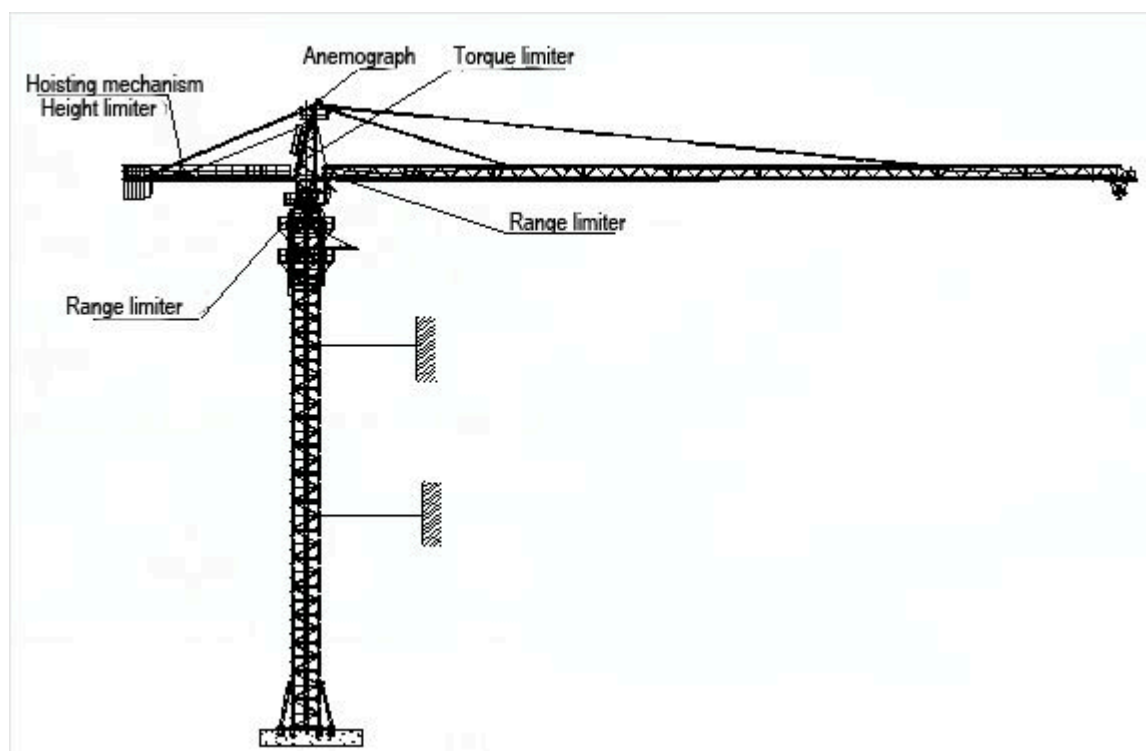
Safety device including lifting torque,load,height,slewing limiter, range limiter and anemograph. The detailed bugging procedure see instructions.

5.1 整机安全保护装置的安装位置(见图 38)

5.1 Safety device installation position of whole machine(see Diagram38)

图 38 整机安全保护装置的安装位置

5.2 安全装置调试



5.2.1 回转限位器调试方法

5.2.1 Slewing limiter debugging

(1) 工况:吊钩空载。

(1)Working condition: empty load of hook.

(2) 按回转左、右各一周半即 540° 调整开关动作，即左转 540° ，再右转 1080° 调整。

(2)Adjust the switch turn one and a half revolution, that is 540 degrees, turn left 540 degrees and turn right 540 degrees.

(3) 重复试验三次校核。

(3)Repeat the debugging test 3 times.

5.2.2 高度限位器调试方法:

5.2.2 Height limiter debugging

(1) 工况: 吊钩空载

(1)Working condition: empty load of hook.

(2) 滑轮倍率不同, 高度限位要求不同, 更换倍率及改变塔身高度时, 应重新调整。

(2)The pulley multiplying power is different, the height limiter requirement is different, changing the multiplying power or tower crane height, it should be adjusted.

(3) 吊钩 2 倍率时, 按吊钩至小车最小距离 1 米调整开关动作。

(3)When hook is 2 falls,the shortest distance between hook and the trolley is 1m, then debugging.

(4) 吊钩 4 倍率时, 按吊钩至小车最小距离 0.7 米调整开关动作。

(4)When hook is 4 falls,the shortest distance between hook and the trolley is 0.7m, then debugging.

(5) 重复试验三次校核。

(5)Repeat the debugging test 3 times.

5.2.3 幅度限位器调试方法:

5.2.3 Range limiter debugging

(1) 工况: 吊钩空载

(1)Working condition: empty load of hook.

(2) 按小车停止时, 距前后端缓冲装置的最小距离 200mm 调整开关动作。

(2)When trolley stopped, min. distance to the front and back buffing device is 200mm, adjust braking switch.

(3) 重复试验三次校核。

(3)Repeat the debugging test 3 times.

5.2.4 力矩限位器调试方法:

5.2.4Torque limiter debugging

(1) 工况: 现有高度、钢丝绳 4 倍率, 起重物稍离地, 小车能够运行即可。

(1)Working condition:the current height, steel wire 4 fall, the lifted load is just above the ground, the trolley is working.

(2) 在幅度 60 米处(最大幅度)起吊 1000Kg, 调整力矩限位器不动作; 使载荷落地, 加载重量至 1100Kg, 调整力矩限制器开关使其断电, 载荷不能起升, 并发出报警信号。

(2)In the range of 60m(Max.), lift 1000Kg, adjust the torque to stop, and make the load on the ground, add the load to 1100Kg, adjust the torque limiter and cut the power off, the load stopped lifting and the alarm sounded.

(3) 在幅度 20 米处校核, 起吊 4200Kg 重复上述试验。

(3)Adjust in the range of 20m, hoisting 4200Kg, repeat the above debugging test.

(4) 钢丝绳 2 倍率时, 吊重按相应起重特性取值。

(4)Steel wire 2 falls, load can be adjusted according to the lifting property.

5.2.5 起重量限制器调整

5.2.5 Hoisting limiter adjustment

(1) 工况: 现有高度、钢丝绳 4 倍率。

(1)Working condition: current height, steel wire 4 fall.

(2) 在幅度 14.6 米以内, 起吊重量 6000Kg, 吊钩低、中速应能正常起升。

(2)Under the range of 14.6m, lifting load 6000Kg, the hook is low, it could be lifted in medium speed.

(3) 增加重量大于 0-小于 600Kg 时, 调整开关断电不能起升只能下降。

(3)Add the weight, above 0 and less than 600Kg, adjust the switch and cut off the power, only descending.

(4) 增加重量 600kg 后以最慢速度起升, 调整开关应动作, 切断所有起升回路电源, 载荷不能起升并发出报警信号。

(4)Adding the 600Kg load, the hoisting the load at the lowest speed, adjust the switch, cut off all hoisting circuit power, load can not be lifted and the alarm sounded.

(5) 校核三次, 误差在 5%内合格。

(5)Check 3 times, tolerance is under 5% is acceptable.

(6) 吊钩 2 倍率时, 按相应起重特性表取值。

(6)When hook is 2 fall, load can be adjusted according to the lifting property.

6、起重机的拆卸

6.Dismantlement of tower crane

6.1 拆卸注意事项

6.1Dismantlement matters

6.1.1 塔机拆出工地之前, 顶升机构由于长期停止使用, 应对顶升机构进行保养和试运转。

6.1.1Before the dismantlement of tower crane, due to the long non working condition of jacking mechanism, the maintenance and debugging should be conducted.

6.1.2 在试运转过程中, 应有目的地对限位器, 回转机构的制动器等进行可靠性检查。

6.1.2In the process of test running, check the limiter, brake of slewing mechanism.

6.1.3 在塔机标准节已拆出, 但套架与塔身还没有连成整体之前, 严禁使用回转机构。

6.1.3After the mast sections are removed, but frame and tower body are not connected, using slewing mechanism is forbidden.

6.1.4 塔机拆卸对顶升机构来说是重载连续作业, 所以应对顶升机构的主要受力件经常检查。

6.1.4Dismantlement is continuous heavy load working for the jacking mechanism, so check the main stressed parts of the jacking mechanism.

