

®



# 电动单梁起重机

Electrical Single Beam Crane

## 说明书

Instructions

WEI H

卫华集团 · 河南卫华重型机械股份有限公司  
WEI HUA GROUP · HENANWEIHUA HEAVY MACHINERY CO.,LTD

# 目 录

## catalogue

一、概述 Brief Instruction .....	1
1. 主要用途 main use .....	1
2. 适用范围 applicable scope .....	1
3. 环境条件 environment condition .....	1
4. 噪声 noise .....	2
二、起重机的结构和性能参数 Structure and performance parameter .....	2
1. 桥架 Loading bridge .....	2
2. 运行机构 traveling mechanism .....	3
3. 起升机构 lifting mechanism .....	3
4. 电气系统 electric system .....	3
5. 操纵形式 operation style .....	3
三、起重机的基本型式 Basic type of crane .....	4
1. 型式 type .....	4
2. 型号表示方法 type representation .....	4
3. 标记示例 mark example .....	4
4. 起重机基本参数 basic parameter of crane .....	5
5. 技术参数 technical parameter .....	5
四、起重机的安全及防护装置 Safety device .....	6
1. 安全制动装置 safety brake device .....	6
2. 轨道端部止档及缓冲器 stopper at end of track and buffer .....	7
3. 限位器 limitator .....	8
4. 安全 safety .....	8
5. 运行极限限制器 run limit limitator .....	8
6. 电动机安全保护 safety protection of motor .....	9
7. 失压保护 no-voltage protection .....	9
8. 错相保护 alternate phase protection .....	10
9. 紧急断电保护（紧急开关） emergent power off protection .....	10
10. 过电流保护和零位保护 over current protection and zero position protection .....	10
五、电气安全规则 Safety regulation of power control .....	10
1. 电气设备的安全技术要求 safety technical requirement of electric equipment .....	10
2. 电器线路安全要求 safety requirement of electric appliance circuit .....	11
六、起重机的安装与调试 Installation and adjustment of crane .....	12
1. 安装准备及注意事项 preparation before installation and notice .....	12
2. 安装时的安全要求 safety requirement of installation .....	12

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3. 桥架组装 main beam connected .....	13
4. 桥架组装完成后的质量要求 quality requirement .....	14
5. 安装架设方法 installation method .....	14
6. 轮缘内侧与轨道间隙 the space between inside of rim of wheel and rail .....	15
7. 司机室的安装 installation of Cab .....	15
七、电气系统安装 Installation of electrical system .....	16
八、电控系统的检查和调整 Examination and adjustment of electric control system .....	19
九、起重机的运转试验 Run test of crane .....	20
1. 试车前的准备和检查 preparation and test before trail run .....	20
2. 无负荷试验 test with no load .....	20
3. 负荷试验 loading test .....	21
十、起重机的检修与维护 Examination and maintenance of crane .....	22
1. 日检 daily check .....	22
2. 月检 monthly check .....	23
3. 年检 annual examination .....	31
十一、起重机的润滑 Lubrication of crane .....	37
1. 起重机设备各润滑点分布如下 every lubrication point distributes as follows .....	37
2. 润滑注意事项 notice of lubrication .....	37
十二、起重机常见故障及处理 Usual troubles and adjustments .....	38
十三、起重机的安全操作规程 Safe operation regulation of crane .....	43
1. 起重机的操作 operation of crane .....	43
2. 安全操作规程 safe operation regulation of crane .....	46
十四、标志、运输和储存 Marks,transport and storage .....	48
十五、电路图 Circuit diagram .....	51



请在安装、使用前仔细阅读使用说明书，并严格按照有关安全操作规程进行作业。

Please read operation instruction carefully before installation and use and work strictly according to the relevant safety operation regulation.



## 一、概述 Brief Instruction

本说明书适用于 LD 型电动单梁起重机的安装、使用和维护，供安装、操作和维修人员使用。

This instruction is appropriate for LD model electrical single beam crane's installation, use and maintenance at attendants' disposal.

### 1. 主要用途 main use

LD 型电动单梁起重机（以下简称起重机）是按 JB/T1306-2008 标准设计的与 CD1、MD1 等型式的电动葫芦配套使用的空间运输工具，主要作用是以间歇、周期的工作方式，通过起重吊钩或其它取物装置及时、迅速地完成任务的位移，是现代工业企业中实现生产过程机械化、自动化，减轻繁重体力劳动、提高劳动生产率的重要工具和设备。

LD model electrical single beam crane (Briefly Crane), a space transport tool, is designed and produced according to JB/T1306-1994 standard and used with model CD1、MD1 electric hoist. It can complete objects' displacement quickly and timely by hoisting hook and other devices in an interval and periodical way. It is indispensable facility and device to realize mechanization and automation in produce procedure and ease heavy physical labor and improve efficiency in manufacturing.

该产品因具有结构紧凑、刚性好、操作灵敏、噪音低、无污染、安全可靠、造型美观等优点，广泛应用于机械制造、装配、仓库、电站、料场等场所。

The products are widely used in machinery manufacture, assembling sites, warehouses and materials sites etc because of their characteristics of tight structure, strong rigidity, delicate operation, low noise, no pollution, safety and reliability and beautiful exterior.

### 2. 适用范围 applicable scope

LD 型起重机适用于在工作级别 A3~A5，工作环境温度 -25℃~+40℃，相对湿度 ≤85% 的无易燃、易爆危险及腐蚀性介质环境条件下工作。

The product applies to such an environment as no fire, no explosive danger and no corrosive media exist. And the work system is between A3 and A5, the temperature is between 25℃ below zero and 40℃ up zero, the wetness is no higher than 85%.

禁止吊运熔化金属、有毒物品及易燃易爆物品。

It is banned to lift melted metals, poisonous, combustible and explosive objects.

### 3. 环境条件 environment condition

(1) 起重机的电源为三相交流，额定频率为 50Hz，额定电压为 380V（如电源电压、频率与此规定不同时，应在订货时注明使用地的电源电压和频率），电动机和电器控制设备上允许电压波动的上限为额定电压的+10%，下限（尖峰电流时）为额定电压的-15%。起重机内部电压损失为 5%。

The power source of crane is 3-phase alternating current, 50Hz frequency and 380V voltage (give clear indication of the power source voltage and frequency when has an order if power source voltage is different from above). The upper limit of allowable voltage fluctuation of motor and electric control device is at +10% of rated voltage and the lower limit is at -15% of rated voltage. The voltage loss of crane inside is 5%.



(2) 吊运物品对起重机吊钩部位的辐射热温度不超过 300℃。

The radiation temperature of lifted object towards hook part is no more than 300℃.

(3) 环境温度不超过+40℃，在 24h 内平均温度不超过+35℃。

The environment temperature is no more than +40℃,The average temperature is no more than +35℃.

#### 4. 噪声 noise

起重机在非密闭性厂房内，无其它噪声干扰和起升高度不小于 5m 的情况下，在地面上测量，其整机噪声不大于 85 dB (A)。

The noise should be  $\leq 85$ dB (A) when there is no other noise and lifting height is no more than 5M in non-tightness workshop.

## 二、起重机的结构和性能参数 Structure and performance parameter

起重机的结构主要由三部分组成：桥架、电动葫芦和电气系统（见图 2 及随机图）。

The crane is comprised of loading bridge, electric hoist and electric system. (See diagram 2 and stochastic diagram)

桥架用来支承和纵向移动载荷，由金属结构和运行机构组成。金属结构包括主梁、端梁及主、端梁连接三部分。运行机构由驱动装置、传动装置、制动装置和车轮组四部分组成。电动葫芦承担升降和横向移动载荷。电气系统由主回路和控制回路组成。

Loading bridge used to bear and remove loads longitudinally is comprised of metal structure parts and traveling mechanism.

Metal structure consists of main beam, end carriage and connection parts of main beam and end carriage.

Traveling mechanism consists of drive unit, gearing, brake equipment and wheel group.

Electric hoist can lift, lower and remove loads laterally.

Electric system is comprised of main loop and control loop.

### 1. 桥架 loading bridge

主梁由冷弯压制的 U 型槽钢与工字钢组焊成实腹梁或用钢板组焊成箱形梁。端梁为 U 型槽钢组焊成箱形结构，主、端梁之间采用螺栓加抗剪凸缘连接结构或座式结构，安装方便，便于运输储存。

The main beam is made of the steel board pressed and lengthened to be "U" shape. Then it is welded with I-steel together to form the beam of case shape. The crossbeam is made in the same way. For the characteristic of usage is dependable. The main beam and the cross-beam are connected in steely way and fixed with the bolts of the high strength adopting connection structure or seater structure. It is convenient to transport, store and install.

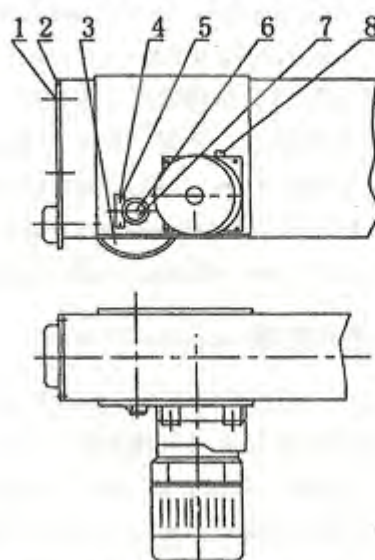


图 1 运行机构 Traveling mechanism

1. 螺栓 bolts
2. 盖板 cover board
3. 车轮 wheel
4. 螺栓 bolts
5. 轴挡板 shaft blocking plate
6. 油杯 oil bottle
7. 车轮轴 wheel shaft
8. 油塞 oil plug



## 2. 运行机构 traveling mechanism

运行机构采用分别驱动形式（见图 1），驱动、制动靠锥形转子电动机来完成，其优点是能减轻因车轮歪斜跑偏造成的啃道磨损，不易出现车轮爬轨掉道故障。

The mechanism adopts separately drive style (see diagram 1) . It drives and brakes by cone rotation motor. The advantage is that it can reduce wear because of the sliding wheel and doesn't go out of order easily.

运行速度 (m/min): 地面操作一般为 20、30; 司机室操作为 30、45、60。起重机设计有单速和双速及变频调速等型式，一般情况下按单速制造，用户如需其它调速方式时，应在订货合同中予以注明。

Traveling speed: operated on the ground 20m/min, 30m/min; operated in the hall, 30m/min, 45m/min, and 60m/min. There are three forms designed: single speed, double speed and frequency control of motor speed. If other, it should be indicated in order contract.

## 3. 起升机构 lifting mechanism

起重机安装电动葫芦组成起升机构，可起升吊运重物，并可沿主梁横向移动。

Electric hoist can be installed to make up lifting mechanism and can lift heavy things and move along the main beam.

## 4. 电气系统 electric system

电动葫芦的起升运行电动机采用起动力矩较大的锥形转子电动机，以适应起重机断续工作中频繁的直接启动。起升电动机有两种型式，ZD 型为单速电机，ZDS 型为双速电机，其常速和慢速之比为 10:1。

起重机的操纵通过按动按钮开关（手电门），使接触器的触点接通或切断电动机的电源。其主回路和控制回路电气元件少，线路简单，使用维护方便。

The conic motor with large tractive force is employed to comply with the frequent direct traveling during course of working discontinuously. CD1-model is equipped with ZD-style single speed motor and MD1 with ZDS-style double speed motor. The difference between the usual speed and the low speed is 10:1.

The crane is operated by pressing the button switch to make the contact of connection put through or cut off power source of motor. The main circuit and control circuit's electric component is very little and is convenient to use and protect.

## 5. 操纵形式 operation style

(1) 地面操纵：操作人员于地面控制手电门按钮，控制起重机进行吊载作业。起重机运行速度  $\leq 30\text{m/min}$ 。

Ground control: operating crew controls button switch on the ground to control crane. The traveling speed is no more than 30m/min.

(2) 司机室操纵：操作人员于司机室内控制按钮或控制器，控制起重机进行吊载作业。起重机运行速度  $\geq 30\text{m/min}$ 。司机室按开门方向分为侧开门司机室（适用于单跨车间）和端开门司机室（适用于双跨车间）。司机室还有开放式和封闭式两种型式，供用户根据需要进行选择。

Cab control: operating crew control buttons in Cab to control crane .The traveling speed is more than 30m/min. The driver room presses to open the door the direction is divided into a side to open the door driv-

er room (be applicable to a list to across a car) and carry the driver room of opening the door. (be applicable to a double to across a car) The driver room still has the open type and shut type two kinds of patterns, providing customer according to need to carry on a choice.

(3) 遥控操纵：操作人员手持遥控器控制起重机进行吊载作业。

Remote control: operating crew take hold of the remote controller to control the crane.

### 三、起重机的基本型式 Basic type of crane

#### 1. 型式 type

(1) 电动葫芦小车在主梁下翼缘运行，电动葫芦布置在主梁下方的起重机，其产品代号为 LD；

The code name of the kind that trolley of electric hoist travels along the lower edge of main beam and electric hoist is disposed below of that is LD.

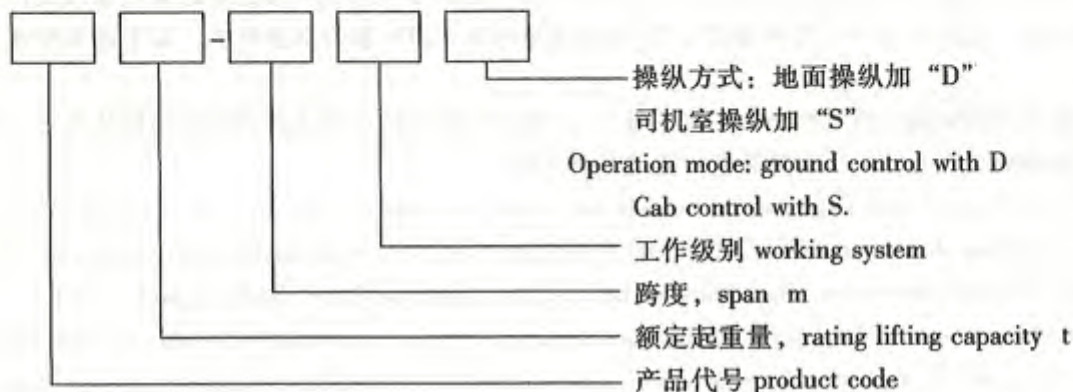
(2) 电动葫芦安装在角形小车上的起重机，其产品代号为 LDP；

The code name of the kind that electric hoist is installed on angle type trolley is LDP.

(3) 电动葫芦小车在主梁下翼缘运行，电动葫芦布置在主梁侧面的起重机，其产品代号为 LDC。

The code name of the kind that trolley of electric hoist travels along the lower edge of main beam and electric hoist is disposed at side of that is LDC.

#### 2. 型号表示方法 type representation



#### 3. 标记示例 mark example

a. 额定起重量 5t，跨度 16.5m，工作级别 A5，地面操纵的 LD 型起重机，标记为：LD 5-16.5 A5 D

LD type crane with ground control, Lifting capacity 5t, span 16.5m, degree of work A5 showing method: LD 5-16.5 A5 D

b. 额定重量 5t，跨度 22.5m，工作级别 A5，司机室操纵的 LDP 型起重机，标记为：LDP 5-22.5 A5 S

LDP type crane with Cabcontrol, Lifting capacity 5t, span 22.5m, degree of work A5 showing method: LDP 5-22.5 A5 S

c. 额定起重量 3t，跨度 13.5m，工作级别 A5，地面操纵的 LD (LDC) 型起重机，标记为：LDC 3-13.5 A5 D

LDC type crane with ground control, Lifting capacity 3t, span 13.5m, degree of work A5 showing method: LDC 3-13.5 A5 D



#### 4. 起重机基本参数 basic parameter of crane

- (1) 起重机的额定起重量: 1~20t; Rated lifting capacity: 1~20t
- (2) 起重机的跨度: 4~31.5m; Span: 4~31.5m;
- (3) 起重机的起升高度: 6~30m; Hoisting height: 6~30m
- (4) 起重机各机构工作速度见表 1。Working speed of each mechanism

表 1 起重机各机构工作速度 Working speed of each mechanism

机构类别 mechanism type	操纵方式 operation method	
	司机室操纵 Cabcontrol	地面操纵 ground control
起重机运行机构 traveling mechanism of crane	20、30、45、60	20、30
小车运行机构 Traveling mechanism of trolley	20、30	20、30
起升机构 Lifting mechanism	参见葫芦说明书 Refer to electric hoist instruction	参见葫芦说明书 Refer to electric hoist instruction

#### 5. 技术参数 technical parameter

外形结构图见图 2 Outer shape drawings (see diagram 2)

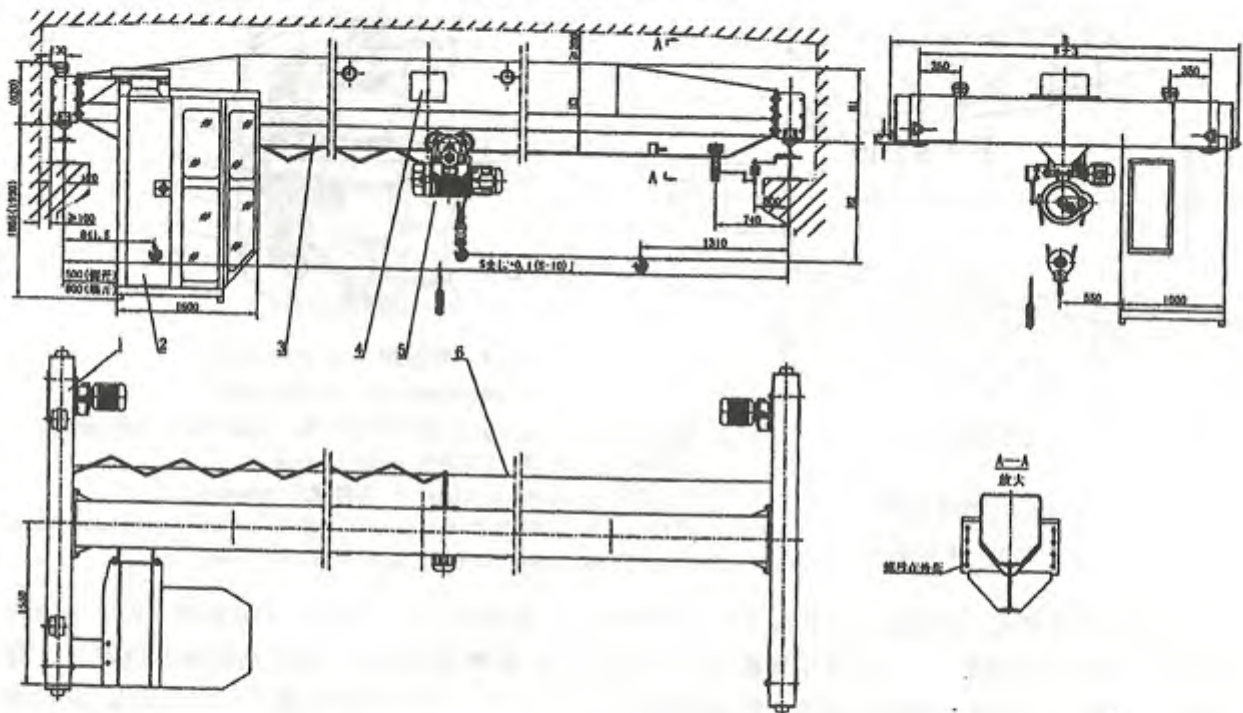


图 2 外形结构图 (安装有司机室) Exterior structure diagram (with operation room)

1. 端梁装置 end carriage 2. 封闭式司机室 cab 3. 主梁 main beam 4. 吨位牌 tonnage brand
5. 电动葫芦 electric hoist 6. 输电装置 electric power transmission device

性能参数表及产品规格参数表 Main Technical Data & specification parameter table (见随机资料图纸)。



## 四、起重机的安全及防护装置 Safety device

为了保证起重机的安全运行，在设计制造时已为起重机配置了相应的安全防护装置，且灵敏可靠，为用户的安全使用，提供了可靠保障。

To ensure safety traffic, the crane deploys relevant safe protection device when design and it is very flexible and reliable and provides reliable guarantee.