6.1.5 顶升机构工作时, 所有操作人员应集中精力观察各相对运动件的相对位置是否正常 (如滚轮与主弦杆之间, 套架与塔身之间), 如果套架在上升时, 套架与塔身之间发生偏斜, 应停止上升, 并立即下降。

6.1.5When jacking mechanism is working, all personnel should focus on observing the relevant movement position(idler wheel and main chord, frame and tower body), if in the process of frame hoisting, frame is tilted from the tower body, it should be stopped and descend.

6.1.6 塔机拆卸方法:

6.1.6 Dismantlement of tower crane

塔式起重机的拆卸顺序是安装的逆过程。即: 后装的先拆, 先装的后拆。

Dismantlement order is the opposite of installation. That is dismantle the parts which are installed the latest, and dismantle the parts which are installed first.

由于塔机拆卸一般是在工程基本峻工时进行, 有的还是在长期闲置后拆卸, 设备技术状态和完好程度上很有可能存在一定的问题, 所以对拆塔前的准备工作和拆塔过程都应高度重视。在认真检查、充分准备的基础上, 按现场具体情况制定可靠措施后, 才可进行拆塔作业。拆塔作业应切实注意以下几点:

Because dismantlement is usually in the end of a project, some are dismantled after a long time in idle, the conditions of the equipment may not be good, so take the preparation work seriously. Under the condition of serious check and enough preparation, make a proper plan according to the actual situation. Mind the following steps:

(1) 拆塔前应仔细检查各主要受力部件是否完好, 焊接部位是否正常, 各紧固部位螺栓副是否齐全完好, 各销轴、挡板是否齐全完好。

(1)Check the condition of main stressed parts, the welding parts, and the bolts condition, the pin and baffle condition.

(2) 认真检查电气系统是否正常、完好，是否可靠。

(2)Check the electric system.

(3) 检查各机构，特别是液压顶升机构的运转是否正常，其技术状态是否可靠。

(3)Check the mechanisms,especially the hydraulic jacking system, make sure the technical state is normal.

(4) 将起重臂回转至标准节引进窗口方向上，并使用回转限制器等装置可靠定位。

(4)Put the jib to the direction of mast section introduction, and use slewing limiter to locate.

(5) 拆下最顶一节标准节与下支座相联的八条螺栓，开动泵站，使油缸活塞杆伸出，顶升横梁的轴头落在下面第二个标准节相应的踏步槽内，就位并扶正，使顶升横梁尽可能的靠近塔身，与油缸纵轴线尽可能在同一平面内，微微顶起塔机上部机构，使下支座下平面与第一节标准节刚刚脱离接触，然后吊钩由臂根处向外运行，观察套架的前后导轮与塔身的间隙，待间隙基本均匀时（约 1.5~2mm）即是基本平衡，小车停止运行（应将此平衡点记录下来）。

(5)Dismantle the 8 bolts connected the top mast section and the chassis, start the pump and push out the pistol, the end of jacking beam is in the groove of the second mast section under, adjust it, make the jacking beam near the tower body, in the same level with the oil tank longitudinal axis,jack the upper body of the tower crane, make lower level of the basic chassis detached from the first mast section, then move the hook from the bottom jib outward,observe the gap between front and back guide wheel of the frame and tower body,when the gap is even(about1.5-2mm),that is balanced, the trolley stopped(mark the balance point.)

(6) 拆下第一节与第二节标准节之间的八条联接螺栓，继续开动泵站，使油缸活塞杆外伸分两步顶升，使两标准节间接触面脱离 50mm 左右，然后安装左右引进轮组，将第一节标准节沿引进平台推出套架。

(6)Remove the 8 bolts between the first and second mast section, continue to start the pump, push the oil tank pistol to jack in two steps, make the two mast section detached for 50mm,then install the introduced wheel group, put the first section out along the side of the introduced platform.

(7) 操纵换向阀，缩回油缸活塞杆，同时注意适时将爬爪放入踏步槽内，直到顶升横梁从下一组踏步槽内提出，操纵换向阀，油缸活塞杆外伸，直到顶升横梁两端轴头准确地放入再下一组踏步槽内，并顶起在 50~100mm，将爬爪提起，以便套架继续下落。

(7)Operate reversing valve, retract pistol,put the claw into the stamping groove in the same time, until the jacking beam get out of the next group of grooves;operate the reversing valve,push put the pistol, until the two ends of jacking beam are in the next group of stamping groove, and jack up50-100mm,raise the claw to descend the frame.

(8) 操纵换向阀，缩回油缸活塞杆，直到下支座的下平面与第二标准节上平面接触，落实后，在对角各穿一个塔身标准节连接螺栓，并紧固。

(8)Operate revising valve, retract pistol of oil tank, until the bottom level of the chassis contacted with the second mast section,put a bolt in every opposite angle of mast section and fix it.

(9) 塔机主吊钩吊挂的标准节下放到地面，再将小车开到平衡点的位置。

(9)Main hook put the mast section on the ground, then put the trolley in a balanced position.

(10) 卸下下支座下平面的四条联接螺栓，重复 6~9 的动作，即可将标准节逐节拆下。但应注意的是：在装有附着装置时，应在套架下落到哪一节标准节时，先将相关附着装置拆下，切不可过早拆除。

(10)Remove the 4 bolts of the chassis, repeat 6-9,then the mast section can be removed. When the anchor device is installed, anchor device can not be removed early.

(11) 套架下落到最低位置时，拆下起升钢丝绳及吊钩组，并将起重臂和平衡臂上的电缆线拆卸下来，然后把配重腔内的配重组解体，并将腔中的配重卸下来一部分，（只留下平衡臂尾部的二块配重块并稳固牢靠），即可准备拆卸起重臂。

(11)When the frame is in the lowest position, remove the hoisting steel wire and hook group, and remove the cable on jib and balanced jib, then dismantle the counter weight,(only left the two weight block on the bottom and fix them),prepare to dismantle the jib.

(12) 以起重臂安装时的吊点为吊点 (作好标记处), 用 25t 汽车吊将起重臂仰起 $10^{\circ}\sim 20^{\circ}$ 角, 分别将前后拉杆第一、二节之间的销轴卸下, 并将在起重臂上的拉杆用铁丝捆牢, 然后慢慢将臂放平, 拆下臂根销轴, 把起重臂慢慢放在地面的支架上。

(12) Take the hanging point of jib installation as the hanging point (make the mark), use 25t automobile to lift the jib to a $10^{\circ}\sim 20^{\circ}$ angle, remove the bolts of front and back rods of mast sections, and fix the iron wire of jib, then put down the jib slowly, remove the bolts, put the jib on the support slowly.

(13) 吊下平衡臂剩余的配重, 以平衡臂安装时的吊点为吊点 (作好标记处), 将平衡臂仰起 $10^{\circ}\sim 20^{\circ}$ 角, 分别将两根拉杆的第一、第二节间的联接销轴拆下, 并将平衡臂上的两节拉杆用铁丝捆牢, 然后慢慢将平衡臂放下, 拆下臂根销轴, 将平衡臂慢慢放在地面上。

(13) Lift the rest counter weight of the balanced jib, take the hanging point while installation as hanging point (make the mark), lift the jib to a $10^{\circ}\sim 20^{\circ}$ angle, remove the bolts of front and back rods of mast sections, and fix the iron wire of jib, then put down the jib slowly, remove the bolts, put the jib on the support slowly.

(14) 拆除司机室与外面相联的电缆线, 依次拆下司机室、塔帽、上转台、下转台。

(14) Remove the cable connect the driver cab and outside, dismantle driver cab, tower cap, upper turntable, down turntable in order.

(15) 将顶升套架从塔身节上抽出来, 再依次将塔身节拆下来, 再将底架压件及底架拆下。

(15) Remove the frame from tower body, then dismantle the tower body, then dismantle the bottom frame.

至此, 拆塔作业基本完成。

Until now, the dismantlement work is done.

拆卸时风力应低于四级, 由于拆卸塔机时, 建筑物已建完, 工作场地不如安装时宽敞, 故在拆卸时应注意工作程序, 吊装堆放位置, 不可马虎大意, 否则容易发生人身安全事故。

The wind should less than 4 grade during dismantlement process, because the building is built when the dismantlement is conducted, the work site is narrow, so pay attention to the working procedure, take it seriously, in case of any accidents.

6.2 塔机拆卸后的注意事项

6.2 After dismantlement matters

6.2.1 塔机拆散后由工程技术人员和专业维修人员进行检查。

6.2.1 The dismantled tower crane must be checked by engineer and professional personnel.

6.2.2 对主要受力的结构件应检查金属疲劳, 焊缝裂纹, 结构变形等情况, 检查塔机各零部件是否有损坏或碰撞等。

6.2.2 Check metal fatigue of main stressed parts, welding flaw, deformation situation, check damage of the tower crane parts.

6.2.3 检查完毕后, 对缺陷、隐患进行修复后, 再进行防锈、刷漆处理。

6.2.3 Repair the deformation and damaged parts, then rust-proof and painting.

7、起重机的使用

7. Tower crane use

7.1 投入使用前的工作

7.1 Before the tower crane work

塔机在投入使用前, 应进行全面的检查和必要的试验, 对机构和安全装置进行认真的测试, 以避免妨碍正常工作秩序和不安全事故发生, 保证塔机的使用和安全运行。

Before the work of the tower crane, complete check and necessary test should be conducted, check the mechanism and safety device seriously, in case of any abnormal working procedure and dangerous accident, to ensure the safe

running of the tower crane.

7.1.1 立塔后检查项目

7.1.1 Items need to check

检查项目 Item	检 查 内 容 Content
底 架 Chassis	检查地脚螺栓的紧固情况 Check bolts condition 检查输电线距塔机最大旋转部分有 5 米的安全 Make sure 5m distance between electrical wire and tower crane 距离并检查电缆通过状况，以防损坏 Check cable condition, in case of any damage
塔 身 Tower body	检查标准节螺栓的连接紧固情况 Check bolts of mast section 检查每三节标准节应有一节设有休息平台 Make sure every three mast sections has one resting platform
套 架 Frame	检查与下支座的连接情况 Connection situation with down chassis 检查顶升爬爪是否灵活可靠 Check the flexibility of jacking claw 检查走道，护栏的紧固情况 Check the aisle, and railing situation
上下转台司机室 Turntable and driver cab	检查与回转支承连接的螺栓紧固情况 Check bolts connected with slewing bearing 检查电缆的运行状况（电缆应从上支座右边和梯子下、下端的钢环里通过） Check cable condition(cable should through the upper chassis and ring of up and down end of the ladder) 检查平台、栏杆的紧固情况 Check platform and railing 检查与司机室的连接情况 Check connection with driver cab 司机室严禁存放润滑油，油棉纱及其它易燃物品 Lubricant , cotton and other inflammable items
塔 顶 Tower cap	检查起重臂，平衡臂拉杆的安装情况 Check rods of jib and balanced jib 检查扶梯、平台、护栏的安装情况 Check ladder,platform and railings 保证起升钢丝绳穿绕正确 Check the steel wire crossing situation
起重臂 Jib	检查各处连接销轴、垫圈、开口销安装的正确性 Check pins,gasket and open pin installation 检查变幅小车安装运行情况，载人吊栏的紧固情况 Check trolley installation, passenger cage 检查起升、变幅钢丝绳的缠绕及紧固情况 Check hoisting,trolleying steel wire
平衡臂 Balanced jib	检查平衡臂的固定情况 Check balanced jib 检查平衡臂护栏及走道的安装情况 Check balanced jib and aisle installation 保证走道无杂物 To ensure no obstacles in the aisle
吊 具 Hook device	检查吊钩组有无影响使用的缺陷 Check hook damage 检查起升，变幅钢丝绳的规格、型号应符合要求 Check hoisting,trolleying steel wire spec.,type 检查钢丝绳的磨损情况 Check steel wire damage
机 构 Mechanism	检查各机构的安装、运行情况 Check mechanisms installation and running 各机构的制动器间隙调整合适 Adjust brakes gap of all mechanisms

	检查各钢丝绳头的压紧有无松动 Check steel wire pressure
安全装置 Safety device	检查各安全保护装置是否按本说明书第五章的要求调整合格 Check if the safety device fit the instructions of chapter five 检查塔机上所有扶梯、护栏、休息平台的安装紧固情况 Check tower crane's all ladder,railing, and resting platform
润 滑 Lubrication	根据使用说明书检查润滑情况，进行润滑工作 Check lubrication according to instructions

7.1.2 塔机组装好后，应依次进行下列试验：

7.1.2 After assembly, do the tests in order

7.1.2.1 空载试验

7.1.2.1 Empty load test

各机构应分别进行数次运行，然后再做三次综合动作运行，运行过程不得发生任何异常现象，否则应及时排除故障。

Every mechanism should run several times and do three comprehensive tests, no obstacles during the running, or else the obstacles should be removed.

7.1.2.2 静载试验

7.1.2.2 Static load test

空载试验合格后，进行静载荷试验，静载荷实验应按照 GB/T5031-1994《塔式起重机性能实验》中第 4.5 条的规定进行。

After qualified to the empty load test, conduct static load test, according to article 4.5 of GB/T5031-1994<tower crane property test>

7.1.2.3 选择适当的起重量及该起重量所对应的最大幅度，进行在该起重量下超载 10%动载实验，本实验应按照 GB/T9462-1999《塔式起重机技术条件》中附录 B 的规定进行。

7.1.2.3 Choose proper load and max. Range, conduct the 10% load test, according to B appendix of GB/T9462-1999<tower crane technical terms>

7.2 安全操作规程

7.2 Safe operation procedure

7.2.1 司机与起重工

7.2.1 Driver and tower crane

7.2.1.1 必须严格执行《塔式起重机操作使用规程》的有关规定，司机与起重工必须是按省级安检部门有关规定进行考核并取得合格证者。

7.2.1.1 Follow the regulations of <tower crane operation manual>strictly, driver and tower crane must comply to the regulations.

7.2.1.2 司机必须了解所操作的工作原理，熟悉该塔机的构造及安全装置的功用及其调整方法，掌握该起重机各项性能的操作方法以及该起重机的维修保养技术。

7.2.1.2 Driver must know the principle of operation, be familiar with structure of crane and safety device and how to adjust the machine, master the operation and maintenance skills.

7.2.1.3 不准斜拉斜吊物品，不准吊重量不明或有根的物体。

7.2.1.3 No tilting object or unknown or root object is allowed.

7.2.1.4 有物品悬挂在空中时，司机与起重工不得离开工作岗位。

7.2.1.4 Driver can not leave the post while there is object hanging in the air.

7.2.1.5 指挥的信号、手势、旗号应符合 GB5082-85 规定。

7.2.1.5 Instruction signal, gesture,flag signal should comply to GB5082-85.

7.2.1.6 司机必须认真做好起重机的使用、维修、保养和交接班的记录工作。

7.2.1.6 Driver must record the use of crane,maintenance,and shit carefully.

7.2.1.7 严禁司机酒后上机操作。

7.2.1.7 Driver under the influence of alcohol in forbidden.

7.2.2 机械部分及其它

7.2.2 Machine part and others

7.2.2.1 起重机的工作环境温度 $-20^{\circ}\text{C}\sim+40^{\circ}\text{C}$ ，风级应小于 6 级。

7.2.2.1 Working temperature is $-20^{\circ}\text{C}\sim+40^{\circ}\text{C}$,wind less than 6 grade.

7.2.2.2 塔机上的所有安全保护装置，必须随时保养，严禁任意搬动和拆卸，严禁超负荷使用。

7.2.2.2 Maintenance of safety device, not allowed to move or over load.

7.2.2.3 夜间作业，施工现场必须备有充分的照明设施。

7.2.2.3 Night working, lights must be ready for worksite.

7.2.2.4 塔机经过大修或转场重新安装前注意事项。

7.2.2.4 After big repair or change of work site, the following matters should be concerned.

a.严格认真检查各联接处各铰接头，销轴有无裂纹、锈蚀、损伤。

a.Check all connections, fraction ,erosion, damage of pins.

b.检查刚性拉杆、钢丝绳、滑轮、吊钩等重要件是否符合使用条件。

b.Make sure the rods,steel wire,idler wheel and hook comply to the requirements.

c.检查金属结构件变形，焊缝等情况应符合使用条件。

c.Check deformation of metal structure, welding situations.

d.对起升、爬升、回转、变幅应进行试运转至正常。

d.Test running of hoisting,lifting,slewing and trolleying.

7.2.2.5 检查电气控制系统应符合要求

7.2.2.5 Check electric control, to meet the requirements.

停机修理或维护保养时，必须切断总电源，不许带电作业。

Cut the power while maintenance.