### 1. 安全制动装置 safety brake device

锥形制动器：锥形制动器是与锥形电动机融为一体的机构，其制动原理为（见图3）：当电动机接通电源时，电动机定子与转子之间产生电磁力  $F$ ，由于定转子为圆锥形表面，所以  $F$  力相对于圆锥面可分解为径向分力和轴向分力；转子与定子之间气隙均匀且磁力对称，径向分力相互抵消。

Cone type brake: cone type brake and cone type motor is a merging mechanism. It has function of drive and brake on electric hoist. Its brake principle is: when motor puts through the power source. Electromagnetic force  $F$  gives birth between rotor and stator of motor. Because of the cone surface of rotor and stator,  $F$  force is divided into radial component force and axial component force. When the normal work space is uniform between rotor and stator and the electromagnetic force is very symmetrical, radial component force cancels out.

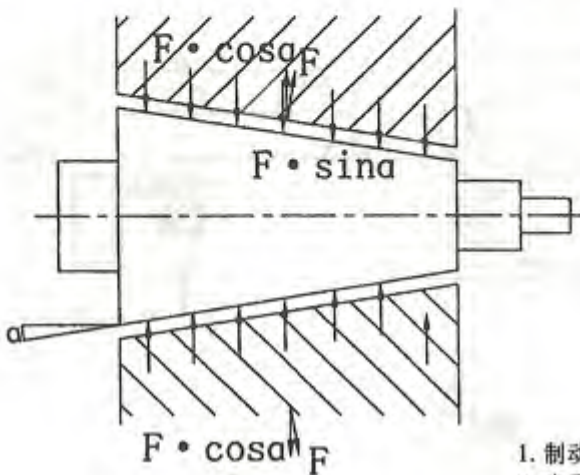


图3 制动原理  
principle of braking

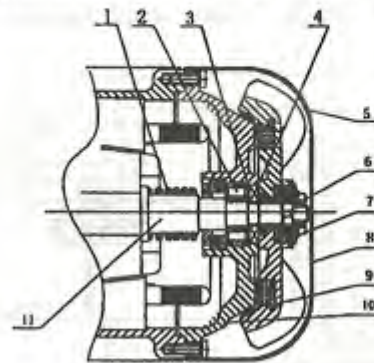


图4 锥形转子制动电动机  
cone-type rotor brake motor

1. 制动弹簧 brake spring
2. 缓冲碟形弹簧 cushion dish-spring
3. 支承圈 support
4. 推力轴承 thrust bearing
5. 风扇制动轮 fan brake wheel
6. 调整螺母 adjust nut
7. 螺钉 screw
8. 风扇罩 fan cover
9. 锥形制动环 conic brake wheel
10. 后端盖 back-end cover
11. 电动机轴 motor shaft

从图4可以看出，在轴向力的作用下，电动机轴11、轴端螺钉7、螺母6及风扇制动轮5一起向右移动，同时压缩弹簧1，此时制动摩擦环9与后端盖10的摩擦面脱离。当电动机断开电源时，磁力消失，轴向力也消失，弹簧1伸张，使电动机轴11向左移动，同时制动摩擦环9与后端盖10的摩擦面紧密接触，达到制动的目的。

It can be seen from diagram 4 that axis of motor 11, bolts of end of axis 7, nuts 6 and fan brake wheel 5 move right together under the action of axial component force, at the same time, compress the spring 1, brake friction ring 9 is remove from the friction surface of behind cover 10. When motor cuts off the power source, the electromagnetic force disappears and axial component force also disappears. The spring 1 promotes make axis of motor 11 move right. At the same time, brake friction ring 9 and the friction surface of



behind cover 10 contact tightly to realize the object of brake.

制动器调整时，先将轴端螺钉 7 拆下，再旋转锁紧螺母 6，调整后要试车观察电动机轴的窜动量，一般窜动量在 1.5mm 为宜。当反复调整，载荷下滑距离仍达不到要求时，应检查制动摩擦环是否已达到报废标准。当制动摩擦环磨损达原厚度的 50% 或磨损量超过了电机轴允许的最大调整量时，即应更换锥形制动环 9。

When adjust the brake, first pull out bolts of end axis 7, then rotate and lock nuts 6, observe drunkenness of axis of motor. The drunkenness is generally 1.5mm. When adjust repeatedly, the glide range of load still does not meet the requirement, check the brake friction ring worn out more than 50% of former thickness or more than max adjustment quantity, the cone brake ring 9 should be replaced.

起重机运行机构的制动器及电动葫芦的运行小车，一般也都采用锥形制动电动机，其制动原理、使用调整均与载荷制动器相同。

Brake of traveling mechanism and trolley of electric hoist generally adopts cone brake motor. And its brake principle and operation are as same as load brake.

## 2. 轨道端部止档及缓冲器 stopper at end of track and buffer

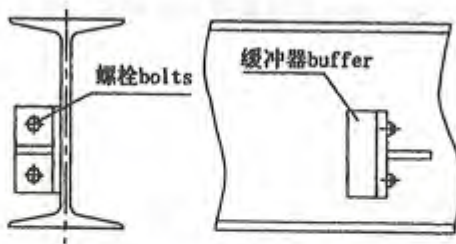


图 5 小车端部止挡  
Backstop at end of track trolley

轨道端部止档是为防止起重机从轨道两端出轨而设置的安全装置。轨道端部止档要求安装必须牢固可靠，能有效防止起重机的脱轨。

Stopper at end of track is a safety device protecting crane from deviating from two ends of track. It is required that installation should be tight and reliable to protect crane from deviating.

电动葫芦运行的工字钢轨道的两端也设有端部止档（见图 5），其位置、高度与电动葫芦的运行小车相适应。小车端部止档上装有橡胶材料的缓冲器。

There are backstop at two ends of I type track which electric hoist travels on. (see diagram 5). Its disposition and height should be adapt to trolley of electric hoist.

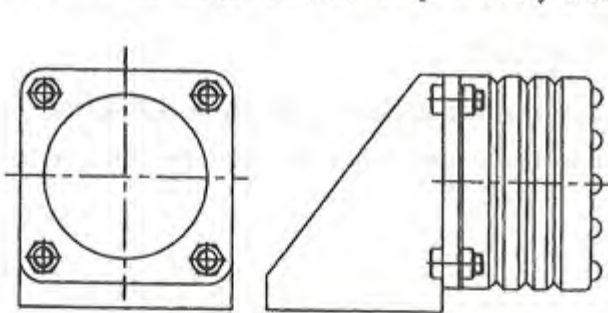


图 6 聚氨酯缓冲器  
Polyurethane buffer

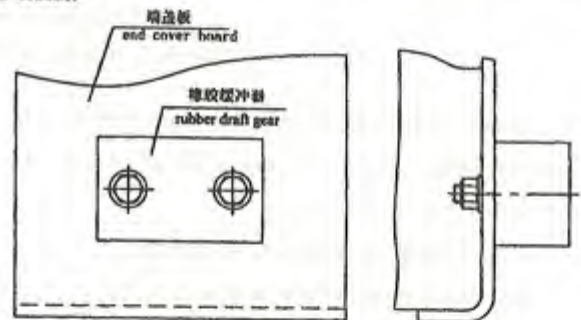


图 6 橡胶缓冲器  
Diagram 7 rubber draft gear

大车端梁的两端装设有聚氨酯或橡胶缓冲器（见图 6、图 7），且端梁上设有行程开关（见图 8），保证大车在切断电源的情况下与车挡相接触而停止运行。

There are polyurethane or rubber draft gear (see diagram 6, diagram 7) and travel switch on the end carriage (see diagram 8) to ensure it contact with bumping post to stop when the crane cuts off the power source.



### 3. 限位器 limiter

上升限位器是保证当吊具起升到上极限位置时，能自动切断起升电源，立即停止起升动作，然后只能向相反的方向运转。上升限位器对起重机的安全运行关系重大，它若失灵将会导致严重事故，所以月检、年检以及日常检查都必须认真检查该机构。检查时，以空载状态起升吊具至上极限位置，电动葫芦能自动停止起升动作即为良好状态。平时使用时绝对不能用上升位置限制器作为停车开关使用。

Upward limiter assures that when load is lifted to upper limit, it can cut off the power source automatically and stop the lifting action, then run at the opposite direction. Upward limiter is important for crane's safe traffic. If it has failure, may brings sever accident, so careful check is needed in each daily check, monthly check and annual examination. It is in good working order that electric hoist can stop lifting action automatically when load is lifted to upper limit with empty load. It is forbidden using upward limiter as shut down switch.

### 4. 安全 safety

(1) 司机室操纵的起重机，进入司机室的门和司机室到桥架上的门设有电气联锁保护装置，当其中任何一个门打开时，开关触头也打开，起重机断电停车。

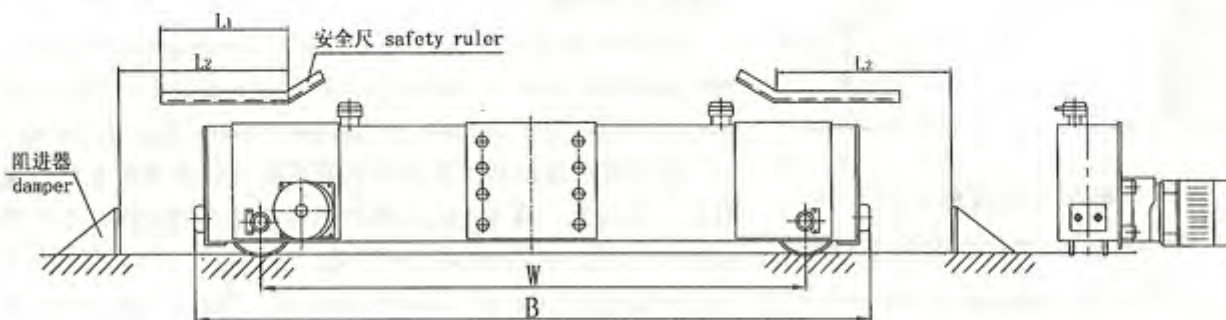


图8 阻进器和安全尺  
diagram 8 damper and safety ruler

Crane with Cab control, there are electric chain protection device at door of Cab and door from Cab to loading bridge. When any one of doors is open the switch contact is also open, at this time, the crane cut off the power source and stop.

(2) 司机室内设有电铃或警报器。

There are electric bell or siren in Cab.

(3) 当采用联动控制台时，零挡位明显且备有零位自锁，其手柄的操纵方向与起重机和小车的运行方向一致。

When adopt linkage control operation, position of zero is obvious. Its operation direction of handle is the same as crane and trolley run direction.

### 5. 运行极限限制器 run limit limiter

运行极限位置限制器是由行程开关与安全尺组成（见图8），行程限位开关安装在起重机上（大车行程开关安装在端梁上），安全尺则安装在承轨梁（主梁）或墙壁上且不妨碍起重机运行。当起重机



运行到离轨道端部止档一定距离时，如果因某种原因没有断电制动，则安全尺碰上行程开关的触头，起重机会自行断电制动。

Run limit limiter consists of travel switch and safety ruler (see diagram 8). Travel switch is installed on crane, safety ruler is installed on main beam or wall. When the crane travels at some distance from back-stop of the end of rail, the ruler will be up against contact of travel switch and the crane will cut off power source automatically if the crane does not cut off power source for some reason.

运行极限位置限制器是保证起重机安全运行的重要装置，不得自行拆除，必须保持其动作灵敏可靠。

Run limit limiter is an important device assuring safety traffic of crane. It is forbidden to dismantle at random and should keep action flexible and reliable.

表 2 安全尺尺寸表 safety ruler dimension table

操纵形式 operation type	地面操纵 Ground control						司机室操纵 Cab control		
	20			30			45	60	75
V 运行 (m/min)									
W (mm)	2000	2500	3000	2000	2500	3000	2000	2500	3000
B (mm)	2500	3000	3500	2500	3000	3500	2500	3000	3500
L1	350	350	350	500	500	500	1200	1200	1200
L2	900	900	900	1050	1050	1050	1750	1750	1750

## 6. 电动机安全保护 safety protection of motor

起重机的起升、运行电动机是采用带有法兰盘的鼠笼式全封闭电动机，大车运行电动机多数也采用鼠笼式电动机，在运行速度大于 45m/min 时，选用绕线式电动机。通过按动按钮开关，使接触器的触点接通或切断电动机的电源。其主回路与控制回路电气元件少，线路简单，使用和维护也简单方便。操纵按钮开关具有机械连锁保护，保证按动起升时，不能按动下降开关，而控制回路的接线也有电气连锁，即保证不能同时接通上升和下降。由于有这样的连锁保护措施，电动机只能接通一个方向的旋转，从而是安全的。

The lifting motor, traveling motor adopt squirrel cage whole sealing motor. Crane traveling motors also adopt squirrel cage motor. Only if the run speed is more than 45m/min, we can adopt winding thread type. The electric contacts put through or cut off the power source through pressing buttons. Operation button switch has mechanism chain protection to ensure that when press rising button, falling button is forbidden. And control circuit also has electric chain assuring that cannot put through rising and falling. Because of this kind of protection method, motor can only put through only one direction rotation, it is very safe.

## 7. 失压保护 no-voltage protection

起重机所使用的电动机均不能在电源电压低于额定电压值的 90% 以下使用。因电动机的转矩与电压的平方成正比，当电压稍有下降，则转矩就降低很多。如果负载不变，电动机即是在超负荷情况下运转，时间一长有可能烧坏电动机。因此电动机电源的接通与切断都要通过接触器来实现。接触器具有失压保护的作用，当遇有停电或电压过低时，接触器铁芯磁力过小，接触器合不上闸（或掉闸），从而达到自动停车。当电源电压恢复正常时，电动机不能自行启动，仍需按动按钮开关使接触器触点闭合才能启动电动机。接触器的失压保护作用可防止意外事故的发生。

All the motors of crane cannot be used below 90% of rating voltage. Torque of motor is proportional to



square of voltage, so when voltage falls slightly, torque fall a great many. If the load is constant, motor runs under the condition of overloading and can be ruined for the long time. So to put through or cut off power source of motor all should be through connection. Connection has no-voltage protection function. And its function can avoid occurrence of accident.

#### 8. 错相保护 alternate phase protection

为了避免电动葫芦因维修后重新接线时错相相接, 发生意外和事故, 而增加了综合保护器, 提示重新改变相序。

To avoid wrong phase to connect, add electromotor protector to prompt to change phase sequence.

#### 9. 紧急断电保护 (紧急开关) emergent power off protection

起重机紧急断电保护, 是利用装设在司机室内操作位置方便的紧急开关来实现的。其作用主要是在事故发生或紧急情况下用来切断连锁保护电路, 因此不允许用紧急开关代替正常操作和断电开关使用。

Emergent power off protection is realized through emergent switch installed in operation room. Its function is to cut off circuit at emergency, so it is forbidden using emergent switch instead of normal operation and power off switch.

#### 10. 过电流保护和零位保护 over current protection and zero position protection

过电流保护中包括短路和过载保护, 主要采用自动开关和电磁式过电流继电器动作等保护形式。零位保护是指空操起重机各控制手柄不在零位时, 各电动机均不能开始工作。

Over current protection consists of short circuit and overload protection, mainly adopts protection type such as fuse and electromagnetic relay.

Zero position protection is referred that every handle is not at zero position; every motor does not start to work.

## 五、电气安全规则 Safety regulation of power control

### 1. 电气设备的安全技术要求 safety technical requirement of electric equipment

(1) 起重机的电气设备在安装、维护、调整和使用过程中, 应按设计图纸进行, 以保证电器设备和各种安全装置动作灵敏可靠。

The installation, maintenance, adjustment and use of electric equipment should be entirely according to design paper to assure every electric equipment and safety device flexible and reliable.

(2) 主回路与控制回路的电源电压如不大于 500V 时, 回路的对地绝缘电阻不大于  $0.8M\Omega$ , 潮湿环境中不得小于  $0.4M\Omega$ 。测量时, 用 500V 的兆欧表在常温下进行, 回路之间绝缘电阻不应低于  $1M\Omega$ 。

The power source voltage of main circuit and control circuit is no more than 500V. Insulated resistor of circuit is no more than  $0.8M\Omega$ . It should be more than  $0.4M\Omega$  in moist circumstance. Insulated resistor among circuit should be more than  $1M\Omega$ .

(3) 制动电磁铁应在安装使用前检验绝缘电阻, 其阻值要求与电动机定子线圈电阻值相同。如低于规定要求, 须干燥处理并检验合格后方可使用。



Check out insulated resistor before installation of brake electromagnet and its resistance should be the same as stator winding resistance. It can be used after seasoning and checking out if it is below the regulation.

(4) 控制器各触头会因经常开闭产生强烈的火花烧灼, 致使转动不灵或接触不良, 应经常进行检查, 发现上述情况及时修复。

Every contact of controller may bring strong spark resulting in unwieldy rotation or bad contact because that it is opened and closed frequently. It should have checked occasionally and repair it on time once find above instances.

(5) 电阻器表面应保持清洁、易于散热, 在使用中温升不宜超过 300℃。各电阻片需保持平直并有一定间距, 如发现相互接触必须及时调整。

The surface of resistor should keep clean and be prone to conduct heat and the temperature should be no more than 300℃ in use. Every piece of resistor should keep lank and keep some space. Once find contact with each other, adjust it timely.

## 2. 电器线路安全要求 safety requirement of electric appliance circuit

(1) 设计、安装和更换起重机电线电缆, 应根据起重机的环境工作温度、接电持续率等因素, 合理选择载流量。

When design, install and replace wires and cables of crane, choose load flow reasonably according to ambient operating temperature, electric continuation rate.

(2) 起重机的滑线应有专用馈电线供电。滑线应在非导电接触面涂刷红色油漆, 并在适当位置装设安全标志或指示灯。

Main slide wire of crane should adopt special wire to supply electricity. For drive power source, when adopt slide wire or cable, should spare a special zero line or earth wire. Brush red paint on non-conductive surface of main slide wire and install safe mark or indicator light.

(3) 起重机的滑线供电, 有电缆、安全滑触线、裸滑线等多种方式。在采用裸滑线供电方式时, 滑线应平直、光滑且无腐蚀。集电器应有足够的压力, 并保持良好的导电性能。

Main slide wire and control slide wire of crane have two types of cable or safety slide wire and bare wire. If adopts bare wire, the wire should be fair, lubricious and no corrosion. The current collector should have enough pressure and keep benign electrical conductivity performance.

(4) 设在起重机司机室一侧的裸漏滑线, 应装设屏护装置, 防止上、下车时发生意外事故。

The bare slide wire at the side of Cab should set a protection device to prevent occurring accident.

(5) 起重机采用裸滑线时, 应与地面或其它设施保持一定的安全距离, 如对地面不小于 3.5m, 对汽车通道不小于 6m, 对一般管道不小于 1m, 对氧气管道不小于 1.5m, 对煤气、乙炔气管道不小于 3m。

When adopt bare slide wire, maintain some distance from ground or other establishment. It is no more than 3.5M for ground, 6M for car channel, 1M for general pipe, 1.5M for oxygen pipe, 3M for acetylene gas pipe.

(6) 室外起重机一律采用穿管配线, 室内须采用保护式配线或穿管配线。

The crane outdoor generally adopts pipe wire and indoor adopts protective type wire or pipe wire.

(7) 起重机桥架照明接在动力开关前, 当动力部分断电时, 仍能保持正常供电。

Illumination of crane and power source circuit of signal should be put through before drive switch. When drive part go out, normal power supply still can be kept.



(8) 检修起重机使用的照明电压为安全电压。

The illumination power source voltage of crane examination should be safety voltage.

(9) 起重机金属结构及所有电气设备的金属外壳、管槽、电缆金属外皮等必须连接成连续的导体，根据电网供电方式采取可靠的接地或接零。通过车轮和轨道接地（零）的起重机轨道两端，应采取接零或接地保护。轨道以及起重机上任何一点的接地电阻均不得大于  $4\Omega$ 。

Metal structure of crane and metal shell, cable metal shuck of electric appliance should all be connect to consecutive conductor and earth reliably according to power supply of electric net.

The ground resistance of each point of track or crane should be no less than  $4\Omega$ .

## 六、起重机的安装与调试 Installation and adjustment of crane

### 1. 安装准备及注意事项 preparation before installation and notice

起重机到用户现场后，应按照随机装箱单清点核实零部件数量是否相符、有无缺损，如有问题应及时处理。

Check and accept according to the packing list after the crane arrives at the installation site. Then examine whether there are damaged or lost components during the course of transportation. Dispose timely if something is wrong.

起重机卸车搬运时，应特别注意避免发生起重机受到扭、弯、撞击等事故，起吊时应通过吊装孔进行吊装（见图9），棱角处应垫以衬垫物。存放时应安置平稳，并用枕木放平垫实。对因搬运不当和存放不好造成的缺陷和超过规定误差的部分，应按技术要求进行调整修复。对金属结构部分的缺陷，必须在地面进行校正，否则不得进行架设。

When use crane, take special notice of avoiding crane to suffer to bending and knocking and lifting strictly according to hoisting hole. (See diagram 9) . Adjust and repair the part of disfigurement because of wrong portage according to technical requirement.

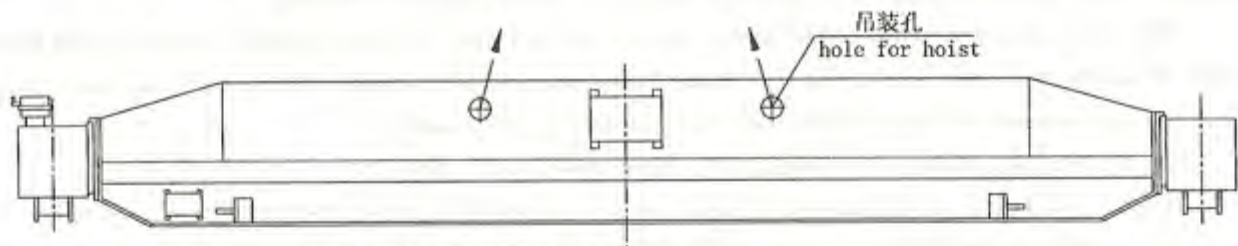


图9 吊装示意图 hoisting diagram

### 2. 安装时的安全要求 safety requirement of installation

起重机在安装前，应先做好安装方案、安全措施、现场调查、技术要求和起升设备等各项安全工作，同时还要遵守以下各项安全技术要求：

Installation scheme, safety method, locate research, technical requirement and lifting device are inevitable before installation of crane. At the same time, observe each safety technical requirement as follows:

(1) 安装前，指挥人员应向参加安装的所有成员详细介绍起升方法、起升步骤、指挥信号、注意事项以及各成员应负的职责。



Commanders should introduce all members lifting method, lifting approach, command signal and responsibilities that every member should take.

(2) 指挥人员应手持指挥旗（红色或红、绿两色），站在各参加安装人员都能看到和听到指挥命令的明显位置。

Commanders should stand at obvious position where installation people all can see and hear commands with flag (red or red and green)

(3) 起重机安装架设区，如无充足的照明设备，则禁止在夜间进行安装工作。

If there is no enough lighting facilities, it is forbidden installing at night.

(4) 禁止任何人员随起重机一同起升，也不得沿钢丝绳或滑车下降。

People are forbidden lifting together with crane and going down along wire rope or pulley.

(5) 不得在悬空中修理起升设备和起升工具。

Do not repair lifting equipment and lifting device hanging in the air.

(6) 在安装区，要确保带电裸线不得与架设人员接触。

Bare conductor is forbidden contacting with people.

(7) 起重机在安装起升过程中，严禁在起重机下逗留或通过，与安装无关的人员不准进入安装区。

It is forbidden going through under the crane when the crane is installing. And people not relevant with installation is not permitted to go into installation section.

(8) 为了检查安装工作是否安全正常，应先将起重机吊离地面 100~200mm，停留一段时间，认真检查所有起升设备和工具，有无不正确的地方，捆绑是否牢固，起重机重心是否合适等。只有确认各部分没有问题后，才允许正式起升进行安装工作。

To check whether the installation work is safe and normal, lift to 100~200mm from ground, after sometime, check carefully all lifting device and facilities. When affirm that there is no problem, the work is permitted.

### 3. 桥架组装 main beam connected

起重机主、端梁之间虽采用可拆分的螺栓连接，但安装架设时仍采用整体安装。

The connection between main beam and end carriage adopt bolts which can be taken apart. But it still adopts whole installation when installs.

(1) 主、端梁连接按图 10 所示，将主梁放在两根平行且处于同一水平面的垫架上，垫架应位于主梁两端的变截面处的筋板下面，调整好水平。

Put main beam on two cradles parallel to each other on the same level. Cradles should be at the variable cross section. We should adjust the lever correctly.

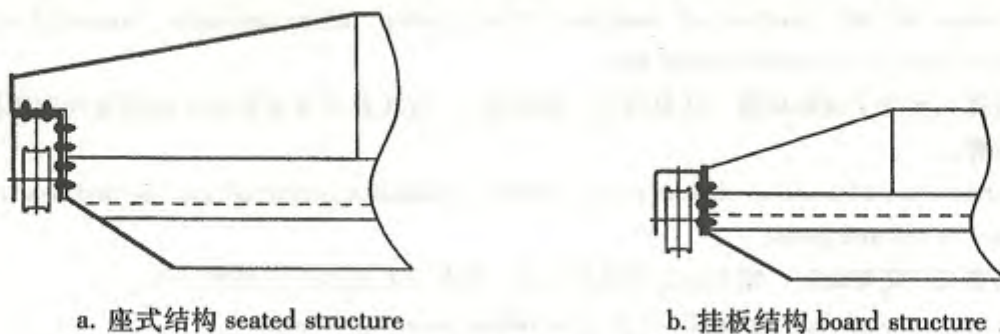
(2) 然后将主、端梁组装的连接面清洗干净，吊起端梁，以连接板止口为基准，按连接孔数量（连接孔数量因起重机的起重量和跨度不同而有所变化），用随机所带的螺栓连接起来。紧固螺栓时，应上下、左右对称依次紧固。

Then clean the connection surface of main beam and end carriage assembled, hoist the end carriage, connect it with high strength bolts.

(3) 起重机电葫芦，在出厂前已经组装完成并经过试运行，经检测和必要的调整，即可在地面预先安装在主梁跨中，并用卡兰或用绳索捆绑固定，防止吊起时电动葫芦横向滑移造成事故。

Electric hoist should be assembled completely, pass through the test, then can install on the main beam beforehand and fasten it tightly with wire rope to avoid electric hoist to slide horizontally insulting to accident.





a. 座式结构 seated structure

b. 挂板结构 board structure

图 10 主、端梁连接 Connection between main beam and end carriage

#### 4. 桥架组装完成后的质量要求 quality requirement

(1) 起重机跨度  $S$  的极限偏差  $\Delta S$  应符合以下要求:

the limit deviation  $\Delta S$  of the span  $S$  should accord with requirements as follows:

当  $S \leq 10\text{m}$  时  $\Delta S = \pm 2\text{mm}$

当  $S > 10\text{m}$  时  $\Delta S = \pm [2 + 0.1(S - 10)] \text{mm}$  经圆整后列于表 3。

表 3 跨度极限偏差  $S$  limit deviation  $\Delta S$

$S$ (m)	7.5~10	>10~15	>15~20	>20~55	>25~30	>30~31.5
$\Delta S$ (mm)	$\pm 2$	$\pm 2.5$	$\pm 3$	$\pm 3.5$	$\pm 4$	$\pm 4.5$

(2) 主梁上拱度  $F$  应为  $(1/1000 \sim 1.4/1000) S$ , 且最大上拱度应位于跨中  $S/10$  的范围内。

Tip-titled angle  $F$  of main beam should be  $(1/1000 \sim 1.4/1000) S$  and max tip-titled angle should be in the range of  $S/10$  of span.

(3) 主梁的水平弯曲值  $f \leq S/2000$ , 此值在腹板上离主梁顶面 100mm 处测量。对 LDP 型起重机, 只允许向主轨道侧凹曲。

Lever bending angle  $f$  of main beam should be  $\leq S/2000$ , measure it at the position of ventroplate which is 100mm from top of the main beam.

(4) 以装车轮的基准点测得的对角线差  $|E_1 - E_2| \leq 5\text{mm}$ 。(见图 11)

Balance of diagonal measured which regards wheels as datum mark  $|E_1 - E_2| \leq 5\text{mm}$ 。(See diagram 11).

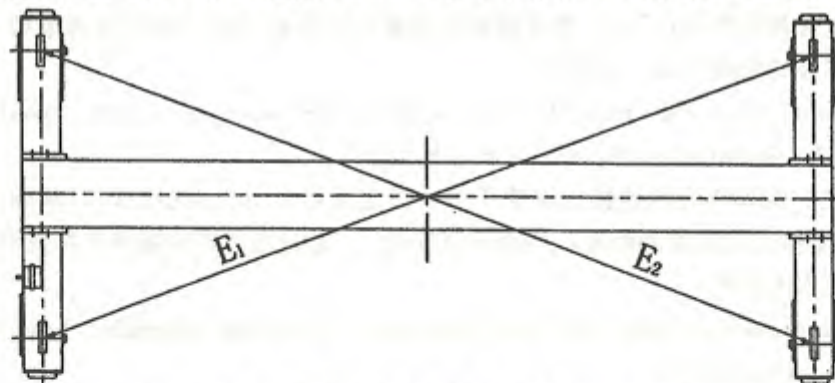


图 11 以车轮为基准点的对角线差 Balance of diagonal

#### 5. 安装架设方法 installation method

(1) 利用移动式起重机安装架设 Install using traveling crane



新厂房在未盖屋面板之前或者厂房轨道之上有足够的空间，可以采用移动式起重机直接整体吊起被安装起重机，在吊起高度超过轨顶面时，用曳绳拉动使起重机转动，使轮槽对正轨道时放下即可。

We can adopt traveling crane to lift the crane being installed in whole directly. When lifting height exceeds top crane, draw ropes to make the crane rotating and put down when sheave groove is over the rail.

(2) 单桅杆整体安装 single backstay installation as a whole

当受厂房或地面限制，不能采用移动式起重机进行安装时，可以采用单桅杆整体安装架设的方法。将一强度、刚度和稳定性足够的单桅杆立于厂房跨中，桅杆底部垫牢，顶部用四根缆绳予以固定。起升钢丝绳穿过悬挂在桅杆顶部的滑轮组，然后绕过固定在桅杆底部的定向滑轮后缠绕在卷扬机或手动绞盘上，卷扬机应予以固定，为防止工作时从底部将桅杆拉倒，可在桅杆底部、卷扬机的反方向拉一根缆索。待吊挂牢固后，开动卷扬机缓慢上升至略高于轨道后，拉动曳绳使待安装的起重机旋转，当车轮对准轨道后，再慢慢降落在轨道上（见图 12）。

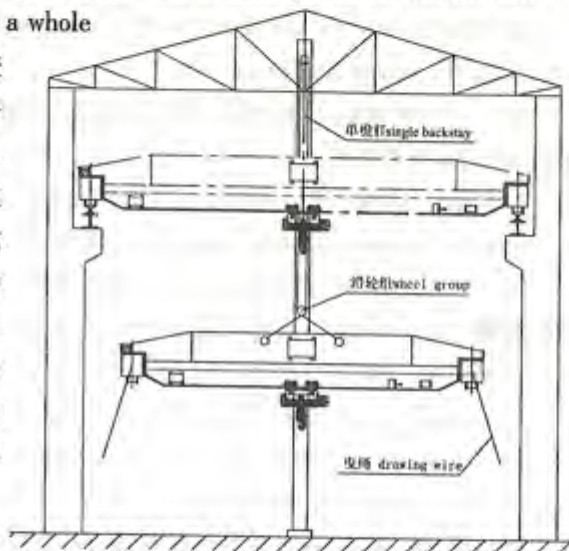


图 12 单桅杆整体架设安装  
single backstay installation as a whole

When limited by workshop or ground, cannot adopt traveling crane to install, can adopt single backstay installation. Put a single backstay that has enough intensity, rigidity and stability in workshop. The top should be fastened with four cable ropes. The lifting steel wire-rope pass through pulley block hung on the top of backstay. Then, wind on windlass or manual capstan. The windlass should be fastened. To avoiding pulling down the backstay from bottom, drawing an wire-rope to rotate the crane. Put it on the rail when the wheel is over the rail (see diagram 12).

6. 轮缘内侧与轨道间隙 the space between inside of rim of wheel and rail

轮缘内侧与轨道间隙太小不仅会影响正常安装架设，而且容易造成卡轨而加剧磨损；间隙过大虽便于安装，但易造成起重机歪斜跑偏、运行扭动等故障。

If the space between inside of rim of wheel and rail is too small, not only influence normal installation, but also can lock the rail making wear and tear prick up; If the space is too great, though install conventionally, it is easy to make malfunction of departure or twisting run.

为保证车轮轮缘内侧与轨道侧面间隙正常，应注意轮槽宽度与轨顶面宽度的正确选配，以避免安装不上或造成一侧间隙太小。支撑轨道侧隙如图 13 所示，车轮与轨道选择如表 4 所示。

To guarantee the normal space, choice width of sheave groove and width of rail correctly to avoid that cannot install or it is too small on one side.