地面、楼台、施工面要设专人指挥塔机作业，与司机联络，必须规定严格的信号或手势、旗号等，最好采用步话机联络。

Ground,floors and construction sites must be instructed by professionals, communicate with the driver,contact with signal,gesture and flag signals, better use walking-talkie.

7.2.2.6 应保证塔机的使用电压在 $380\text{V}\pm 5\%$ 的范围内，否则塔机的电气设施容易损坏。

7.2.2.6 Make sure the voltage is $380\text{V}\pm 5\%$, or else the crane will be damaged.

7.2.2.7 在遇大雷雨、暴雨、浓雾或风级超过 6 级一律停止起重作业，当风级超过 10 级时，应将塔机降塔至 5 个标准节以下高度，或采用牵缆绳加固等办法以保证安全。

7.2.2.7 Not allowed to work,when storm,frog or the wind is above 6grade,the wind is above 10grade, the crane must down to 5 sections height, or use attraction rope to enhance.

7.2.2.8 在多台塔机同时进入一个施工现场时，塔机的平面布置要合理，相互之间不得在空间交错和发生干涉。

7.2.2.8 The work site must be reasonable when several tower cranes are in the same site, no space crossing.

7.2.2.9 司机在接通地面电源，登上塔机进入司机室内应全面检查按钮操作手柄等是否处于非工作状态，确认无误后方可启动总按钮。

7.2.2.9 After power supplied, driver must check the operation handles in the cab are in non working state, then start the main button.

7.2.2.10 司机必须严格按照本塔机技术性能表和起重特性曲线图的规定作业，不得超载和强行作业。

7.2.2.10 Driver must follow the performance chart and load diagram, no over load.

7.2.2.11 操作时严禁起重吊钩着地，以免引起卷筒钢丝绳排列不齐而遭损坏，如果吊钩必须着地，则吊钩着地面后再次起升时，必须注意监视卷筒钢丝绳排列情况，必要时须重新将钢丝绳排列整齐。

7.2.2.11 Hook can not on the ground while working, in case of any damage due to disorganized steel wire, if the hook is on the ground, then observe the steel wire coiling drum while lifting again.

7.2.2.12 小车侧面的吊栏是供维修使用的，当需要维修吊臂上的某一零件时，维修人员可站在吊栏内随载重小车一起执行维修任务，吊栏的额定承载重量为 100 公斤，当起吊重物时，吊栏内严禁站人，在立塔施工中，地面安装吊臂时，要仔细检查吊栏与载重小车的连接是否完善可靠。

7.2.2.12 The side cage of trolley is for maintenance, when some parts are needed to be repaired, the maintenance staff can stand in the cage to do the work, rated load is 100kg. No personnel in the cage while lifting heavy load. Check the jib, cage and load trolley while working.

7.2.2.13 各机构需要反向运行时，必须待电机正转停止后，再启动反转，反之也一样。

7.2.2.13 If want to running revers direction, must make sure the clockwise running is fully stopped, then do the counter clockwise running. Same as the other direction.

7.2.2.14 发现塔机有异常现象时，应停机切断电源，待查清并排除故障后再使用。

7.2.2.14 Cut power off when abnormal happens and repair it.

7.2.2.15 塔机在每班作业完毕后，必须将吊臂转到与建筑物平行的方向，吊钩升高至离开最高建筑物的高度，小车应在起重臂的最小工作幅度处，切断总电源方可离去。

7.2.2.15 After every shift of work, the jib must in the parallel direction of the building, the hook in the height of away from the highest building, trolley must under the min. range of jib, left before cutting the power off.

7.2.2.16 每班工作前，司机必须对塔身、臂架、回转支承、起重臂刚性拉杆、平衡臂拉杆、卷筒联接螺栓、刹车制动器等主要关键部位的销轴，螺栓等进行日常检查，紧固，确定无松动或脱离现象才允许开车作业。

7.2.2.16 Before every shift, driver must check the bolts of tower body, jib and slewing bearing, rods of jib, rods of balanced jib, bolts of coiling drum, make sure no loosening end or detachment.

7.2.2.17 司机对减速器、滑轮、轴承座等处要按规定日常保养加油，如发现有漏油现象，要及时处理。

7.2.2.17 Driver must check the reducer, pulley, bearing, chassis and deal with the leakage.

7.2.2.18 司机在正式作业之前，必须逐项检查各安全装置的可靠性，绝不允许在安全装置不可靠、失灵的情况下勉强作业。

7.2.2.18 Driver must check the reliability of safety device before working, no working if the safety device is not reliable or malfunction.

7.3 维修及保养，每天班前进行。

7.3 Maintenance and day shift

7.3.1 经常保持整机清洁，及时清扫。

7.3.1 Keep the machine clean.

7.3.2 检查各减速器的油量，及时加油。

7.3.2 Check the reducer and fill the oil

7.3.3 注意检查各部位钢丝绳有无松头，断丝、磨损等现象，如超过有关规定，必须及时更换。

7.3.3 Check the loosing ends of steel rope and damage, replace it when necessary.

7.3.4 检查制动器的效能，间隙，必须保证可靠的灵敏度。

7.3.4 Check the efficiency of brake, gap and sensitivity.

7.3.5 检查各安全装置的灵敏可靠性。

7.3.5 Check the sensitivity of safety device.

7.3.6 检查各螺栓联接处, 尤其塔身标准节联接螺栓, 每使用一段时间后, 必须重新进行紧固。

7.3.6 Check the bolts connections, especially the tower body bolts, strengthen it after a while.

7.3.7 检查各钢丝绳头压板、卡子等是否松动, 应及时紧固。

7.3.7 Check the pressing plate of steel wire and strengthen it.

7.3.8 钢丝绳、卷筒、滑轮、吊钩等的报废, 应严格执行 GB5144-94 和其他相关标准的规定。

7.3.8 Check the steel rope, drum, pulley and hook, execute the GB5144-94.

7.3.9 检查各金属构件的杆件, 腹杆及焊缝有无裂纹, 特别应注意油漆剥落的地方和部位, 尤以油漆呈 45° 的斜条纹剥离最危险, 必须迅速查明原因并及时处理。

7.3.9 Check the rods of metal parts, web member and welding fraction, especially the drop-off pain parts, the 45° strip fraction is most dangerous, deal with it promptly.

7.3.10 塔身各处(包括标准节与底架的连接)的连接螺栓螺母, 各处连接直径大于 $\phi 20$ 的销轴等均为专用特制件, 任何情况下, 绝对不准代用, 而塔身安装时每一个螺栓必须有两个螺母拧紧。

7.3.10 Bolts of tower body(mast section and chassis connection), the connection pin which is above $\phi 20$, special made, under no circumstance, they can be replace, and bolt of tower body must be strengthened by two screws.

7.3.11 塔身标准节螺栓性能等级为 10.9, 螺母性能等级为 10 (螺母防松)。螺栓头部顶面和螺母头部顶面必须有性能等级标志, 否则一律不准使用。

7.3.11 Bolt of tower body property is above 10.9, screw is 10(loosen prevent). Bolt top and screw top must have same sign, or else it can not be used.

7.3.12 整机及金属机构每使用一个工程后, 应进行除锈和喷刷油漆一次。

7.3.12 Rust cleaning and painting after every project.

7.3.13 起升钢丝绳经过一段时间使用磨损拉长后, 需对高度限位器重新按规定进行调整。

7.3.13 Reset height limiter after the use of steel wire for a while.

7.3.14 观察各电器触头是否氧化和烧损, 若有接触不良应修复或更换。

7.3.14 Check the electric contactor of oxidation and damage, replace them if necessary.

7.3.15 各限位开关和按钮不得失灵, 零件若有生锈或损坏及时更换。

7.3.15 No malfunction of limiter switch and button, replace them when necessary.

7.3.16 各电机开关, 与开关板等的绝缘必须良好, 其绝缘电阻不应小于 $0.5M\Omega$ 。

7.3.16 Make sure good insulation condition of engine switch and switch, resistance insulation no less than $0.5M\Omega$.

7.3.17 检查各电器元件之紧固螺栓是否松动, 电缆及其它导线有否破裂, 若有应及时排除。

7.3.17 Check bolts condition of electric elements, cable and wire damage, repair it.

7.4 主要故障及排除方法

7.4 Malfunction and repair

序号 NO.	故障现象 Malfunction	故障原因 Cause	排除方法 Repair
1	制动器打滑产生吊钩 下滑和变幅小车制动后向 外走 Hooke sliding and trolley goes outward due to brake sliding	制动力矩过小 制动轮表面油污和制动时间过长 Brake torque too small Oil stain on the brake wheel and brake for a long time	调整制动器弹簧压力 清除油污调整制动瓦间隙 Adjust brake spring and clean the oil stain
2	制动器负载冲击过猛 Brake load impact too severely	制动过急 闸瓦两侧间隙不均匀 Brake too urgently, shoe gap of two sides not even	调整制动瓦闸的间隙或增大液压推杆行程 Adjust shoe gap or enlarge hydraulic stroll
3	制动器转动过程中发热冒 烟 Smoke in the brake turning process	制动瓦闸间隙过小 Brake shoe gap too small	加大制动瓦间隙 Enlarge shoe gap
4	减速器温度过高 Over heat of reducer	润滑油缺少或过多 Lubricant too little or too much	注意适量增减油量 Adjust the oil
5	减速器轴承温度过高 Over heat of reducer bearing	主要是润滑脂过量或太少 润滑脂质量差 轴承轴向间隙不符合要求或轴承已损 坏 Lubricant too little or too much, low quality, bearing gap not proper or damaged bearing	按规定更换润滑脂并适量重新调整轴承间隙 更换轴承 Change the lubricant and adjust bearing gap, or change it
6	减速器漏油 Reducer oil leakage	联接部位贴合面的密合性，轴端密封 圈损坏 Adaptation of connection parts, and seal ring damage	更换密封圈 Change seal ring
7	回转机构启动不了 Can not start slewing mechanism	主要看有无异物卡在齿轮处，液力偶 合器充油量过少 Check obstacle of gear, and oil of coupling	清除异物适当加油 Remove obstacle and fill oil
8	回转机构冲击大震动 Slewing mechanism impact	可能是液力耦合器充油量过多 Too much oil of coupling	适当减少充油量 Reduce oil
9	顶升太慢 Jacking too slowly	a.油泵磨损，效率下降 b.油箱油量不足或滤油器堵塞 c.手动换向阀杆与阀孔磨损严重	修复或更换损坏件加足油量或清洗滤油器 Repair or change the damaged parts and clean the filter

		d.油缸活塞杆密封有损伤出现内泄漏 A.pump damage,low efficiency B.Lack of oil or obstruction of pistol C.Wear out of manual reversing valve or damage of valve hole D.Inside oil leakage of pistol	
10	顶升无力或不能顶升 Can not jacking-up	a.油泵严重内泄 b.溢流阀调定压力过低 c.手动换向阀阀芯过度磨损 d.溢流阀卡死 A.oil tank inside leakage B.Relief valve pressure too low C.Wear our of center of manual reversing valve D.Stuck reversing valve	修复或更换磨损件，调整压力 Repair or change the damaged parts or adjust the pressure
11	顶升升压时出现噪声振动 Noise when jacking-up	滤油器堵塞 Blocked oil filter	清洗滤油器 Clean the oil filter
12	顶升系统不工作 Jacking system not working	电机转向与油泵转向不合 Engine running direction does not fit oil pump running direction	改变电机旋向 Change engine running direction
13	顶升时发生颤动爬行 Vibration crawling while jacking-up	a.油缸活塞杆空气未排净 b.导向机构有障碍 A.air left in the pistol B.Obstruction of guide mechanism	空载反复伸缩排气 Move repeatedly when empty load
14	顶升有负载后自降 Self descending when jacking-up with load	a.缸头上的锁向阀出现故障 b.油缸活塞杆密封损坏 A.lock valve malfunction B.Seal damage of pistol	排除故障 更换密封件 Remove malfunction and change sealing
15	变幅机构不能起动 Can not start trolleying mechanism	1、控制接线错误 2、熔丝烧断 3、电机绕组相间短路，接地及断路 4、电机电压过低 5、绕组接线错误 6、电磁制动器未松闸 7、负载过大或传动机械有故障 1. Wrong connection of control wire 2. Melt fuse 3.short circuit, connect to ground or open circuit 4. Low voltage of engine 5. Wrong crossing wire 6. Non switch off of electromagnetic	1、核对接线图 2、检查熔丝容量是否太小，如小更换大的 3、测量电网电压 4、按各种速度供电找出短路，断路部分予以修复 5、检查制动器电压及绕组是否有断路或卡住 1. Check wire map 2. Check the fuse, if too small, change it 3. Check voltage 4. Check short circuit and repair open circuit 5. Check brake voltage and wire group for open circuit and stuck

		brake 7. Over load or malfunction	
16	变幅机构 有异常噪声振动过大 Trolleying mechanism noise or vibration too much	1、定转子相擦 2、电机和减速箱不同心 3、轴承严重缺油或损坏 4、齿轮磨损 5、两相运行、有啸叫声 1. Fixed rotor friction 2. Engine and reducer not concentric 3. Lack of oil of damage of bearing 4. Wear out gear 5. Two phase running , noise	1、检查定转子间隙是否均匀 2、重新调整电机与减速箱的同心率 3、清洗轴承加新润滑油、更换轴承 4、更换齿轮箱 5、切断电源检查并修复 1. Check gap of fixed rotor 2. Adjust the engine and reducer concentric 3. Clean the bearing and add new lubricant, change bearing 4. Cut off the power and check
17	变幅机构电动机温升过高 或冒烟 Trolleying mechanism over heat or smoke	1、负载过大 2、负载持续及工作不符合规定 3、两相运行 4、电源电压过低或过高 5、电机绕组接地或相间短路 6、摩擦片间隙不对 7、制动和释放时间不对 8、电机通风阻塞，温度升高 1. Overload 2. Continuously with load and false operation 3. Two phase running 4. Voltage too high or too low 5. Wire group on the ground or short circuit 6. Friction plate gap not right 7. Wrong brake time and release time 8. Wind block or over heat	1、测定子电流如大于额定值要减少负载 2、按规定负载 3、测量三相电流并排除故障 4、检查输入电压并纠正 5、找出原因并修复 6、按要求调节间隙 7、检查制动器电压及延迟断电器运作时间消除故障 8、保持通风良好 1. Check sub-electric current, if bigger than rated, them reduce the load 2. With rated load 3. Check three phase and remove malfunction 4. Check input voltage and correct it 5. Find the cause and repair it 6. Adjust the gap 7. Check brake voltage and delay power off working time and remove malfunction 8. Keep ventilation
18	变幅机构轴承过热 Trolleying mechanism bearing over heat	1、轴承烧坏 2、润滑脂过多或过少 1. Bearing damage 2. Too much or too little lubricant	1、更换轴承 2、按要求加润滑脂 1. Change the bearing 2. Add the lubricant properly
19	变幅机构带电 Electrification of trolleying mechanism	1、电源线及接地线接错 2、接地不良 3、电机引接线擦伤接地 1. Electric wire of ground wire wrong 2. Ground connection wrongly	1、查出并纠正 2、接地要接触良好 1. Check and correct it 2. Good connection on the ground

		3. Engine introduce wire damage	
20	变幅机构制动器失灵 Trolleying mechanism brake malfunction	1、制动力矩过小 2、摩擦片磨损间隙增大 1. Brake torque too small 2. Friction plate gap enlargement	1、制动器弹簧断或失效须更换 2、电刷破碎、电压不足 1. Change damaged brake spring 2. Electric brush broken or low voltage
21	总启动时不动作 Can not start main switch	1、操作手柄未归零 2、熔丝烧断 3、起动按钮、停止按钮接触不良 1. Not reset operation handle 2. Melt fuse 3. Malfunction of start and stop button	1、将手柄归零 2、换保险 3、修或换按钮 1. Reset operation handle 2. Change insurance 3. Repair or change button
22	起升动作时跳闸 Trip when hoisting		检查起升刹车是否打开过检定值是否变化 Check hoisting brake evaluation number
23	变幅有 2 速无 1 速 Trolleying 2 speed, not 1 speed	1、手柄触点不良 2、接触器触点接触不良 3、电机损坏 1. Handle poor contact 2. Contactor poor contact 3. Engine damage	1、修手柄触点 2、修理或更换接触器 3、修理或换电机 1. Repair handle 2. Repair and change contactor 3. Repair and change engine
24	变幅有 1 速无 2 速 Trolleying 1 speed, not 2 speed	1、限位开关或触点接触不好 2、电机损坏 1. Poor contact of limiter switch 2. Engine damage	1、修或换限位开关 2、修或更换电机 1.repair or change limiter switch 2. Repair or change engine
25	回转制动不起作用 Slewing brake not working	1、刹车开关接触不良 2、整流桥烧坏 3、延时继电器触点接触不良 1. Brake switch poor contact 2. Rectifier bridge damage 3. Delay relay poor contact	1、修或换刹车开关 2、更换或修理损坏的元件 1. Repair or change brake switch 2.change or repair damaged elements
26	幅度指示仪反向或不准 Range indicator direction reversed or not correct	幅度指示仪接线有误或传感器接触不良 Wrong wire connection of range indicator or sensor poor contact	调整接线顺序或清理电位器拧紧螺钉 Adjust wire connection order or clean electric element,strengthen screw
27	吊重无力电机不转 Engine not working	1、输入电压过低 2、交流接触器断线 1. Input voltage too low 2. Wire cut off of a.c. contactor	1、检查工作电压，保证输入电压不低于规定 2、接通线路 1. Check voltage, to ensure the voltage is not lower than requirement