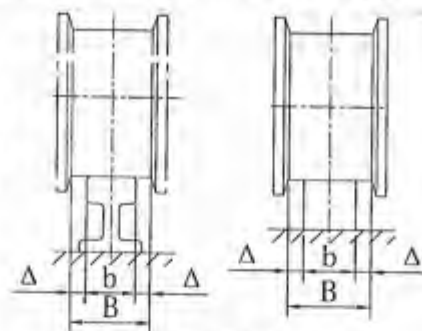


图 13 轨道侧隙  
Clearance of side of rail

7. 司机室的安装 installation of Cab

基本要求 basis requirement:

(1) 由于起重机自重轻，如果组装好司机室再整体安装时，则会出现重心偏移，给吊装带来困



难。因此司机室待起重机安装好后，再单独安装。

Because of the light dead weight of crane, whole installation after assembling Cab can make barycenter deviate to bring troubles. So separately install the Cab after the crane is installed well.

(2) 司机室应安装在桥架的非导电侧，以防止司机上、下车时发生意外触电事故。

The Cab should be installing on the non-conductor side of loading bridge to avoid electric shock accident when the driver gets on or off.

(3) 由于起重机为单根梁，刚性较差，为减小振动和冲击，因而司机室端面与轨道中心线距离控制在 500mm 左右为佳。

To reduce shake and impulsion, the distance between end side and center line of track should be under the control of 500mm because that the crane is a single beam crane and has poor rigidity.

(4) 司机室的开门方向有端面开门和侧面开门之分，当厂房为双跨时，可采用端面开门，这样可以在两跨之间只安装一处梯子和平台，就可分别进入两跨中的司机室。当厂房为单跨时，只能采用侧面开门司机室，梯子与平台应设在靠近山墙处。

The operator can enter the Cab from one side or rear, if twin spans workshop, can adopt opening door of one side, and so can install one ladder and flat roof between two spans. If single span workshop, only can adopt Cab opening from one side.

(5) 电源滑触线安装形式 (参见图 14~图 16)。

Installation type of slide wire (see diagram 14~diagram 16).

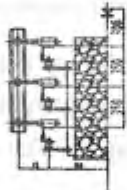


图 14 角钢滑触线安装

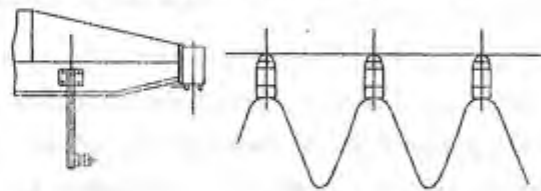


图 15 软缆滑线安装

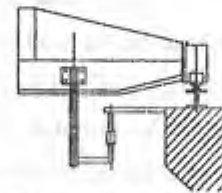


图 16 安全滑触线安装

Installation of angle iron slide wire    Installation of cable slide wire    Installation of safety slide wire

表 4 车轮与轨道选择 Choice of wheel and rail

配用轨道形式与规格 matched rail type and specification				车轮槽宽 B (mm) Width of wheel groove	侧隙 Δ (mm) back lash
轻轨 light rail	钢轨类型 (kg/m) rail type		15    18    24	70	16.5~9.5
	轨顶面宽 b (mm) width of rail head surface		37    40    51		
重轨 heavy rail	钢轨类型 rail type (kg/m)	33	38    43    50	90	15~10
	轨顶面宽 b (mm) width of rail head surface	60	68    70    70		
方钢轨 square bar rail	b×b (mm×mm)	40×40、42×42、45×45、 48×48、50×50		70	15~20
		60×60、63×63、65×65、 70×70		90	15~10

## 七、电气系统安装 Installation of electrical system

1. 电气设备的安装和电线的敷设应按照电气原理图、控制线路图、外部接线图进行 (图纸见电路图)。



Installation of electric apparatus and laying of wire should accord with schematic diagram and connection diagram.

2. 安装前应详细地熟悉上述电气图及技术要求，了解各元件的相互作用和操纵原理，以求能迅速有效的解决处理安装和试车中所发生的问题。

Be familiar with above schematic diagram and technical requirement before installation, know about the mutual action of every component and operation principle to settle questions rapidly and effectively in installation and run test.

3. 安装前应清理和检查全部电气设备和元件。所有的电气设备和元件应无缺陷，转动应灵活，不允许有卡阻和松动现象。其规格、型号、触头的闭合次序等必须符合图纸要求，需要调整的应按图纸规定调整好（电气元件见表 5）。

Clean the dirt and oil stain of all equipments and elements before installation. Check the quantity of electric equipments and elements and they should act flexibly without lock, adhesion and loosing. Its specification, type and close sequence should accord with requirement of diagram. ( see table 5 for electric elements ).

表 5 电气元件表 (10/16t CD 电动葫芦 电压 36v)

electric elements table ( 10/16t CD electric hoist voltage 36v)

序号 NO.	代号 code	名称及项目代号 Name and Item Code	单位 Unit	件数 pcs	备注 remarks
1	Q0	断路器 DZ47-60/3P Circuit breaker DZ47-60/3P	件 pc	1	In=60A
2	KO	总接触器 CJX2-6311/6511 Mastercontactor CJX2-6311/6511	件 pc	1	线圈电压 AC36V Coil voltage AC36V
3	F50	保护继电器 XJ3-D Combined protector XJ3-D	件 pc	1	合同要求时有 Contract requires it will be added
4	K41、 K42	大车接触器 CJX2-1801 Crane contactor CJX2-1801	件 pc	2	线圈电压 AC36V Coil voltage AC36V
5	K31、 K32	小车接触器 CJX2-1201 Trolley contactor CJX2-1201	件 pc	2	线圈电压 AC36V Coil voltage AC36V
6	K11、 K12	升降接触器 CJX2-6311/6511 Rising and falling contactor	件 pc	2	线圈电压 AC36V Coil voltage AC36V
7	S95	断火限位器 LXD-40 Limit switch LXD-40	件 pc	1	
8	F30	断路器 DZ47-60/1P Circuit breaker DZ47-60/1P	件 pc	1	In=4A
9	S1	手电门 8H Pendant switch 8H	件 pc	1	
10	T1	控制变压器 BK100-380/36 Control transformer BK100-380/36	台	1	
11	S91、 S92	大车限位器 LX10-12 Crane limiter LX10-12	件 pc	2	
12	M41、 M42	大车电机 ZDY (D) 1 22-4/1.5kW	台 pc	2	
13	M31、 M32	小车电机 ZDY1 21-4/0.8kW Trolley motor ZDY1 21-4/0.8kW	台 pc	2	
14	M11	起升电机 ZD1 51-4/13kW Lifting motor ZD1 51-4/13kW	台 pc	1	Gn=10/16t
15	F70	超载限制器 F70 overload limiter	套 pc	1	
16	F31	断路器 DZ47-60/2P Circuit breaker DZ47-60/2P	件 pc	1	C4



4. 检查电动机、接触器、继电器等电气元件的绝缘性能，用兆欧表测量其绝缘电阻，如低于 0.5 兆欧，应进行干燥处理，经检验合格后，方能安装使用。

Check the insulation property of motor, connection or relay and measure the insulation resistance with megohmmeter. If it is below 0.5, should has drying dealing. And it can be used after inspection.

5. 检查控制器、接触器、继电器触头间的压力，如压力过大或过小均应予以调整。

Check pressure among controller, connection and relay .If the pressure is too big or small, adjust it inevitably.

6. 护线管应牢固地固定在桥架上，管口应装有护线嘴，护线管内敷设的导线不得有接头。

The wire-protection pipe should be fastened on loading bridge tightly and the conductor in wire-protection pipe should do not have terminal.

7. 限位开关安装前应仔细检查开关是否灵活可靠，安装后检查其线路是否正确并进行调整。

Check whether the spacing-limiter switch is flexible and reliable and whether the circuitry is correct.

8. 大车导电器的绝缘子必须完整无缺，且无裂缝，并且要牢固地固定在导电架上。

The insulation terminal should be intact and no split and should be fastened on the electric bracket tightly.

9. 小车电缆导电装置安装时，应首先将电缆理顺，避免扭结和缠绕，按图纸要求顺次排列在终点夹、电缆滑车和拖动滑车上。调整电缆，使每段电缆的悬长基本一致。

When install electric device, straighten out cables to avoid winding and arrange them on terminal clip, cable pully sequentially according to requirement of diagram. Fasten the cable on suspension cable pulley with cable plywood.

10. 按照电气图和其它安装用图所示的位置，安装所有电器设备和元件。

Install all electric apparatus and components according to schematic diagram.

11. 全部电线敷设完后，应按图纸规定在电线和线管末端的接线盒上标上相同的号码标识，以便于安装和检修。

Mark same identification number on junction box of electrical wire and end of pipe according to diagram after all wires have been laid.

12. 全部电线敷设完后，应用兆欧表测量整个线路的绝缘性能，三相绝缘电阻不超过标准规定要求，而各相绝缘的电阻值相差不大时方为合格。

Check all the insulation performance of the whole circuit with megohmmeter. When three phase insulation resistant is not more than that of standard regulation requirement and when every phase insulation resistance balances not too much that it can be regarded eligible.

13. 司机室操纵时的安装

a. 检查司机室内部接线情况，如有松动和脱落等现象应予以消除，确保接触良好。

Check the internal wiring situation in operation room. If there has inadhesion and loosening situation, should eliminate it to ensure that in good contact.

b. 控制柜（屏）安装前，应对控制柜（屏）内的电器元件和电气线路作详细检查，并把接触衔铁接触面上的油垢（出厂时涂有防锈油）擦洗干净。

Examine all electric components and electric circuit in control cubicle particularly before installing control cubicle and clean the oil on the interface of gag bit.

c. 控制柜前面的通道宽度应不小于 0.5m，后面间隙应不小于 100mm，以保证维修正常进行。

The width of channel before control cubicle should be more than 0.5M and the clearance behind it



should be more than 100mm to ensure that the maintenance is carrying through normally.

## 八、电控系统的检查和调整

### Examination and adjustment of electric control system

1. 电气元件按要求整定完毕后，进行电气线路的检查和调整。

Examine and adjust electric circuit after the electric components are cleaned up.

首先对线路的接点进行全面的检查，确认接线正确并拧紧所有接线螺栓后，合上起重机的总电源开关，对电气线路进行检查和调整。

Firstly, check all contacts of circuit to affirm that all wiring is correct and fasten all bolts. Switch on the power and check the electric circuit.

2. 起重机上所有带电设备的金属外壳，必须有效地接地，允许利用起重机的轨道作为接地线。总接地电阻不得大于  $4\Omega$ 。

Do be sure all the metal shell of electric equipment should be connected to the earth effectively. It can use the rail of crane as earthing conductor. The ground resistance of crane should be no more than  $4\Omega$ .

3. 起重机的电气设备全部安装完成后，其主回路对地绝缘电阻在一般环境中应不小于  $0.8M\Omega$ ，在潮湿环境中应不小于  $0.4M\Omega$ 。

Ground insulation resistance of main circuit should be no less than  $0.8M\Omega$  in general circumstance and should be no less than  $0.4M\Omega$  in wet circumstance.

4. 控制柜（屏）各元件动作顺序的检查与调整。

Check and adjust of operation sequence of every component of control cubicle.

检查时，合上主回路断路器，合上控制回路开关，然后逐次按（转）动主零控制器手柄按钮（见图 17~18），观察各接触器、继电器的动作顺序及各种电气连锁是否与电气原理图的要求相符，否则应找出原因并予以消除。

When check, draw down the line-circuit breaker, switch on the control circuit, then press the handle button of master controller and observe every connection and relay's action sequence and whether the electric chain is according with the requirement of electric schematic, or find out why and eliminate it.

5. 安全保护线路的检查与调整 examination and adjustment of safety protection circuit.

用手搬动各机构限位开关及所有安全开关，观察其动作是否灵活，看其保护的机构到达极限位置后，是否能切断电源起到保护作用。如有故障应找出原因并予以消除。

Flip all limit switches and safety switches with hand, observe whether they act flexibly. Take notice that when mechanism protected arrives at limit position, can they cut off the power source to make the function of protecting. If there has malfunction, find out why and eliminate it.

6. 电动机运转方向的调整 adjustment of motor run direction

合上所有开关，操纵控制器，点动各机构电动机，观察电动机的运转方向是否与控制器的操纵方向一致。如果不一致，应将任意两相的接线调整一下，使其转动方向符合要求。

Switch on all power sources, operate controller and observe whether the run direction of motor are same as operation direction of controller. If the directions are different, adjust one of the two wiring to meet the requirement.

7. 在对电气线路进行全面的检查、调整并确认无误后，合上所有的断路器，使各机构的主回路和



控制回路全部接上电源，在空载情况下逐个启动各机构，进行试运行，观察各机构工作是否正常。

Switch on all circuit breaker to make all main circuit and control circuit put through power source. Start each mechanism one by one to have test run in empty loading situation and observe whether each mechanism is in working order.

8. 试运行全部正常后，起重机电气设备才可以投入正常使用。

The electric device can be used after test run is all in working order.

## 九、起重机的运转试验 Run test of crane

### 1. 试车前的准备和检查 preparation and test before trial run

为保障试运行安全、顺利地进行，试验前必须对试验设备进行认真的检查，并为试验做好充分准备。

a. 关闭起重机电源，检查所有联接部位的紧固情况；各传动机构装配是否转动灵活；金属结构有否变形，钢丝绳在滑轮和卷筒上的缠绕情况；检查轨道上是否有障碍物及有碍起重机运行的情况。

b. 在断开动力线路的情况下，全面检查电气系统所有设备、线路、元件位置是否正确、可靠，其中必须特别注意限位开关、安全开关和紧急开关的可靠性，注意分别驱动的运行机构电动机的相序接线检查，保证两电动机能够同向运转。

c. 各润滑点是否加注润滑油。

d. 准备好负荷试验的重物，重物可用相对密度比较大的钢锭、钢坯、条材、生铁块或大型铸造毛坯等。无论用何种材料，均要对质量计算准确，并应可靠捆扎好。

To ensure safe and smooth process of trial run, we should check the testing equipment carefully and do enough preparation for test.

a. Turn off all power sources, check whether all related parts are fixed firmly, whether all transmission mechanisms are assembled accurately and flexibly, whether the metallie structrue has distortion.

b. Check fully whether all electrical equipment, circuitry, component are located correctly and reliably.

c. Check whether the lubricant grease is forced into all lubricated parts .

d. Prepare well for the load mainly having high relative density, its weight should be calculated accurately and it should be bundled reliably.

### 2. 无负荷试验 test with no load

a. 分别开动各机构使其运转，操纵机构操作方向应与机构运动方向相一致，先慢速试转，再以额定速度运行，观察各机构应平稳运转，没有冲击、振动和不正常响声等现象。

Switch the power source on, separately start up every machine to run, check whether the lifting and rotation direction is accord with the button mark. Firstly, try to rotate at slow speed. Then, run at rated speed. Observe that every mechanism should run smoothly and no such phenomena as shock, shake and abnormal noise.

b. 沿行程全长，往返运行三次，检查大、小车运行机构情况。

Check the performance of traveling mechanism of crane and electric hoist though making the crane traveling three times back and forth.



c. 进行各种开关的试验, 包括吊具升(降)极限位置限制器, 大、小车运行极限位置限制器, 各联锁保护装置, 司机室的紧急开关等。

Do test of different kinds of switch including limiter, chain protection device and emergent switch in operation room.

### 3. 负荷试验 loading test

无负荷试验试车情况正常后, 才允许进行负荷试验, 负荷试验分静、动两种情况。先进行静负荷试验, 再进行动负荷试验。

It is not until there is no abnormal phenomenon occurring in the no-load test that the loading test can be conducted. The latter test is carried out in two forms of static test and dynamic test.

#### a. 静负荷试验 static loading test

静载试验的目的是检验起重机及其各部分结构的承载能力。

The aim of static loading test is to check carrying capacity of crane.

首先起升较小的负荷, 分 2~3 次逐渐加载, 直至加载至额定负荷, 在桥架全长往返运行三次, 不出现异常。卸去负荷, 将空载小车停放在主梁端部极限位置, 在跨中定出测量主梁挠度的基准点。将小车开至主梁跨中, 起升 1.25 倍的额定负荷, 距地面 100~200mm 高度处, 悬停 10min, 卸载后将小车开至主梁端部后再检查有无永久变形。如此重复三次, 第一、二次允许主梁有少许变形, 第三次主梁不得再产生永久变形。将小车开至主梁端部, 检查主梁实有上拱度应不小于 0.8S/1000。

First, lift small load, add gradually at twice until to rated load and the crane should travel three times back and forth and there is no abnormal phenomena. Unload and drive the trolley to the limited position of end of the main beam and measure the datum mark of main beam flexivity. Then, drive the trolley at the span of crane with rated voltage, add load gradually to 1.25 times the rated load, lift to position 100~200mm from the ground and stay for no less than 10min. Unload and drive the trolley to the limited position of end of the main beam and check whether there has permanent distortion .Repeatedly three times. It is permitted to have little distortion for the first time and the second time, but it is not permitted for the third time. Drive the trolley to end of the main beam, check that the tip-titled angle should be no less than 0.8S/1000.

静载试验结束后, 起重机各部分均不应有永久变形、裂纹、油漆剥落、联结处松动或损坏等现象产生。

There should be no abnormal phenomena like crackles or permanent distortion to all parts after static loading test.

#### b. 动负荷试验 dynamic loading test.

动负荷试验的目的主要是验证起重机各机构和制动器的功能。

The aim of dynamic loading test is to validate the function of each mechanism and arrester.

起重机各机构的动载试验应先分别进行, 而后作联合动作试验, 同时开动两个机构。

起升 1.1 倍额定载荷, 试验中, 对每种动作应在其整个运动范围内反复启动和制动。对悬挂着的试验载荷作空中启动时, 试验载荷不应出现反向动作。按其工作级别和工作循环试验时间应延续 1 小时。

试验后, 起重机各功能正常, 没有发现机构或结构损坏, 连接处无松动或损坏现象, 则认为合格。

Dynamic test should be under condition of crane carrying out with 1.1 times the rated load. In test, start and brake repeatedly in entire movement range. Start the test load in the air, the load should be not having



opposite action. Continue one hour according to working grade and working circle test time.

It is eligible when relative components are able to perform functions and structure parts have no damage after dynamic test.

## 十、起重机的检修与维护 Examination and maintenance of crane

为了保证起重机能安全、可靠、正常使用，就必须合理地使用和及时的进行检修、维护和保养，才能达到延长零部件、元器件及起重机的使用寿命，为此应坚持日检、月检和年检的三检制度，使起重机始终保持完好状态。

To ensure that the crane can be used safely and reliably, appropriate use and well-timed maintenance is requisite. So stick to three check system including daily check, monthly check and annual check to keep good order.

### 1. 日检 daily check

单梁起重机的特点是很少为同一人整天操作使用（尤其是地操起重机），几个作业人员交替操作使用的情况很多，为此应对每台起重机定出各自的现场负责人进行日常检查。日常检查是在每日开始工作之前，现场负责人应做空车运转并确认以下事项：

The characteristic of single beam crane is that it is rarely operated by same people all day, but some people operate it alternately, so assign someone in charge of respective locale for each crane to execute daily check is essential. The people in charge of local should operate the crane with no load and affirm the following:

(1) 地面操作的起重机，为了安全运转，应注意确认操作者步行范围内有无障碍物，确认步行的安全。

For ground control crane, check whether there are obstacles within walking distance of operator to affirm safety of walking.

(2) 由地面观察运行轨道是否有异常。

Observe whether the rail has abnormal phenomena from ground.

(3) 按动手电门按钮，检查起重机各动作是否与操作按钮所示动作方向一致。

Press the pendant control button; check whether each action of crane is the same as the direction of operation button.

(4) 检查制动器的动作是否灵敏、安全可靠。

Check whether the arrester action is flexible, safe and reliable.

(5) 检查起升限位开关能否准确限位。

Check whether the lifting limit switch can limit the position accurately.

(6) 检查起重机有无异常声响和振动。

Do examine whether there are abnormal noise and unusual libration.

(7) 检查吊钩、滑轮能否灵敏地回转，有无缺油现象，吊钩螺母防松装置有无异常。

Do examine whether there are abnormal phenomena like lacking of oil, acting inflexibly and loosening of bolts.

(8) 检查钢丝绳是否正确地缠绕在卷筒上，有无跳槽和乱绳缠绕，有无从滑轮槽内脱落。

Check whether the wire rope winding on the winding drum correctly.



(9) 检查钢丝绳上是否缺油。

Check whether the steel wire rope lacks of oil.

(10) 检查吊装吊具有无异常。

Do examine load lifting device whether there are abnormal phenomena.

## 2. 月检 monthly check

月检是由工程技术人员和专职负责安全技术人员，根据使用者提供的情况进行检查，检查记录应予以存档。在月检中主要是依靠目测、听觉和手感等直观方法进行检查。因此在检查中必须取下外罩检查，随时确定安全程度、磨损状况和运转状态，确定进行必要的检修、维护和保养。月检项目与内容见表 6。检查内容的分类要求如下：

Monthly check mainly is that engineer and technicians check crane according to the information supplied by operator and keep in the archives. Monthly check mainly depends on range estimation, sense of hearing and hand feeling etc. to keep a view method to carry on a check. Therefore dismantle the outside cover to check, make sure the safe degree and wear away condition and run appearance at any time to assure essential maintenance is inevitable. See table 6 for the monthly check item and contents. The classification of check content is as follows:

A 类：是与保证起重机安全可靠性的项目，是月检中的重点检查内容，每个月必须至少检查一次。

Type A: The item relevant to assuring the safety and reliability of crane is one of essential check content. Check once a month at least.

B 类：是与保证起重机能无故障正常运转使用的重点检查项目，主要是机械、电气方面重点维护内容，可以每三个月检查一次。

Type B: The essential check item relevant to assuring that the crane can run orderly mainly includes mechanism examination and electric aspect. Check once every three months.

C 类：是与起重机各部分磨损破坏有关的一般检查项目，可以每六个月检查一次。

Type C: General check item relevant to each wearing part can be check once every six months.

表 6 月检项目与内容 Items, contents for monthly check

序号 Serial No	分类 class	月检项目 item		月检内容与要求 content and requirement
1	B	整机性能 completeMa chineperfor mance	起升异常检查 Lifting abnormity inspection	在满载起升时，目测主梁或吊载是否有异常振动，倾听各机构是否有异常声响，在可能时手触各齿轮箱、电机是否有异常发热，分析这些异常的原因，并排除这些异常现象。 Observe whether main beam or loading has abnormal librations and hear whether there are abnormal sounds of each mechanism. If possible, touch each gear box with hand to check whether the motor is heating. Analyze the reason and remove the abnormal phenomena.
2	B		下降下滑检查 Descending inspection	满载下降中停车，如果下滑量过大，应及时调整起升制动器间隙，直至刹车正常 Stop when descend with full load. If the slide -down distance is too large, adjust the clearance of lifting brake until it brakes normally.



续上表

序号 Serial No	分类 class	月检项目 item	月检内容与要求 content and requirement
3	A	小车运行检查 Trolley traveling inspection	观察葫芦运行小车是否爬坡吃力、运行打滑、车轮悬空、啃轨、轮缘爬轨等现象。如有上述现象，应检查主梁是否刚性太差，轨道面上是否有油污，运行小车制造装配精度是否太差等。 Observe whether electric hoist climb incline difficultly, skid, wheel hung in the air and so on. If there are above phenomena, check whether the rigidity of main beam is too bad and whether there is oil on the surface of track and so on.
4	A	大车起、制动检查 Start and stop of crane inspection	检查起重机在起、制动时，是否有明显的不同步现象，如果有应及时调整大车运行制动间隙，最好由同一人调整分别驱动的两个制动器。 Check crane whether there is obviously absent of synchronism. If has, adjust the brake clearance on time and it is better to adjust the two separated drive brake by same people.
5	A	起重机运行中的检查 Traveling of crane inspection	察看起重机在运行中是否有异常蛇形、扭动、侧向滑移、歪斜跑偏、啃道、异常声响等现象，做好标记，查找原因。 Check crane whether there are such phenomena like twist, slippage, abnormal sound. Mark correctly and find out the reason.
6	B	起重机运行中的刹车检查 Brake inspection	检查运行制动器刹车动作是否灵敏，是否有刹不住车滑行距离太大的现象。 Check whether the traveling brake acts flexibly and whether there is unreliable brake or the slide-down distance is too long.
7	B	检查起重机电轮的着力情况 wheel under pressure inspection	检查起重机的四个车轮中是否有悬空现象，运行中是否有个别车轮似转非转，出现“三条腿”现象。 Check four wheels of crane whether there is phenomenon like hovering and whether there is only three legs.
8	B	渗漏检查 Leaking inspection	检查起升减速器、大小车运行减速器是否有渗、漏油现象。 Check lifting reducers and traveling reducers whether there are phenomena like leaking of oil.
9	A	检查整机绝缘性能 Insulation performance of complete machine inspection	用 500V 兆欧表分别检查各机构主回路、控制回路（低压控制除外）对地的绝缘电阻在一般环境中 $\geq 0.8M\Omega$ ，在潮湿环境中 $\geq 0.4 M\Omega$ 。 Check main circuit and control circuit separately with 500V megohmmeter. Insulated resistor of circuit is more than $0.8M\Omega$ . It should be more than $0.4 M\Omega$ in moist circumstance.
10	C	表面外观检查 Appearance inspection	检查起重机各部分表面是否有锈蚀、脱漆、损伤等缺陷。 Check each surface of crane whether there are phenomena like tarnishing, depainting or damage.

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续上表

序号 Serial No	分类 class	月检项目 item	月检内容与要求 content and requirement
11	A	运行止档(阻进器)检查 Travel stop-gear inspection	运行止档是否有变形、损伤、脱落的危险，采用螺栓固定时，螺栓是否有松动，采用焊接固定时，焊缝是否有开裂。 Check whether travel stop-gear has deformation or damage, whether joint bolt is tight and whether the welding line has slight crackle.
12	C	运行机构 Traveling mechanism 轨道安装检查 Rail installation inspection	检查轨道接缝处是否有变形，固定螺栓是否有松动，轨道是否有侧向移动，焊缝是否有龟裂，垫板、连接板是否有松动。 Check Seaming of rail whether there is deformation, whether fixed bolts have been loosened, rail has moved side and tie plate has been loosened.
13	C	轨道磨损检查 Wear and tear of rail inspection	运行轨道踏面和侧面，工字钢轨道翼缘踏面和翼缘端部是否有局部严重磨损或出现剥落和变形现象。 Check whether thread and end of flange of I style rail has severe wear and tear, flaking or deformation.
14	C	主、端梁焊缝检查 Welding line of main beam and end carriage inspection	检查主梁、端梁上的焊缝是否有裂纹 Check whether there are crackles of welding line of main beam or end carriage.
15	C	主梁磨损与变形检查 Wear and tear and deformation of main beam inspection	检查主梁工字钢轨道翼缘踏面和侧面是否有严重磨损，翼缘是否有塑性变形（翼缘下塌）。 Check whether thread and end of flange of I style rail has severe wear and tear and whether flange has plastic deformation.
16	C	主、端梁连接检查 Connection of main beam and end carriage inspection	主、端梁之间采用螺栓连接时，检查螺栓是否有松动。 Check whether bolts have been loosened when main beam and end carriage adopt bolts to connect.
17	C	主梁及端梁 Main beam and end carriage 主梁上轨道检查 Rail of main beam inspection	主梁上采用支承形轨道时，检查轨道是否有异常弯曲变形，轨道压板、连接螺栓是否有松动，焊缝是否有裂纹。 When main beam adopts supporting type rail, check whether there is abnormal deformation, whether joint bolts has been loosened and sealing has crackles.
18	B	检查主梁上运行止档 stop-gear on the main beam inspection	检查主梁上的小车运行止档是否出现变形、损伤、脱落危险，连接螺栓是否有松动，焊缝是否有裂纹。 Check whether the trolley stop-gear of main beam has deformation or damage, whether joint bolt is tight and whether the welding line has slight crackle.
19	C	检查主、端梁上的缓冲器 Buffer of main beam and end carriage inspection	安装在主梁止档上和端梁端部上的抗撞击的缓冲器，连接螺栓不得有松动，缓冲器不得有龟裂、破损、裂纹等。 Joint bolts of knocking protection buffer that installs on stop-gear of main beam and end of end carriage should not has been loosened and crackles of buffer are not allowed.



续上表

序号 Serial No	分类 class	月检项目 item		月检内容与要求 content and requirement
20	B	电动机 motor	电动机发热检查 Motor heating inspection	检查起升、运行电动机是否有发热现象，如有应分析原因，是超载过多还是电压降过大，或者是制动过于频繁，制动器间隙太小、制动轮与制动环之间有摩擦等。 Check whether the motor has heating phenomenon. If there is such phenomenon, analyze the reason as that it is overloading, the voltage is too low or to brake too often and so on.
21	B		电动机异常检查 Motor abnormality inspection	检查起升、运行电动机是否启动勉强、噪声太大或有异常声响，此时应分析是否超载过多，电源电压过低，制动器未完全脱开或是电源线有虚接、断线等原因。 The start of motor should not be too grudging. Too noisy and abnormal sounds are forbidden. If there are above phenomena, analyze the reason as that it is overloading, the voltage is too low and so on.
22	C	制动器 brake	磨损状态检查 Worn condition inspection	对于锥形制动电动机，应打开电机罩检查锥形制动环或平面制动环的磨损状态，可以用手轴向推动风扇轮看窜动量是否过大，窜动量大证明磨损严重，窜动量不得大于 4mm，应能将窜动量调整到 1.5mm，否则应报废更换。对于平面制动器，当磨损量达到原厚度的 50% 时应报废更换。 For cone type motor, check worn condition of cone type brake ring and drive fan wheel axially with hand to find whether the running distance is too large. Check the running distance of the main conic motor axis to 1.5mm or it will be replaced. For plane brake, the worn proportions amounting to 50% of original thickness should be rejected.
23	C		刹车性能检查 Brake performance inspection	检查起升制动器在重物下降时是否刹不住车，下滑太大；检查运行机构制动器在运行中是否刹不住车，滑行距离太大。有上述情况时，应及时调整制动器的性能。 Check lifting brake whether there is unreliable brake or the slide-down distance exceeds the specifications; Check brake of traveling mechanism whether there is unreliable brake or the slide-down distance exceeds the specifications; If exists above phenomena, adjust the performance of brake.
24	C		异常检查 Abnormality inspection	检查各锥形制动器锁紧螺母是否有松动，如果制动时有尖叫声，应检查制动环或制动片之间是否相对摩擦或接触不良等缺陷。 Check each cone type brake whether the nuts has been loosened. When brake, there is scream, check whether there are defects like relative friction between brake ring and brake piece or bad contact.



续上表

序号 Serial No	分类 class	月检项目 item	月检内容与要求 content and requirement
25	C	减速器 reducer	检查各机构齿轮传动的声响是否有异常，分析异常声响是否因缺油润滑不良、齿轮轴承磨损严重、齿面有磕碰损伤或齿轮加工和装配精度不良造成的。 Check whether gear drive sound is abnormal and analyze the reasons that lie in bad lubrication or severe wear and so on.
26	C		异常检查 Abnormity inspection 检查各减速器连接和固定螺栓是否有松动，是否有漏油现象。 Check whether each reducer connection and fixed bolts has been loosened and whether there is a phenomenon like leaking of oil.
27	C	卷筒装置、 钢丝绳 Winding drum steel wire rope	磨损状态检查 Worn condition inspection 检查卷筒绳槽是否有异常磨损 Check whether there is wear and tear of rope groove of winding drum
28	C		卷筒外壳检查 Shell of winding drum inspection 检查卷筒外壳是否有损伤（当起升限位器失灵最易造成吊钩滑轮顶伤外壳） Check shell of winding drum whether there is damage.
29	C		导绳器检查 Rope guider inspection 检查导绳器是否有破裂，空钩下降时钢丝绳能否顺利地由导绳器出绳口排出 Check whether the wire rope has breach and whether the steel wire rope can successfully be ejected from rope guide when empty hook is descending.
30	C		异常检查 Abnormity inspection 检查卷筒上压绳板是否松动，卷筒连接螺栓、导绳器连接螺栓是否松动，导绳器的导向滑块移动是否顺利。 Check whether the plywood and joint bolts of winding drum and joint bolts of rope guide have been loosened and whether the slipper of rope guide moves successfully.
31	A		断丝检查 Broken wires inspection 检查钢丝绳是否有断丝现象，当在一个导程之内断丝数超过钢丝总数应报废 Check steel wire rope whether there is phenomenon like broken wires. When the numbers of broken wires are more than total numbers of steel wires, the steel wire rope should be rejected.
32	A		磨损状态检查 Worn condition inspection 钢丝绳磨损后的直径减少量不得超过公称直径的 7%，否则应报废。 The diameter proportions should be
33	A		变形检查 Deformation inspection 因斜吊造成的挤伤变形或扭结的钢丝绳应报废 Steel wire rope distorted or twisted because of lifting slant should be rejected.
34	B	腐蚀检查 Corrosion inspection 检查钢丝外表不得有锈蚀现象，外表应有一定的润滑油，但不得有过多的污物。 Surface of steel wire should not have tarnishing phenomenon and should be covered with lubricant oil but not too much dirt.	



续上表

序号 Serial No	分类 class	月检项目 item		月检内容与要求 content and requirement
35	B		空中打花 Twist in the air	察看钢丝绳在空中是否有打花现象（尤其是四绳以上者），其主要是由于缠绳时钢丝绳未能在放松状态进行造成的。 Observe whether wire rope has been twisted, because the steel wire-rope has not been slackened when binding the rope.
36	A		异常检查 Abnormity inspection	对钢丝绳工作的重要部位和安全环节必须做到经常检查，如钢丝绳的各固定部位是否有松动的危险，与滑轮、平衡轮接触部位不得有缺油、啃绳、脱槽等故障。 Check critical area and safety circulation of steel wire rope frequently such as loosened dangerous of each fixed part of steel wire-rope, leaking of oil of contact site and so on.
37	A	吊钩与滑轮 Hook and block	裂纹检查 Crackles inspection	吊钩、滑轮和滑轮外壳均不得存在有害的裂纹。 There should be no harmful crackles of hook, block or shell of block.
38	A		磨损状态检查 Worn condition inspection	吊钩钩口及滑轮槽均不得有异常的磨损。 There should not be unusual wear and tear of mouth of hook or block groove.
39	A		异常检查 Abnormity inspection	检查滑轮是否有破损，吊钩螺母是否锁紧，外壳连接螺栓和档轴板固定螺栓是否松动等。 Check whether the block has damage, bolts of hook are tight and the joint bolts are loosened.
40	A		变形检查 Deformation inspection	吊钩钩口不得有异常变形。 Mouth of hook should not have abnormal deformation.
41	C		回转检查 Rotation inspection	检查滑轮能否灵活转动。 Check whether the block can rotate flexibly.
42	C		车轮 wheel	磨损检查 Worn condition inspection
43	C	裂纹检查 Crackles inspection		车轮表面不得出现异常裂纹。 Unusual crackles are not allowed on surface of wheel.
44	C	司机室 Operation room	固定状态检查 Fixed condition inspection	检查司机室固定连接螺栓是否松动，焊接连接的焊缝是否有裂纹 Check whether the joint bolts of Cab have been loosened and welding line have crackles.
45	C		工作固定状态 Fixed condition of working	通风、照明、取暖等是否正常合理，司机室是否晃动严重等 Check whether aeration, illumination or warming is reasonable and Cab shakes severely.