28	电动机温度过高 Over heat of engine	1.	1、应适量减少操作次数 2、检查起升刹车 1. Reduce operation time 2. Check hoisting brake
29	起升后动作 Movement after hoisting	1、操作次数，过于频繁 2、低速使用时间太长或起升刹车没打开 2. Operation too frequently 3. Long time low speed use or hoisting brake not open	先检查外围元件无故障后检查操纵台内部电器元件 Check outskirts elements first and then the inside elements
		操纵台外围元件故障或操纵台内部电器元件故障 Operation panel outskirts elements malfunction or inside element malfunction	

8、 附图、附表

8. Appendix and diagram

8.1 轴承明细表

8.1 Bearing list

序号 NO.	轴承类型 Bearing model	标准号 Standard no.	安 装 部 位 Installation part	件数 Quantity
1	轴承 6205 Bearing 6205	GB/T276-1994	套架 Frame	4
2	轴承 6212 Bearing 6212	GB/T276-1994	塔顶 Tower cap	6
3	轴承 6212 Bearing 6212	GB/T276-1994	起重臂 Jib	2
4	轴承 6004 Bearing 6004	GB/T276-1994	起重臂 Jib	6
5	轴承 6004 Bearing 6004	GB/T276-1994	载重小车 Load trolley	8
6	轴承 6212 Bearing 6212	GB/T276-1994	载重小车 Load trolley	8
7	轴承 6009 Bearing 6009	GB/T276-1994	载重小车 Load trolley	8

8	轴承 51309 Bearing 51309	GB/T301-1995	吊钩 Hook	1
9	轴承 6212 Bearing 6212	GB/T276-1994	吊钩 Hook	6

8.2 易损件明细表

8.2 Wear out parts list

序号 NO.	名 称 Name	规格型号 Spec.	归 属 部 件 Belong part	安 装 位 置 Installation part
1	钢丝绳 Steel wire	6×19S+FC-12.5	起升机构 Hoisting mechanism	卷筒 Coiling drum
2	钢丝绳 Steel wire	6×19S+FC-7.7	变幅机构 Trolleying mechanism	卷筒 Coiling drum
3	滑轮 Pulley	φ330	前臂、塔帽、吊钩、跑车 Jib ,tower cap, hook, trolley	
4	滑轮 Pulley	φ200	前臂 Jib	
5	轴承 Bearing	6009	跑车 Trolley	
6	轴承 Bearing	6212	跑车 Trolley	
7	轴承 Bearing	6212	前臂、塔帽、吊钩、跑车 Jib ,tower cap, hook, trolley	
8	滚轮 Idler wheel		跑车 Trolley	
9	滚轮 Idler wheel		套架 Frame	
10	托轮 Idler wheel		跑车 Trolley	

8.3 整机零部件明细表

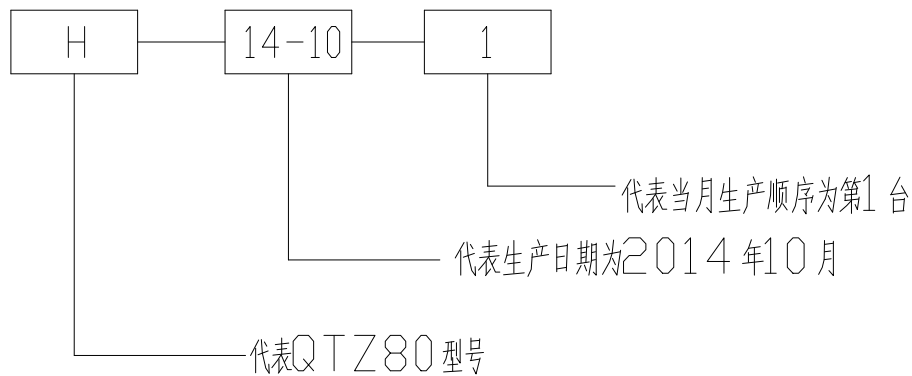
8.3 Machine parts list

序号 NO.	名称 Name	单件重量 (Kg) Weight per unit	数量 Quantity
1	底梁 Beam	969	1
2	标准节 Mast section	844	1

3	套架 Frame	3181	1
4	上转台 Upper turntable	1056	1
5	下转台 Down turntable	1793	1
6	平衡臂 Balanced jib	2318	1
7	平衡重 Counter weight	17615	整体 Whole
8	平衡臂拉杆 Rod of balanced jib	543	1
9	塔帽 Tower cap	1301	1
10	起重臂 Jib	5595	1
11	起重臂拉杆 Rod of jib	1886	1
12	载重小车 Load trolley	403	1
13	吊钩 Hook	267	1
14	附墙架 Anchor tie	1243	1
15	起升机构 Hoisting mechanism	1150	1
16	变幅机构 Trolleying mechanism	220	1
17	回转机构 Slewing mechanism	500	1

8.4 主要结构件的唯一性标识说明

8.4 Only mark of main structure elements



H---Model

14-1----Manufacture date

1---Manufacture order of the month

塔机标识位置:

Tower crane position

1、底梁： 焊在井架（整梁）横梁中部;十字梁焊在长梁中部及半梁与长梁连接处的端部

1. Beam : welding to the frame(whole frame) beam middle, cross beam welded to middle of the long beam and connection end of half beam and long beam.

2、标准节： 焊在爬爪左侧主肢内侧

2. Mast section: welded to left of claw and inside of main frame

3、套架： 焊在油缸侧，左侧主肢最上端 200mm 处

3. Frame: welded to tank side, left main frame top 200mm.

4、下转台： 焊在转台上平面一角

4. Down turntable: welded to a corner of turntable surface.

5、上转台： 焊在转台上平面一角

5. Upper turntable: welded to a corner of turntable surface.

6、旋转塔身： 焊在后侧面左侧主肢下部 300mm 处

6. Turn tower body: welded to back side and main frame bottom 300mm.

7、塔帽： 焊在后侧主肢下部 300mm 处

7. Tower cap: welded to back side and main frame bottom 300mm.

8、拉杆： 焊在拉杆单耳板上

8. Rods: welded to rod single otic placode

9、平衡臂： 焊在前部横梁上面中部

9. Balanced jib: welded to middle upper surface of front beam

10、前杆： 焊在臂根节上

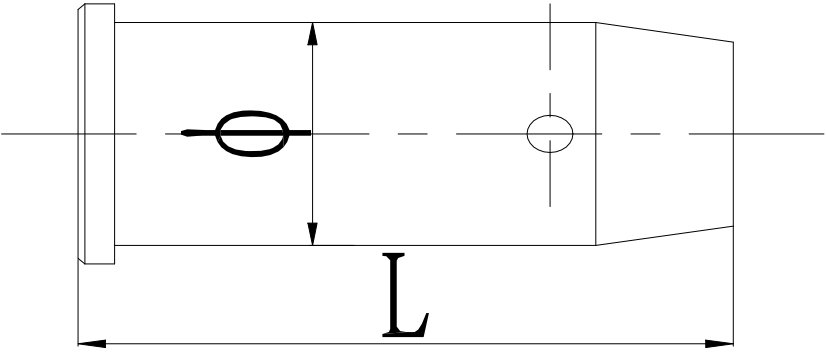
10. Front rod: welded to bottom of jib.