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续上表

序号 Serial No	分类 class	月检项目 item	月检内容与要求 content and requirement
46	B	馈电裸滑线安全检查 Bare slide-wire safety inspection	检查馈电裸滑线与周围设备的安全距离是否符合有关规定要求，是否有相应的安全保护措施 Check whether the distance between bare wire and other devices around is according with the relevant regulation requirement and whether there is relevant safety protection measure.
47	B	滑触面检查 surface of slide-wire inspection	检查滑触线的滑触面是否有腐蚀、锈蚀缺陷，应及时用钢刷、砂纸打磨，以保证导电性能。 Check whether there are defects like corrosion; burnish it with steel brush or sand paper to guarantee the electrical conductivity.
48	B	绝缘装置检查 Insulation device inspection	滑线的支承绝缘子不得有破损，连接部位不得有松动。 Damage of supporting insulator of slide wire is not allowed and connection part should not be loosened.
49	C	软缆引入装置检查 Cable introducing device inspection	当采用软缆引入装置时，应检查支承软缆的拉紧钢丝绳的磨损状态和张紧状态。 Check the worn state and tight state of strained steel wire rope supporting cable when adopts cable introducing device.
50	C	滑触线安全标志检查 Slide wire safety mark inspection	检查电源滑触线在非导电侧接触面是否涂有安全标记，在适当位置是否安装有安全标志，是否安装表示带电的指示灯。 Check whether there is safety mark on non-conductor side connection surface of slide-wire and whether there is indicator light with electricity.
51	C	磨损状态检查 Worn condition inspection	检查集电器滑轮、销轴或吊线环不得有异常磨损。 The unusual wear and tear of block of current collector, pins or bridle ring is forbidden.
52	C	固定状态检查 Fixed state inspection	集电器与电缆的连接螺栓不得松动，集电器的绝缘体固定应安全可靠。 Joint bolts of current collector and cable should not be loosened and insulation of current collector should be fixed safely and reliably.
53	B	集电滑轮回转状态检查 block turning state inspection of current collector	集电器滑轮应能灵活而平稳的回转，如有摩擦声响或回转困难应及时注油润滑。 Block of current collector should turn flexibly and smoothly. Inject lubricant oil if there is fricative sound or it turns difficultly.
54	C	集电器弹簧检查 Spring of current collector inspection	集电器的弹簧不得因生锈或疲劳而丧失弹力。 Spring of current collector should not lack bounce because of rusting or fatiguing.
55	B	机内接线外表检查 Wiring surface inspection	机内接线包括橡胶软缆和电线配线，不得有外伤。 Wiring includes rubber cable and electrical wire. Outer damage is forbidden.



续上表

序号 Serial No	分类 class	月检项目 item	月检内容与要求 content and requirement
56	C	固定连接检查 Fixed connection inspection	所有电器固定连接螺栓、机内配线固定连接螺钉不得有松动，配线管在机体上的固定要牢固。 All joint bolts should be tight.
57	B	软缆移动检查 Cable remove inspection	检查软缆在移动中是否有异常弯曲和扭转。 Check whether there are drawbacks like unusual bending or trauma in cables.
58	B	触点及铁芯检查 Contact and slug inspection	打开电磁开关箱，察看触点和铁芯是否有异常磨损、损伤，铁芯端面是否平整清洁。 Open up the electromagnetism and observe whether contact and slug have abnormal wear and tear and the end surface of slug is smooth and clean.
59	C	配线固定检查 Wiring fixed state inspection	检查各配线固定螺钉是否松动。 Check whether each wiring fixed bolt is loosened.
60	A	接触器动作检查 Connection action inspection	动作应灵敏可靠、触点接触紧密、无粘连、卡阻故障。 The act should be flexible and reliable and contact should be tight without block and adhesion.
61	A	外观检查 Appearance inspection	按钮标志应明显，手电门开关盒无外伤。 Button mark should be obvious and there is no damage out of the pendant switch.
62	A	故障异常检查 Troubles abnormity inspection	手电门悬挂软缆下端连接部位附近不得出现破损，联锁应无故障，内部绝缘应安全可靠，不得有断线等故障。 Connection part between pendant control and end of cable should not have damage and there should not have trouble like broken wire.
63	A	动作检查 Action inspection	检查起升限位开关动作是否灵敏安全可靠。 Check whether the lifting position-limiter act flexibly, safely and reliably.
64	B	触点检查 contact inspection	检查开关的触点是否有损伤和磨损状况，损伤、磨损严重时应及时更换，以保证安全使用。 Check whether the contact of switch has damages or worn condition. When damage is very severe, replace it on time.
65	C	配线固定检查 Wiring fixed state inspection	检查接线固定连接螺钉是否有松动。 Check whether the wiring fixed joint bolts has been loosen.
66	A	限位位置检查 Spacing position inspection	吊钩滑轮组起升至上极限位置，起升限位开关应能立即动作，此时吊钩滑轮组最高点距卷筒最低点应保证有 50mm 以上距离。 Lifting position-limiter switch can stop action immediately when hook block group ascend to the limited position. The distance from highest position of hook block group to lowest position of winding drum should be more than 50MM.



### 3. 年检 annual examination

年检是由专业维护人员或起重机保全工以年为周期的定期检查与维护，在日检和月检维护的基础上，根据起重机故障的具体情况，酌情自行确定年检周期为一年或两年。年检的部分项目要求会与月检相同，但年检绝不同于日检和月检只是外观检查和观察，年检是一次全面性检查、试车，对主要机械部分要进行拆检，对出现有较严重的磨损、变形要进行具体检测，对于达到报废标准或预计到下一次年检日期有可能达到报废使用极限危险的部分必须及时更换或修理，同时做好必要的维护。

Annual examination mainly is that professional attendant check crane annually on basis of daily check and monthly check. Part requirement of annual examination is the same as monthly check. But annual examination is different from monthly check that only check and observe the appearance of crane. It is a general check that needs to check severe wear and tear and deformation concretely. For the crane amounting to rejection standard, replace or repair it timely.

年检的具体检查项目见表 7。

Item of annual examination to see table 7.

表 7 年检项目和要求 Items, Requirements for Yearly Examination

检查项目 Items			检修标准 Requirements
运 行 轨 道 状 态	1	轨道踏面清洁状态 Clearance state of rail thread	不得积聚灰尘、铁屑，也不得附着油污和污水。 No attached greasy dirt or amount of dirt.
	2	轨道跨度检测 rail span inspection	支承形轨道 bearing type rail: $S \leq 10m, \Delta S = \pm 3mm$ 。 $S > 10m, \Delta S = \pm [3 + 0.1(S - 10)] mm$ 。 注：S-跨度， $\Delta S$ -跨度公差。 S-span, $\Delta S$ -tolerance of span
	3	轨道倾斜度 rail inclination	$\leq 1/1000$ 。
	4	同一截面两轨道标高差 Difference of two rails elevation of same section	$\leq S/1000$ 。
	5	同一侧轨道支承点标高差 Difference of same side rail bearing elevation	$\leq 1/1000$ (1-支承点间距)。
	6	轨道接缝间距 rail juncture distance	$\leq 2mm$ 。
	7	轨道接缝错位 rail juncture displacement	踏面上下、左右相错 $\leq 1mm$ 。
	8	轨道裂纹与变形检查 Crackles and deformation of rail inspection	不得有裂纹与变形（塑性）。 Crackles and plastic deformation are not allowed.
	9	轨道踏面疲劳检查 Rail that makes contact with the road inspection	轨道踏面不得有剥落、疲劳破坏。 Rail that makes contact with the road should not flake and should not have fatigued damage.
	10	轨道磨损 wear and tear of rail	支承形轨道，磨损量 $\leq$ 原尺寸 10%。 Worn proportions of bearing rail is no more than 10% of original dimension.
	11	轨道固定安装检查 Fixed installation of rail inspection	螺栓不得有松动，焊缝不得有裂纹。 Joint bolt should be tight and Defects like crackles in welding line are forbidden.



续上表

		检查项目 Items	检修标准 Requirements
起 重 机 桥 架	主 梁	12 主梁外观质量检查 Appearance quality of main beam inspection	不得有外伤和异常变形；锈蚀量≤原板材厚度的10%；涂漆层不得有剥落。 Damage or unusual deformation is not allowed; The corrosion proportions should be not more than 10% of original dimension.
		13 焊缝质量检查 welding line quality inspection	焊缝不得有裂纹。 Defects like crackles in welding line are forbidden.
		14 主梁跨中上拱度检查 Tip-tilted angle of main beam inspection	$\Delta F = (1/1000 \sim 1.3/1000) S$
		15 主梁旁弯检查 bending of main beam inspection	旁弯值 $\Delta F_p \leq S/2000$
		16 葫芦运行轨道的磨损状态检查 Worn condition inspection of electric hoist traveling rail	对于工字钢轨道，踏面磨损量不大于原尺寸的10%，宽度磨损量不大于原尺寸的5%。 Worn thread proportions should be no greater than 10%， and the worn width proportions should be greater than 5% for I style rail.
		17 工字钢轨道翼缘局部弯曲变形 deformation of I style steel flange	工字钢承载翼缘不得有明显的下塌变形（塑性变形）。 Flange of I style steel should not have obvious plastic deformation.
	端 梁	18 端梁外观质量检查 Appearance quality inspection of end carriage	不得有外伤和异常变形；锈蚀量≤原板材厚度的10%；涂漆层不得有剥落。 Damage or unusual deformation is not allowed; The corrosion proportions should be not more than 10% of original dimension; Coat of paint should not flake.
		19 焊缝质量检查 Welding line quality inspection	焊缝不得有裂纹。 Defects like crackles in welding line are forbidden.
		20 轮距偏差 The deviation degree of wheel distance	$K \leq 3m, \Delta K = \pm 3mm$ $K > 3m, \Delta K = \pm K/1000mm$ 注：K-轮距， $\Delta K$ -轮距偏差。
		21 运行电动机检查 Traveling motor inspection	电动机启动不得勉强、噪声过大或有异常声响。 The start of motor should not be too grudging. Too noisy and abnormal sound are forbidden.
	运 行 机 构	22 运行制动器检查 Traveling brake inspection	制动器应安全、可靠、灵敏。 Brake should be safe, reliable and flexible. 当制动器零部件出现下列情况应报废更换： Reject when any of the following has occurred: 裂纹；crackles 制动环或制动片等材料磨损量达原厚度的50%； The worn proportions of brake ring amounts to 50% of original thickness. 弹簧出现塑性变形； The spring appears plastic deformation. 小轴或轴孔直径磨损达原直径的5%时。 The worn proportions of shaft hole diameter amounts to 5% of original diameter.
23 运行减速器安装 installation of traveling reducer		固定连接螺栓不得有松动。 Joint bolt should be tight.	

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续上表

检查项目 Items		检修标准 Requirements	
起 重 机 桥 架	运 行 机 构	24 运行减速器外观 Appearance of traveling reducer	外壳不得有外伤、破损。 The shell should be no damage.
		25 运行传动齿轮质量检查 Gear quality inspection	检查齿轮出现下列情况之一时应报废： Reject when any of the following has occurred: 齿轮出现裂纹； There have been crackles on the gear teeth. 齿轮出现断齿； The gear teeth have broken. 齿面点蚀损坏达啮合面的30%，且深度达原齿厚的10%； The corrosive-pitting surface amount to 30% of the mating surface and the depth amounts to 10% of the origin. 起升第一级啮合齿轮齿厚磨损达原齿厚的 10%，其它级啮合齿轮齿厚磨损达原齿厚的 20%，开式齿轮达 30%。 The permitted worn proportion of first-level gear amounts to 10% of the origin, and others amounts to 20%. The exposed gear amounts to 30%.
		26 运行减速器密封检查 Traveling reducer sealing inspection	不得有渗、漏油现象。 Leaking of oil is forbidden.
		27 键联接检查 Key connection inspection	键及键槽不得有松动、变形。 Any loosening, distortion or unusual wear are all banned to the connection between key and keyslot.
		28 轴的磨损状态 worn condition of shaft	磨损量 $\leq$ 原轴颈的 2%。 The worn proportion should be less than 2% of the original shaft journal.
		29 轴承的检查 bearing inspection	是否涂有油脂；不得有破损、损伤；安装不得有松动。 Check whether there is oil grease. Damage is not allowed.
		30 油封的检查 Oil-tight devices inspection	不得有老化变质；与轴或孔的接触面不得有有害的损伤。 Aging and metamorphosis are forbidden; Seamless on the matching surfaces are forbidden.
		31 车轮表面质量检查 Surface of wheel quality inspection	出现下列情况之一时报废： Reject when any of the following has occurred: 裂纹； crackles 轮缘厚度磨损达原厚度的 50%； The worn wheel rim thickness amounts to 50% of the original thickness. 踏面厚度磨损达原厚度的 15%； Wheel thread thickness proportions amounts to 15% of original thickness.
		32 两侧车轮直径差 Difference of two side wheels diameters	踏面直径差 $\leq$ 1%。 Diameter difference of wheel thread is no more than 1%.
		33 车轮轴的磨损状态 Worn condition of wheel shaft	磨损量 $\leq$ 原轴颈的 2%。 The worn proportion should be less than 2% of the original shaft journal.
34 轴承检查 Bearing inspection	不得有破损或裂纹。 There should be no damage or crackle.		



续上表

检查项目 Items			检修标准 Requirements	
桥架	35	跨度偏差 $\Delta S$ The deviation degree of span $\Delta S$	$S \leq 10m, \Delta S = \pm 2mm$ 。 $S > 10m, \Delta S = \pm [2 + 0.1(S - 10)] mm$ , 且 $\Delta S_{max} \leq \pm 10mm$	
	36	桥架对角线差 Diagonal difference of loading bridge	$K \leq 3m,  S1 - S2  \leq 5mm$ , $K > 3m,  S1 - S2  \leq 6mm$ , (S1、S2-对角车轮距离)	
	37	车轮着力点高度差 Height difference of wheel forced on	$S \leq 10m, \Delta h = \pm 2.5mm$ $10 < S \leq 15 m, \Delta h = \pm 3.5mm$ $15 < S \leq 20 m, \Delta h = \pm 4.5mm$ $20 < S \leq 25 m, \Delta h = \pm 5.5mm$	
电动机葫芦	电机	38	电动机温升检查 The rising temperature of motor inspection	对于 E 级绝缘的电动机温升不得超过 $115^{\circ}C$ 。 The rising temperature for E grade insulation motor should be no more than $115^{\circ}C$ .
		39	电动机异常检查 Abnormity inspection of motor	检查电动机是否有启动勉强或有异常声响。 Check whether the motor starts grudgingly or whether there is abnormal sound.
	制动器	40	制动性能检查 Brake performance inspection	制动性能应安全可靠、刹车灵敏。 Brake performance should be safe and reliable and act flexibly.
		41	制动器零件质量检查 Component of brake quality inspection	制动器出现下列情况之一应报废： Reject when any of the following has occurred: 裂纹；crackles 制动环或制动片等材料磨损量达原厚度的 50%； Worn proportions of brake ring amounts to 50% of original thickness. 弹簧出现塑性变形； The spring has plastic deformation. 小轴或轴孔直径磨损达原直径的 5% 时。 Worn proportions of axis hole diameter amounts to 5% of original diameter.
	减 速 器	42	安装状态检查 Installation state inspection	连接螺栓不得有松动。 Joint bolt should be tight.
		43	减速器外观检查 Exterior inspection of reducer	不得有破损缺陷。 The defect like damage is not allowed.
		44	密封质量检查 Sealing quality inspection	不得有渗、漏油现象。 Leaking of oil is forbidden.
		45	异常检查 Anomaly inspection	不得有异常声响，异常发热。 Abnormal sound and abnormal heating are forbidden.
	46	齿轮质量检查 Gear quality inspection	检查齿轮出现下列情况之一时应报废： Reject when any of the following has occurred: 齿轮出现裂纹； There have been crackles on the gear teeth. 齿轮出现断齿； The gear teeth have broken. 齿面点蚀损坏达啮合面的 30%，且深度达原齿厚的 10%； The corrosive-pitting surface amount to 30% of the mating surface and the depth amounts to 10% of the origin. 起升第一级啮合齿轮齿厚磨损达原齿厚的 10%，其它级啮合齿轮齿厚磨损达原齿厚的 20%，开式齿轮达 30%。 The permitted worn proportion of first-level gear amounts to 10% of the origin, and others amounts to 20%. The exposed gear amounts to 30%.	



续上表

检查项目 Items			检修标准 Requirements
电 动 葫 芦	卷 筒 装 置	47	减速器其它零件检查 Reducer inspection  键联接不得有松动、变形； Any loosening, distortion or unusual wear are all banned to the connection between key and key slot. 齿轮轴的磨损量 ≤ 原轴颈的 1%； The worn proportion of gear shaft should be less than 1% the original shaft journal. 其它轴的磨损量 ≤ 原轴颈的 2%； The worn proportion of other shafts should be less than 2% the original shaft neck. 轴承不得有裂纹和破损； Bearing are forbidden to have damage or crackles. 油封不得老化变质，与轴孔的接触面不得有有害的损伤。 Aging and metamorphosis are forbidden; Seamless on the matching surfaces are forbidden.
		48	钢丝绳尾端固定状态检查 Fixed condition at the end of steel wire rope inspection  卷筒上的钢丝绳尾端压板不得有松动和异常，塞块不得有裂纹和异常。Pressing plate at the end of steel wire rope should not be loosened.
		49	导绳器工作状态检查 Rope guider working state inspection  当空钩下降时，钢丝绳应能顺利的从导绳器的出绳口排出。 The steel wire rope should successfully be let out from rope guide when empty hook is descending.
		50	卷筒报废标准 Winding drum rejection standards  卷筒出现下列情况之一时应报废： Reject when any of the following has occurred: 裂纹；crackles 筒壁磨损达原壁厚的 20%。 Worn proportion of drum wall amounts to 20% of the original thickness.
		滑 轮	51
	铸造滑轮报废标准 Block rejection standards  出现下列情况之一时应报废： Reject when any of the following has occurred: 裂纹；crackles 轮槽不均匀磨损达 3mm； Uneven wear of block groove amounts to 3mm. 轮槽壁厚磨损达原壁厚的 20% Wear of groove wall amounts to 20% of the origin. 因磨损使轮槽底部直径减少量达钢丝绳直径的 50%； The worn of the bottom of block groove proportion amounts to 50% of the wire-rope diameter. 其它损害钢丝绳的缺陷。 Any defects damage the wire rope		
钢丝绳润滑状态检查 Steel wire-rope lubrication state inspection  钢丝绳应保证良好的润滑状态。 Steel wire-rope should keep perfect lubricating state.			
钢丝绳	52	钢丝绳报废标准 Wire-rope rejection standards  见钢丝绳报废标准。其安全程度与报废内容主要有以下几个方面： See wire-rope rejection standards. Its safety degree and rejection contents include several aspects as follows: 断丝的性质和数量；Property and quantity of broken wires 绳端断丝；Broken wires at the end of rope 断丝的局部聚集；Broken wires get together partly 弹性减小；The bounce is reduced. 外部和内部磨损；Exterior and interior wear and tear 外部和内部腐蚀；Exterior and interior corrosion 变形；Deformation 由于热和电弧造成的损坏。 Damage because of heating and arc.	