11、跑车： 焊在跑车大横梁上部

11. Trolley:welded to front beam trolley.

8.5 销轴统计表

8.5 Pin data

			
规格 (φ×L) Spec. (φ×L)	数量 Quantity	开口销 Open pin	使用部位 Use part
φ60×180	9	φ10×80	起重臂上弦 principal rafter of jib
φ60×270	8	φ10×80	回转塔身与塔冒及前后臂 Slewing tower body and tower cap, and jib, balanced jib
φ55×180	4	φ10×80	下转台与套架 Down turntable and frame
φ60×180	1	φ10×80	下拉板与拉杆 Down pulling plate and pulling rod
φ60×210	5	φ10×80	上拉板与拉杆、拉板与起重臂 Upper pulling plate and pulling rod, and jib
φ60×120	16	φ10×80	起重臂拉杆间 Between rods of jib
φ60×330	1	φ10×80	塔冒与前臂拉板 Tower cap and jib rods
φ55×330	1	φ10×80	塔冒与后臂拉板 Tower cap and balanced jib pulling plate
φ40×110	12	φ8×60	平衡臂拉杆间 Balanced jib rods

8.6 主要零部件的检查

8.6 Main parts check

8.6.1 结构件的报废及工作年限

8.6.1 Wasted structure elements and working limit

a) 塔机主要承载结构件由于腐蚀或磨损而使结构的计算应力提高，当超过原计算应力的 15%时应予报废。对无计算

条件的当腐蚀深度达原厚度的 10%时应予报废。

a)Due to erosion and wear out of tower crane load bearing part, the calculation performance improved, when it is over the 15% of the original, then it should be scrapped.

b) 塔机主要承载结构件如塔身、起重臂等,失去整体稳定性时应报废。如局部有损坏并可修复的,则修复后不应低于原结构的承载能力。

b)Tower crane main load bearing parts,like the tower body,jib,etc.which should be scrapped when lost stability.If only partial damaged and can be repaired, then the bearing capacity can not be lower than original.

c)塔机的结构件及焊缝出现裂纹时,应根据受力和裂纹情况采取加强或重新施焊等措施,并在使用中定期观察其发展。对无法消除裂纹影响的应予以报废。

c)When there is friction on structure elements and welding part, enhance it or weld it again, according to the stress and friction condition.

8.6.2 钢丝绳

8.6.2 Steel rope

8.4.2.1 钢丝绳的安装、维护、保养、检查机报废应符合 GB/T5972 的规定。

8.4.2.1 Installation, maintenance, and check of steel wire should comply to GB/T5972.

8.4.2.2 钢丝绳端部的固接应符合下列要求:

8.4.2.2 steel wire ends connection should comply to the following requirements:

a) 用钢丝绳夹固接时,应符合 GB/T5972 的规定,固接强度不应小于钢丝绳破断拉力的 85%;

a) Clip the steel rope, comply to GB/T5972, fixed strength no less than 85% of braking force.

b) 用编结固接时,编结长度不应小于钢丝绳直径的 20 倍,且不小于 300mm,固接强度不应小于钢丝绳破断拉力的 75%;

b) Use knot to fix, length of the knot no less than 20 times of the steel wire diameter, and not less than 300mm, fix strength no less than 75% braking force of the steel rope.

c) 用楔形接头固定时,楔与楔套应符合 GB/T5973 中的规定,固接强度不应小于钢丝绳破断拉力的 75%;

c)Fix with wedge shape connection, wedge and the wedge frame should comply to GB/T5973, fix strength no less than 75% braking force of steel rope.

d) 用锥形套浇铸法固接时,固接强度应达到钢丝绳的破断拉力;

d)Use taper shape frame connection, fix strength should reach braking force of steel wire.

e) 用铝合金压制接头固接时,固接强度不应小于钢丝绳破断拉力的 90%;

e) Aluminum alloy pressed connection, fix strength no less than 90% of steel wire braking force.

f) 用压板固接时,压板应符合 GB/T5973 中的规定,固接强度应达到钢丝绳的破断拉力。

f) Use pressed plate for connection, pressed plate should comply to GB/T5973, fix strength should reach braking force of steel rope.

8.6.3 吊钩禁止补焊,有下列情况之一的应予以报废:

8.6.3 Hook welding is forbidden, scrape it in the follow situations:

a) 用 20 倍放大镜检查表面有裂纹;

a)Use 20 time multiply magnifying glass to observe the friction.

b) 钩尾和螺纹部分等危险截面及钩筋有永久性变形;

b) Cross section of hook end and screw cross section, and hook steel deformed permanently.

c) 挂绳处截面磨损量超过其直径的 10%;

c) Wear out of cross section rope hanging part is more than 10%.

d) 心轴磨损量超过其直径的 5%;

d) Wear out of axis over 5% of diameter

e) 开口度比原尺寸增加 15%;

e) Openness bigger than 15% of the original size.

8.6.4 卷筒和滑轮有下列情况之一的应予以报废：

8.6.4 Scrap the coiling drum and pulley under the following situations:

- a) 裂纹或轮缘破损；
- a. Friction or wheel frame damage
- b) 卷筒壁磨损量达原壁厚的 10%；
- b. Wear out of coiling drum wall reach 10% of original.
- c) 滑轮绳槽壁厚磨损量达原壁厚的 20%；
- c. Wear out of pulley rope groove reach 20% of original.
- d) 滑轮槽底的磨损量超过相应钢丝绳直径的 25%。
- d. Wear out of pulley bottom over 25% of the corresponding steel wire diameter.

8.6.5 制动器零件有下列情况之一的应予以报废：

8.6.5 Scrap the brake device under the following situations:

- a) 可见裂纹；
- a. Visible friction
- b) 制动块摩擦衬垫磨损量达原厚度的 50%；
- b. Wear out of brake block gasket reach 50% of the original thickness.
- c) 制动轮表面磨损量达 1.5mm-2mm；
- c. Braking wheel surface erosion reach 1.5mm-2mm,
- d) 弹簧出现塑性变形；
- d. Plastic deformation of spring
- e) 电磁铁杠杆系统空行程超过其额定行程的 10%。
- e. Electromagnetic lever system empty journey over 10% of rated journey.

8.6.6 车轮有下列情况之一的应予以报废：

8.6.6 Scrap the wheel under the following situation:

- a) 可见裂纹；
- a. Visible friction
- b) 车轮踏面厚度磨损量达原厚度的 15%；
- b. Stamping surface of the wheel reach the 15% of original.
- c) 车轮轮缘厚度磨损量达原厚度的 50%。
- c. Wear out of wheel frame reach 50% of original.

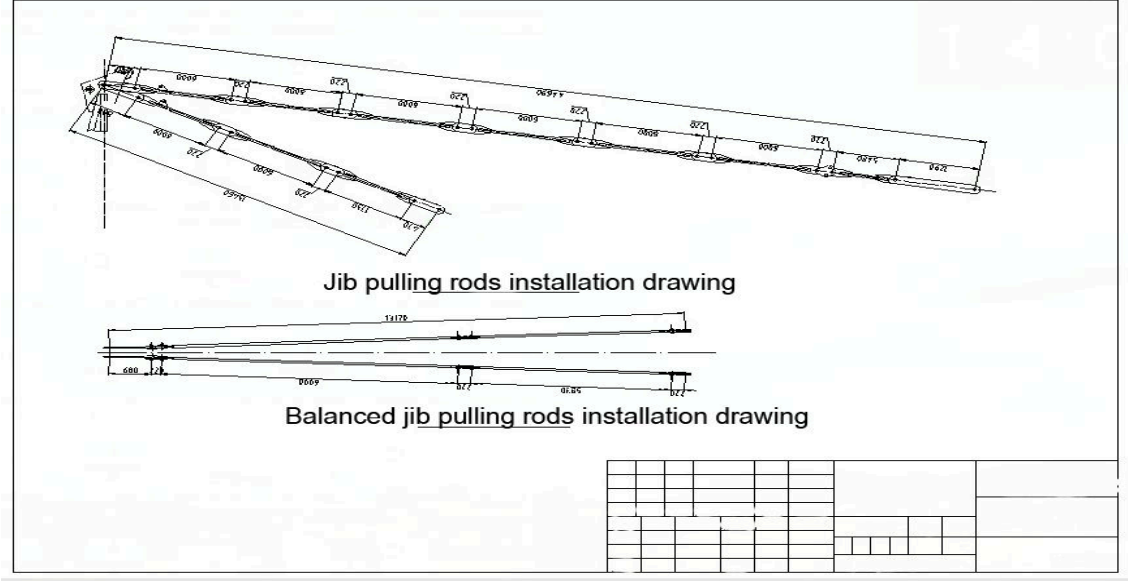
8.6.7 塔机在安装、增加塔身标准节之前应对结构件和高强度螺栓进行检查，若发现下列问题应修复或更换后方可进行安装：

8.6.7 Before the installation of tower crane and adding of mast section, check the structure part and enhanced bolts, repair or change it under the following situations:

- a) 目视可见的结构件裂纹及焊缝裂纹；
- a. Visual structure part friction and welding friction.
- b) 连接件的轴、孔严重磨损；
- b. Severe wear out of connecting axis, and hole.
- c) 结构件母材严重腐蚀；
- c. Severe erosion of structure materials.
- d) 结构件整体或局部塑性变形，销孔塑性变形。
- d. Whole structure part or part deformation, and pin hole plastic deformation.