续上表

检查项目 Items			检修标准 Requirements
	吊钩	53	吊钩报废标准 Hook rejection standards 出现下述情况之一应报废： Reject when any of the following has occurred: 裂纹；crackles 危险断面磨损达原尺寸的 10%； Wear and tear of dangerous section is more than 10% of original dimension. 开口度比原尺寸增加 15%； Open degree is more than 5% of the original dimension. 扭转变形超过 10%； Twisted deformation is more than 10% the original dimension 危险断面或吊钩颈部产生塑性变形。 Dangerous section or neck of hook occurs plastic deformation.
		54	葫芦运行小车车轮报废标准 Traveling trolley wheel of electric hoist rejection standards 出现下述情况之一应报废： Reject when any of the following has occurred: 裂纹；crackles 轮缘厚度磨损达原厚度的 50%； The worn wheel rim thickness should be no greater than 50% the original thickness; 踏面磨损达原踏面最大直径的 5%。 the worn width proportions should be greater than 5% of max diameter of original wheel.
	55	轮缘与工字钢翼缘的间隙极限 Clearance limit between wheel rim and rim of I steel. 最大间隙不得大于车轮踏面宽度的 50%。 Max clearance should be not more than 50% of the wheel thread width.	
电气部分	电气部分	56	同月检项目 The same as monthly check item 同月检内容要求。 The same as monthly check contents.
	空载试车	57	空载试运转 Run test with no load 作大车前后运行，小车左右运行、葫芦起升、下降动作，检查是否有异常，动作是否符合按钮标志。 Drive crane to travel forward and backward and electric hoist to go up and down. Check whether there are abnormal phenomena and action is according with button mark.
		58	安全装置检查 Safety device inspection 检查起升限位开关、运行行程开关等安全装置动作是否灵敏、安全可靠。 Check whether lifting limit switch and travel switch act flexibly, safely and reliably.
	负载试车	59	额定负荷试验 rated loading test 主梁垂直下挠不得超过标准中的规定值。 The flexivity of main beam should be no more than regulation of standard.
		60	超载试验 Overloading test 超载 25%起吊载荷，卸载后主梁不得有永久变形、裂纹、油漆剥落、松动、损坏等现象。 Add 1.25 times the rated load. When unload, there should be no abnormal phenomena like crackles or permanent distortion.
61		动载试验 dynamic loading test 起吊 1.1 倍额定载荷中，只作起升、下降和大车运行，在规定时间内各机构动作应灵活、平稳可靠、无异常。 Dynamic test should be under condition of crane carrying out with 1.1 times the rated load and each mechanism should act flexibly, smoothly and no abnormal phenomena.	

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## 十一、起重机的润滑 Lubrication of crane

1. 起重机设备各润滑点分布如下 every lubrication points distribute as follows:

- (1) 吊钩轴两端及吊钩螺母下的推力轴承;  
Two ends of hook axes and thrust bearing under hook nuts
- (2) 钢丝绳; Steel wire rope
- (3) 各减速器; Each reducer
- (4) 各车轮轴承、电动机轴承; Every wheel bearing, motor bearing.
- (5) 抓斗的上下滑轮轴;
- (6) 电缆导电中滑车的轴承。

润滑条件与润滑材料

Lubricating condition and lubricating material.

起重机设备必须采用合适的润滑油脂, 定期润滑和及时更换, 润滑装置和各润滑点必须保持清洁。表 8 是各机构主要零部件的润滑时间和推荐用的润滑材料。

The crane should adopt appropriate lubricant grease. Lubricate periodically. Lubricating device and every lubricating point should keep clean.

The table 8 is about main spare parts' lubricating time and recommended lubricating material.

表 8 主要零部件的润滑材料及润滑时间 Lubricating material and lubricating time of main spare parts

序号	零部件名称 name	润滑周期 Lubricating period	润滑条件 Lubricant condition	润滑材料 Lubricant material
1	钢丝绳 Steel wire rope	一般 15~30 天一次, 根据实际使用中的润滑情况而定 Once 15-30 days	(1) 把润滑脂加热到 50℃~100℃浸涂至饱和 Heat lubricating grease to 50℃~100℃ until saturation (2) 不加热涂抹 Daub without heating	(1) 丝绳麻心脂 (SH0388-1992) (2) 石墨钙基润滑脂 graphite lime-base grease
2	减速器 Reducer	使用初期每季换一次, 以后可根据油的清洁情况半年至一年换一次 once a quarter		按减速器说明书要求 Be according to reducer instruction
3	开式齿轮 Open type gear	半月一次, 每季或半年清洗一次 Once half a month or once half a year		明齿轮脂 (HG1-26-73) Gear grease
4	滚动轴承 Rolling bearing	3~6 个月一次 Once 3 to 6 month		通用锂基润滑脂 (GB7324-1994) lithium soap base grease

2. 润滑注意事项 notice of lubrication

- (1) 润滑材料必须保持清洁; Lubricating material should keep clean.
- (2) 不同牌号的润滑脂, 不可混合使用; Lubricating grease of different trademark cannot mingle to use.
- (3) 经常检查润滑系统的密封情况; Check seal state of lubricating system.

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(4) 选用适宜的润滑材料和按规定添加润滑脂的时间，进行润滑工作；

Choose fitting lubricating material and add lubricating grease according to regulation to lubricate.

(5) 应用压力注脂法（油枪）添加润滑脂较好，尽量避免用涂抹方法添加润滑脂，因润滑脂不宜进到摩擦面上。It is better to add lubricating grease with oil gun and avoid daubing method.

(6) 只有在起重机完全断电时，才允许进行润滑操作（电动干油集中润滑除外）；

Lubricating operation is permitted when power source of crane is completely cut off.

(7) 潮湿地区不宜选用钠基润滑脂，因其吸水性强，易失效；

It is not better to choose sodium soap base grease in humid area because it is very absorbent and prone to invalidate.

(8) 各机构没有注脂点的部位，应定期用稀油点注在转动部位缝隙中，以减少机件的磨损和防止锈蚀；

Inject oil into gap of rolling member termly to reduce wear and tear.

(9) 润滑点润滑时，应适当转动以使润滑脂均匀分布；

Turn properly to make the lubricating grease distribute evenly when lubricate.

(10) 各种润滑油料等如未到更换间隔时间，但已发现受污或变质时，应立即予以更换。

Replace on time when find kinds of lubricating oil has metamorphosed, though it is not until changing time.

## 十二、起重机常见故障及处理 Usual troubles and adjustments

起重机在使用过程中，不可避免的会产生有形磨损，并引发故障，如果不及时发现和排除的话，就会造成严重后果。因此要对故障进行认真的分析，准确地查找故障原因，并采取相应的措施排除故障，从而恢复和保证起重机的技术性能。为了使广大起重机用户，对起重机常见故障及故障原因和排除方法有所了解，表 9 中列出了起重机一般常见故障原因及排除方法，供广大用户参考。

The crane must be wear and tear unavoidably in use process. If we do not find or remove troubles on time, may bring severe consequence. So we should analyze troubles carefully, find the reason and take relevant measure to assure the technical performance of crane. To make customers know about the usual troubles and exclusion method, table 11 listed usual troubles and adjustments of crane for consideration of users.

表 9 起重机常见故障及排除方法 Usual troubles and adjustments

序号	项目 item	常见故障 troubles	故障原因 reason	排除方法 exclusion method
1	电动机 Motor	空载时电动机不能启动 Motor cannot start with no load	1) 电源未接通 Power source is not plug in 2) 按钮失灵，接触不良 Failed button or bad connection 3) 熔断器、接触器等元件失效 Fuse and connection is ineffective 4) 限位器未复位 Limit device does not restore. 5) 按钮接线折断 Button wiring has been broken	1) 接通电源 Put through the power source 2) 修整更换有关电器元件 Replace relevant electrical components 3) 调整或重新更换按钮接线 Adjust or replace the button wiring.
		空载时旋转，有载时不转 Rotate with no load and do not rotate with load	1) 转子断条，转子铸铝铝条粗细不均匀 Rotor is broken 2) 电动机单相运转 Single-phase run of motor	1) 更换电动机 Replace the motor 2) 重新接线 Rewiring



续上表

序号	项目 item	常见故障 troubles	故障原因 reason	排除方法 exclusion method
		启动勉强, 噪声大 或有异常声响 Starts grudgingly, too noisy or abnormal sound	1) 超载过多 Extremely overloading 2) 电源电压过低 Voltage is too low. 3) 制动器未完全打开 brake is not open completely 4) 接触器线圈, 电路接线有折断 Loop of rheostat and wiring has been broken.	1) 按额定起重量吊载 Lifting at rated lifting capacity 2) 调整电源电压 Adjust the voltage 3) 调整制动器间隙 Readjust the space of brake 4) 重新接线 Rewiring
		定子绕组烧毁 Rotor is burned	绝缘等级低或漆包线有外伤 Insulation degree is too low	更换电动机 Replace the motor
		电动机过热 Too high is the rising temperature	1) 超载吊运 Overloading 2) 电压过低 Voltage is too low 3) 启、制动过于频繁 To brake is too often 4) 制动器间隙过小 Clearance of brake is too small	1) 按额定起重量吊载 Lifting at rated lifting capacity 2) 调整电源电压 Adjust the voltage 3) 减少启、制动次数 Reduce the number of start and brake 4) 调整制动器间隙 Adjust clearance of brake.
2	减 速 器 Reducer	减速度传动噪声 过大 Reducer is too noisy	1) 润滑不良、缺油 Poor lubricating and lack of oil 2) 传动件有损伤或磨损严重 There are damages and sever wear and tear of driving member	1) 清洗、加足润滑油 Clean and fill up with lubricant oil 2) 修整或更换齿轮、轴承等传 动件 Repair and replace gear and bearing
		起升减速度箱体 破损 Cabinet of lifting reducer is broken	起升限位器失灵, 吊钩撞击卷筒 外壳, 吊钩偏摆而打裂 Lifting limit is out of order and hook knocks against shell of winding drum	更换箱体, 修理限位器 Replace cabinet and repair limit
3	制 动 器 Brake	制动失灵 The brake is out of order	1) 电动机轴断裂 Axis of motor is broken 2) 锥形制动环磨损出台阶, 制 动失效 Ineffective brake because of wear and tear of cone type brake ring	1) 更换电动机轴 Replace axis of motor 2) 更换制动环 Replace brake ring
		重物下滑或运行时 明显刹不住车 unreliable brake	1) 制动间隙太大 Large-space brake disc 2) 制动环磨损严重 Severe wear and tear of brake ring 3) 电动机轴端或齿轮轴端紧固 螺钉松动 The fixed bolts of the end of axis of motor or gear have been loosened.	1) 调整制动间隙 Adjust the clearance of brake 2) 更换制动环 Replace the brake ring 3) 拧紧松动的紧固螺钉 Tighten loosened bolts.
		制动时发出尖叫声 Scream when brake	制动轮与制动环间有相对摩擦, 接触不良 There is relative friction between brake wheel and brake ring and bad contact.	修制动环, 使制动轮、制动环锥 面相符 Repair brake ring to make brake wheel accord with cone surface of brake ring.



续上表

序号	项目 item	常见故障 troubles	故障原因 reason	排除方法 exclusion method
4	卷筒装置 Winding drum	导绳器破裂 Rope guide is broken	斜吊违章操作 Be off slant out of normal process	按操作规程操作 Operate by working instruction
		电动葫芦外壳带电 Live shell of electric hoist	轨道未接地或接地线失效 Rail is not connected to ground or ground wire is ineffective.	加装或接通接地线 Put through the ground wire
5	钢丝绳 Steel wire rope	钢丝绳切断 Steel wire rope is cut off	1) 因限位器失灵被拉断 Pull apart because of failure of 2) 超载过多起吊 Extremely overloading 3) 已达到报废标准, 仍继续使用 Continue to use after amounting to rejection standard.	1) 修理或更换限位器 Repair or replace position limiter. 2) 按规章吊载 Loading according to regulation 3) 更换钢丝绳 Replace steel wire rope
		钢丝绳变形 Steel wire rope has deformation	1) 无导绳器, 钢丝绳被挤压变形 Without rope guide, steel wire rope is pressed to distort. 2) 斜吊造成乱绳而变形 Be off slant to cause distortion	1) 应安装导绳器 Install rope guide 2) 按操作规程操作 Operate by operation regulation
		钢丝绳磨损 Wear and tear of steel wire rope	1) 斜吊使钢丝绳与外壳相磨 Be off slant to make friction between steel wire rope and outer shell 2) 钢丝绳直径过大与绳槽不符 Diameter of steel wire rope is too large and does not accord with rope groove	1) 不要斜吊 Do not be off slant 2) 合理选用钢丝绳 Choose steel wire rope reasonably
		钢丝绳空中打花 Twist in the air	缠绳时未将钢丝绳放松 Do not slacken the steel wire-rope when binding the rope	将钢丝绳拆下, 在放松后状态下重新缠绕在卷筒上 Remove steel wire rope, rewind it on winding drum.
6	手电门 (按钮开关) Button switch	按钮动作失灵, 按下不能复位 Failure action of button	1) 按钮弹簧疲劳、损坏 Spring of button fatigues and damages 2) 灰尘污物过多 There is too much dirt 3) 电路断线或接头松动 The circuit is broken or junction is loosened	1) 更换弹簧 replace spring 2) 保持清洁 Keep clean 3) 更换电缆或重接线 Replace cable or rewiring
		动作与按钮标志不符 Action is not according with button mark	电源相序接错 Phase sequence of power source has been connected faultily.	重新接线 (换相) rewiring
		触电 Electric shock	1) 采用铁壳手电门 adopt steel casing pendant control 2) 非低压手电门 Non low voltage pendant control	1) 改用塑壳手电门 Choose plastic case pendant control 2) 采用低压 (36V 或 42V) 手电门 Choose low voltage (36v or 42v) pendant control



续上表

序号	项目 item	常见故障 troubles	故障原因 reason	排除方法 exclusion method
7	交流接触器 Rheostat	接触器线圈断裂 Winding of rheostat is broken	疲劳损坏 Fatigue and damage	更换接触器 Replace the rheostat
		接触器触点粘连 Contact of rheostat adheres	1) 磁铁接触面上有油污 There is oil dirt on surface of magnet 2) 触点烧损 Contact is burned.	1) 清除油污 Clean the dirt 2) 更换触点 Replace contact
		接触器触点烧毁 Contact of rheostat is burned	触点接触面不平, 质量差 Surface of contact is not even and quality is bad	更换触点或换接触器 Replace contact or rheostat
8	起升限位器 Lifting position limiter	升至极限位置时不能限位 Lift to limiting position but cannot limit position	1) 电源相序接错 Phase sequence of power source has been connected faultily. 2) 接线不牢 loosely wiring 3) 限位杆的停止块松脱 Stopper of gag lever post is shed.	1) 重新接线 Rewiring 2) 重新接线 Rewiring 3) 调整好限位块位置 Adjust location of stopper
9	葫芦运行小车 Traveling trolley	葫芦车轮打滑 Wheel of electric hoist skids	轨道面或车轮踏面有油污 There is oil dirt on surface of rail	清除油污 Clean up the oil dirt
		葫芦车轮悬空 Wheel of electric hoist hovers	1) 工字钢下翼缘不规整 2) 车轮组装配不合要求 Assembly of wheel group does not accord with the requirement.	1) 修整工字钢翼缘 Repair flange of I style steel 2) 修整车轮组, 重新装配 Repair wheel group and reassemble
		车轮爬轨 wheel climbs rail	运行小车两侧不平衡 The two sides of traveling trolley do not balance.	加配重调整 Adjust with additional weight
10	起重机运行机构 Traveling mechanism	启动时, 主动车轮打滑 Drive wheel skid when start	1) 轨面有油污 Greasy dirt on rail surface 2) 车轮三条腿, 主动轮悬空 Wheel with three legs. Drive wheel is hovering.	1) 清除油污 Clean off the stain 2) 调整、修复解决三条腿, 或矫正桥架 Adjust or repair to resolve the problem of three legs
		大车启制动时有明显不同步, 扭动 Obvious outasync	1) 车轮踏面磨损 Wear and tear of wheel thread 2) 直径尺寸相差太大 Diameter difference is great. 3) 分别驱动两端制动器间隙相差太大 Clearance difference between two ends brake is great.	1) 更换、修理车轮 Replace or repair wheel 2) 同一个人, 调整两侧制动间隙 Adjust brake clearance of two side by the same people.
		大车制动刹不住车 Unreliable brake	1) 制动间隙过大 Clearance of brake is too large 2) 制动环磨损已达报废标准 Wear and tear of brake ring amounts to rejection standards	1) 调整间隙 Adjust the clearance 2) 更换制动环 Replace the brake ring
		大车运行中出现歪斜、跑偏、啃道 The crane deflects when traveling	1) 轨道安装质量不合格 Installation quality of rail is not eligible. 2) 桥架发生变形 Loading bridge deformation 3) 车轮装配精度不合格 Precision of wheel assembly is not eligible 4) 车轮磨损 Excessive worn gears	1) 修复轨道 Mend rail 2) 检查矫正桥架 Check and adjust loading bridge 3) 修整车轮组 Mend wheel group 4) 更换、修理车轮 Replace or repair wheel