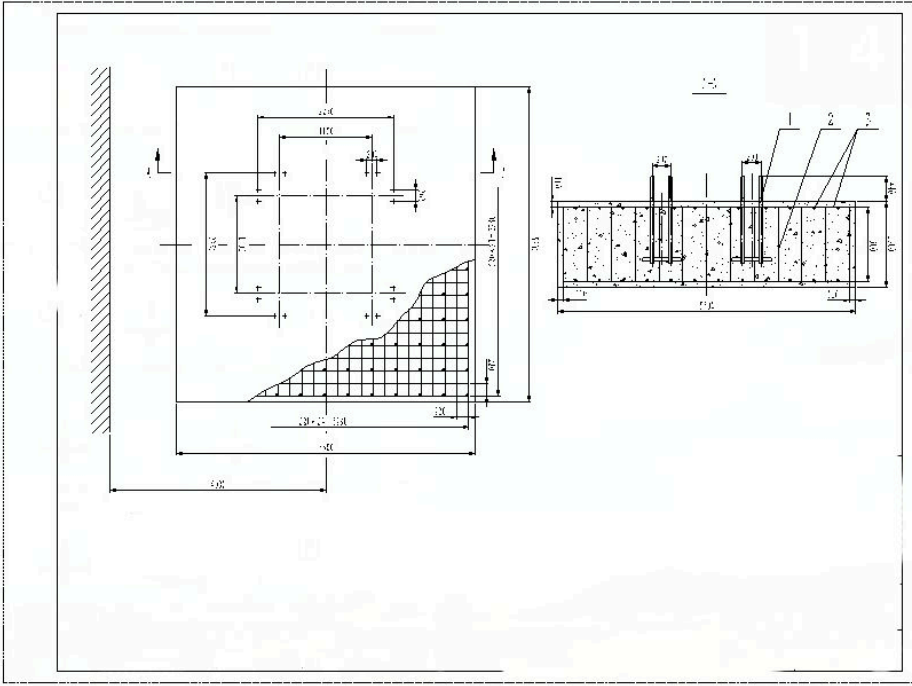
8.7 拉杆图

8.7 Pulling rod diagram



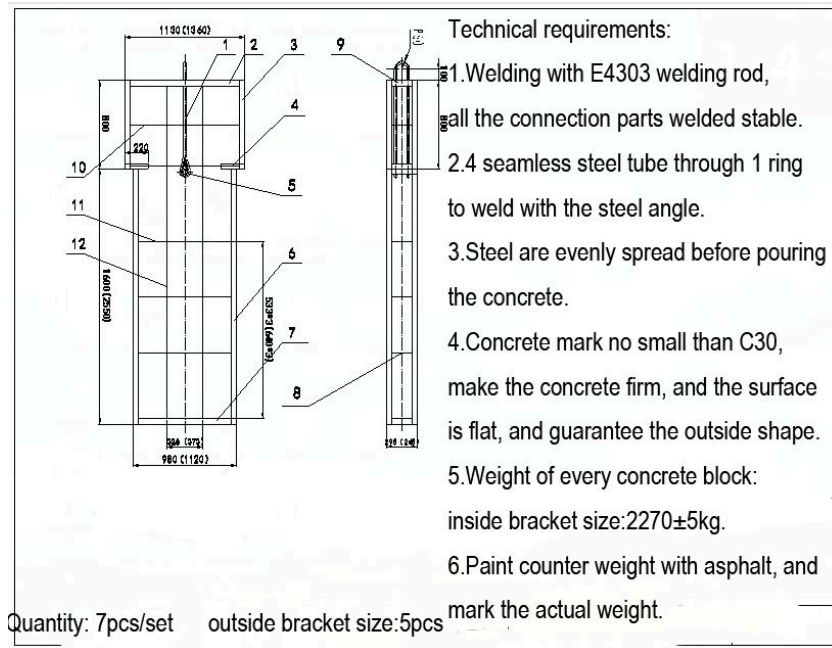
8.8 基础图

8.8 Foundation diagram



8.9 配重图

8.9 Counter weight diagram



附件： Attachment

《建筑机械与设备高强度紧固件技术条件》(JG/T5057、40-1995)规定了高强螺栓的使用要求，望各塔机用户执行。<<Technical conditions of construction equipment high strengthened fixtures>> (JG/T5057、40-1995) rules on usage of high strengthened bolts, should obey strictly.

一、 我公司生产的塔机使用高强螺栓的情况： Usage conditions of our tower cranes

1、10.9 级螺栓、10 级螺母及 300HV 平垫圈： 10.9 grade bolts, 10 grade nuts and 300HV flat washer:

使用于：塔身连接；回转支承与上下转台连接；旋转塔身与上下转台连接；起重臂间连接等受力部位。

Are used: connection of tower body, joint of slewing bearing and upper, lower turntables, connection of slewing body and upper, lower turntables, connections of hoisting jibs and other stressed parts.

2、8.8 级螺栓、9 级螺母及 300HV 平垫圈： 8.8 grade bolts, 9 grade nuts and 300HV flat washer:

使用于：变幅机构及其电机、减速机、轴承架固定；起升机构及其电机、减速机、轴承架固定等机构部位。

Are used: fastening of trolleying mechanism, motors, reducers, bearing supports; hoisting mechanism, motors, reducers, bearing supports

二、 高强螺栓预紧力及预紧扭矩要求： Requirement of high strengthened bolts pre-tighten force and torque:

螺栓性能等级 grade of bolts performance	8.8		10.9	
项目 item	预紧力(N) pre-tighten force	预紧扭矩(N.m) pre-tighten force	预紧力(N) pre-tighten force	预紧扭矩(N.m) pre-tighten force
螺 栓 规 格 specification				
M14	52500	120	74000	170
M16	73000	190	102000	265
M18	88000	260	124000	365

M20	114000	370	160000	520
M22	141000	500	199000	700
M24	164000	640	230000	900
M27	215000	950	302000	1350
M30	262000	1300	368000	1800
M36	328000	2000	538000	2800

共 2 页 第 1 页

三、使用注意事项 Attentions:

1、日常检查: Daily check

在第一次安装完成后立即重新检查紧固,以后每班检查。使用 100 小时之后应普遍的均匀的检查拧紧,以后至少 300 小时紧固一次。在检查紧固中如发生螺母、螺栓松动或有螺纹部分损伤,应立即拧紧或更换螺母或螺栓。(检查螺栓时注意紧固件的变形情况)。

After first installation, should check the fixture immediately and check daily when use. After 100 hours, should check all fixtures, at least fasten one time per 300 hours. During the check of fixture, if some nuts or bolts relax or screw thread broke down, should fasten or change nuts or bolts.(when check bolts, should pay attention to deformation conditions of fasteners).

2、关于重复使用: About reuse:

高强度螺栓、螺母使用后拆卸下再次使用,一般不得超过二次。且拆下的螺栓、螺母必须无任何损伤、变形、滑牙、缺牙、锈蚀、螺纹粗糙度变化较大等现象。否则禁止再用于受力结构的连接。

After be dismantled, high strengthened bolts and nuts, can't be used more then 2 times. All bolts and nuts shouldn't have any damage, deformation, screw loose, lack screws, robots or screw threads become larger. If have the above conditions, shouldn't be used on the joint of stressed parts.