续上表

序号	项目 item	常见故障 troubles	故障原因 reason	排除方法 exclusion method
		大桥运行中出现卡轨、爬轨、掉道或蛇形、扭摆、冲击 Rail blocking impulsion	1) 起重机跨度与轨道跨度相差太大 Crane span and rail span is so different. 2) 车轮槽与轨顶面不匹配 Sheave groove does not match with top of rail 3) 起重机三条腿 Crane with three legs 4) 轨道质量差, 接缝不合要求 Quality of rail is bad and welding line is not meet the requirement	1) 修整跨度 Repair span 2) 修车轮槽 Repair sheave groove 3) 修车轮组使四轮与轨道全接触 Repair wheel group to make four wheels fully contact with rail 4) 重新调轨道 Readjust the rail
11		主梁上拱消失, 出现下塌 (下挠) Tip-tilted angle disappears and downwarping appears	1) 超载起吊 Overloading 2) 主梁疲劳 Main beam fatigues 3) 使用环境恶劣 (如高温烘烤) Be used in hostile environment	1) 按规定吊载 Hoist according to regulation 2) 利用火焰烘烤修复 Using flame to roast 3) 改善工作环境 Improve the working circumstance
		主梁工字钢下翼缘下塌 Flange of main beam I type steel sags	1) 超载过大 Extremely overloading 2) 葫芦轮压太大 Wheel load of electric hoist is too large 3) 工字钢翼缘太薄 Flange of I style steel is too thin 4) 磨损严重而变薄, 局部弯曲强度减弱 It is thinner because of severe wear and tear.	1) 不得超载 Overloading is forbidden 2) 增加走轮个数, 减小轮压 3) 工字钢贴板补强 Strengthen I type steel pasting 4) 严重时, 无法补强应报废 If it is severe, reject it
12	司机室 Operation room	司机室振动, 摇晃 Cab librates	1) 司机室本身刚性差, 与主梁连接不牢 Bad rigidity of Cab itself 2) 主梁动刚度差 Bad rigidity of main beam 3) 起重机运行振动、冲击大 The crane travels with great impact	1) 加强司机室刚性 Intensify rigidity of Cab 2) 增加减振器 Increase vibration isolator 3) 适当提高主梁刚度 Enhance rigidity of main beam properly. 4) 尽量采用双速起升与运行 Adopt double speeds lifting and traveling 5) 对轨道缺陷进行修复
13	电气 Electric	行程开关失灵 Failure of travel switch	1) 短路 short Circuit 2) 接线不对 Wiring is not correct	重新接线 Rewiring
		电源引入装置 滑轮滑脱 Block of power source device is shed	1) 塑料滑轮磨损严重 Plastic block wears severely 2) 滑线架设支承不当 Bearing of slide wire is not appropriate.	1) 改成耐磨塑料滑轮 Choose 2) 修改滑线支承装置 Replace slide wire bearing device
14	密封 Seal	渗、漏油 Leaking of oil	1) 油封疲劳损坏失效 Oil-tight devices fatigues and invalidate 2) 减速器加油过多 Fill up reducer with oil too much 3) 装配时螺栓没紧固好 Connecting screws are loosening 4) 箱体结合面未采用密封结构或未涂密封胶 Junction plane of cabinet does not adopt seal structure or does not paint some sealant on it.	1) 及时更换油封 Replace the oil-tight device 2) 适量加油 Fill up with oil appropriately 3) 重新紧固螺栓 Tighten the screws 4) 拆装时应清除箱体结合面的污物。重新涂上密封胶 Clean the dirt on junction plane of cabinet and repaint some sealant on it.



### 十三、起重机的安全操作规程 Safe operation regulation of crane

#### 1. 起重机的操作 operation of crane

因为单梁起重机结构简单，操作方便，所以操作以地面操作为主，其次是司机室操作，亦有采用遥控操作的。

The structure of single-beam crane is simple and operates conveniently, so mainly ground control, next Cab control, but remote control also.

##### (1) 地面操纵 ground control

地面操纵的起重机是通过手动按钮开关（手电门）进行操纵控制的，手电门通过橡胶软缆及加强钢丝悬挂在起重机下，距地面 1~1.2m 为佳。手电门通过电磁开关的闭合和切断，控制电动机的正、反转，达到吊载起升、下降、左右横行或前后运行的目的。手电门有 36V 或 42V 低压电源（图 17 a）和双速手电门（图 17 b），按钮标记常为“上、下、前、后、左、右”或  $\uparrow$ 、 $\downarrow$ 、 $\leftarrow$ 、 $\rightarrow$ 、 $\times$ 、 $\cdot$ ，安装后必须将按钮标记调整至与起重机运行方向相一致，否则很容易发生操作事故危险。

Ground control crane is controlled by pendant control. Pendant control hangs under the crane through rubber cable and strengthened steel wire. Pendant control controls reversion of motor through closure or break of electromagnetic switch to achieve the aim of going left, right, forward, backward. Pendant control has two types of single speed (diagram 17a) and double speed (diagram 17b). Adjust button mark to make them run in the same direction, or there will easily occurs accident.

##### 按钮开关说明：Pushbutton Switch Instruction

##### 单速控制按钮：Single-speed pushbutton

急停—紧急停机按钮，遇有紧急情况，按下此按钮，使起重机停止工作；

emergent stop—if meet emergency, press this button to stop crane working

启动—按下此按钮，起重机接通电源，可以开始工作；

start—press this button, the crane accesses the power source and starts to work.

停止—按下此按钮，起重机切断电源，停止工作；须再次工作时，应按一下启动按钮；

stop—press this button, the crane cuts off the power and stops working; press start button when require the second working.

起升—按下此按钮，吊钩开始上升；

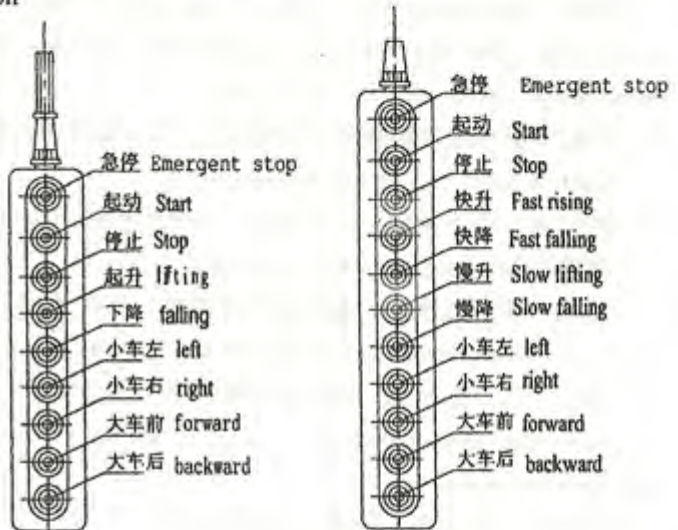
rise—press this button, the hook is rising;

下降—按下此按钮，吊钩开始下降；

fall—press this button, the hook is falling;

小车主—按下此按钮，电动葫芦向左运行；

left—press this button, the hoist goes left.



a. 单速控制按钮开关

b. 双速控制按钮开关

Single-speed pushbutton switch

dual-speed pushbutton switch

图 17 手电门  
pendant control



小车右—按下此按钮，电动葫芦向右运行；

right—press this button, the hoist goes right.

大车前—按下此按钮，起重机向前运行；

forward—press this button, the crane goes forward;

大车后—按下此按钮，起重机向后运行。

backward—press this button, the crane goes backward;

双速控制按钮：Dual-speed pushbutton switch

快升—按下此按钮，吊钩开始快速上升运行；

Fast rising—press this button, the hook goes up quickly.

快降—按下此按钮，吊钩开始快速下降运行；

Fast falling—press this button, the hook goes down quickly.

慢升—按下此按钮，吊钩开始慢速上升运行；

Slow rising—press this button, the hook goes up slowly.

慢降—按下此按钮，吊钩开始慢速下降运行。

Slow falling—press this button, the hook goes down slowly.

其它按钮的控制作用与单速控制按钮相同。

The control function of other pushbutton is as same as the single-speed pushbutton.

## (2) 司机室操纵 Cab control

当起重机运行速度大于 45m/min 时应安装司机室进行操作，司机室有开放式和封闭式之分，开门方向有侧面开门与端面开门之分，用户可根据使用环境和需要进行选择。

When traveling speed of crane is more than 45m/min, can adopt Cab control which has open model and closed model. And the direction of entering the gate has two forms, sideway and ends in order to satisfy the users, choice under different conditions.

司机室操纵控制面板如图 18 所示。大车运行为凸轮控制器操纵，升降和前、后为按钮操纵。

Control panel of Cab to see diagram 18.

控制面板开关说明：Control panel switch instruction

单速控制：Single-speed pushbutton

启动—按下此按钮，起重机接通电源，可以开始工作；

start—press this button, the crane accesses the power source and starts to work.

停止—按下此按钮，起重机切断电源，停止工作；须再次工作时，应按一下启动按钮；

stop—press this button, the crane cuts off the power and stops working; Press start button when require the second working.

升—按下此按钮，吊钩开始上升运行；

rise—press this button, the hook is rising;

降—按下此按钮，吊钩开始下降运行；

fall—press this button, the hook is falling;

向前—按下此按钮，电动葫芦向前运行；

forward—press this button, the hoist goes forward;

向后—按下此按钮，电动葫芦向后运行；

backward—press this button, the hoist goes backward;

凸轮控制器手柄顺时针旋转—起重机向右运行；



Turn cam controller handle clockwise—the crane goes right.

凸轮控制器手柄逆时针旋转一起重机向左运行；

Turn cam controller handle anticlockwise—the crane goes left.

照明—为旋钮开关，司机室控制照明的开关；

Illumination—thumb wheel switch can control the illumination.

电铃—为司机发出警告信号的电铃开关；

Electric bell—electric bell switch can give a warning to drivers.

备用—备用按钮。

spare—Spare button

双速控制：Dual-speed pushbutton switch

慢升—按下此按钮，吊钩开始慢速上升运行；

Slow rising—press this button, the hook goes up slowly.

慢降—按下此按钮，吊钩开始慢速下降运行；

Slow falling—press this button, the hook goes down slowly.

快升—按下此按钮，吊钩开始快速上升运行；

Fast rising—press this button, the hook goes up quickly.

快降—按下此按钮，吊钩开始快速下降运行。

Fast falling—press this button, the hook goes down quickly.

其它按钮的控制作用与单速控制面板按钮相同。The control function of other pushbutton is as same as the single-speed pushbutton.

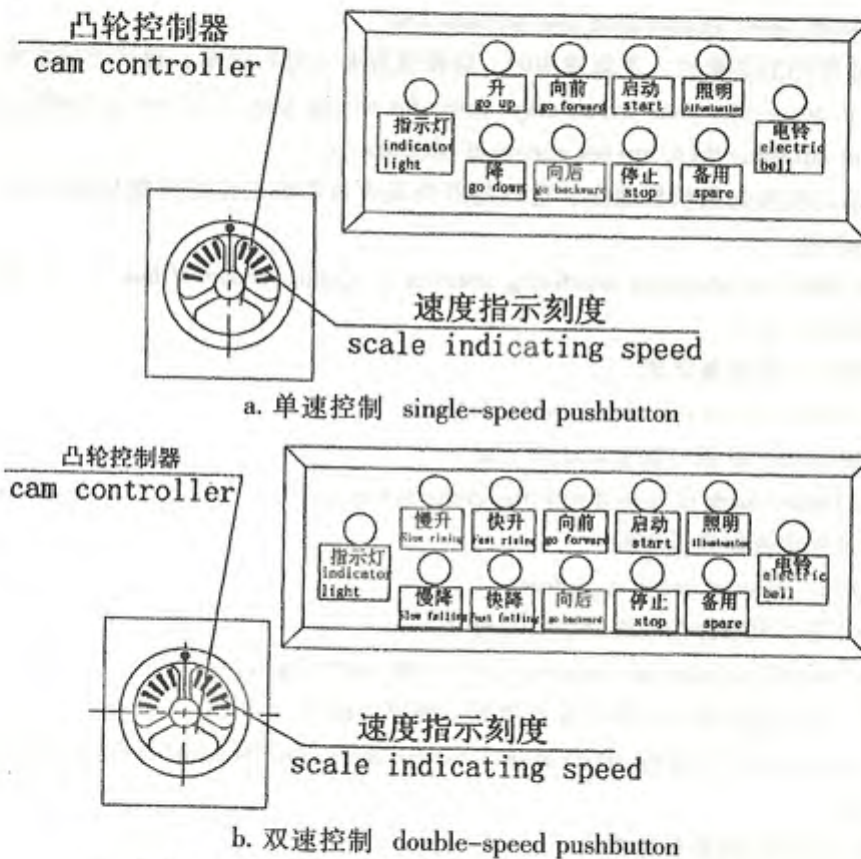


图 18 司机室控制面板 Control panel of operation room



(3) 遥控操纵 remote control

操作者手持遥控器，按动信号传输装置上的按钮，依靠起重机上的接受信号装置的开关动作，指挥起重机作业的形式称为遥控操纵。

The type of remote control is that operator holds remote control and press the button to command the crane.

2. 安全操作规程 Safe operation regulation of crane

(1) 对操作者的要求 The requirement to operator

1) 操作者必须身体健康。年满 18 周岁，视力在 0.7 以上，无色盲症，听力能满足具体工作条件的要求。

The operators should be over 18 years old and be healthy. They are supposed to have good eyesight; no color blindness and normal sense of hearing can meet the requirement of specific working condition.

2) 操作者应能熟悉安全操作规程和掌握有关安全注意事项。

The operator should be familiar to safety rules and such illustrations..

3) 操作者应熟悉经常操作的起重机的基本结构和性能。

The operator should be familiar to crane's basic structure and performance.

4) 操作者应熟悉起重机安全装置的作用，掌握相应的吊装作业知识。

The operator should be familiar to the function of safety device and master relative hoisting knowledge.

5) 操作者必须持有有效期内的操作证才能上岗。

(2) 作业前的注意事项 Points of attention for operation

1) 做好必要的安全检查和准备工作。

Make the necessary safety examination and preparations.

2) 对长期停止使用的起重机，重新使用时，应按规程要求进行试车，确认无异常方可投入使用。

When require to reuse the crane which stops using for a long time, trial run according to the regulations, put to use after affirming there are not abnormal phenomena.

3) 开始作业前应检查起重机轨道上、运行范围内是否有影响工作的异物与障碍物。如有，应确认清除后才能开始作业。

Check whether there are obstacles interfering working in running scope. If has, we should start to work after assuring unblocking of it.

4) 检查电压降是否超出规定值。

Check whether the voltage value lies above or below.

5) 检查操作按钮标记是否与起重机动作一致。

Check whether button mark is accord with the crane action.

6) 检查制动器制动效果是否良好

Check whether the effect of brake is perfect.

7) 检查上升极限位置限位器动作是否安全可靠。

Check whether the lifting position-limiter action is safe and reliable.

8) 检查起升、运行机构空车运转时是否有异常响声与振动。

Do examine lifting and traveling mechanism whether there are abnormal noise and unusual libration when there is no load.

9) 检查吊钩、滑轮组是否有异常。

Do examine hook and wheel group whether there are abnormal phenomena.



10) 检查吊装钢丝绳是否有故障与损坏。

Check whether hoisting steel-rope is damaged.

(3) 起重机安全操作规程

Safe operation regulation of crane

1) 不得超载进行吊装作业。

Overloading is forbidden.

2) 不得将吊载在其他作业者头上通过。

Suspended load should not be lifted over head of other operators.

3) 不得侧向斜吊。

It's forbidden to pull objects slantingly.

4) 不得利用起升限位器作起升停车使用。

Do not stop via lifting position-limiter

5) 不得在正常作业中经常使缓冲器与止档器冲撞，或达到停车的目的。

Do not make buffer and gear stopper knocking frequently in normal operation or to the purpose of stopping.

6) 不得在吊载中调整制动器。

Do not adjust the brake while lifting heavy loads.

7) 不得在吊载作业中进行检修与维护。

Maintenance is forbidden in process of lifting.

8) 不得在吊载有剧烈振动时进行起吊、横行与运行作业。

It's forbidden to hoist and operate when the load has strenuous vibration.

9) 不得在吊载重量不清情况下进行作业。

It's forbidden to hoist and operate when not clear about the objects' weight.

10) 不得吊拔埋置物及斜拉作业。

Lift buried objects and pull slantingly is not allowed.

11) 不得随意拆改起重机上任何安全装置。

Do not remove and revise the safety devices on the electric hoist.

12) 不得在下列有影响安全的缺陷及损伤情况下作业：制动器失灵、限位器失灵、吊钩螺母防松装置损坏、吊装钢丝绳损伤已达到报废标准等。

It is forbidden to operate when there are defects or injuries which shall influence safe work .For example, the brakes or position-limiter doesn't work, the nuts of the hook are damaged, the wear and tear of the steel-rope reaches the scrap standard and so on.

13) 不得在捆绑吊挂不牢、吊载不平衡、易滑动、易倾翻状态下、重物棱角处与吊装钢丝绳之间未加衬垫情况下进行吊装作业。

It is forbidden to operate when there is possible sliding as result of loose binding or disequilibrium or there is no pad between edges of heavy objects and the wire-ropes.

14) 不得在工作场地昏暗、无法看清场地与被吊物的情况下作业。

Too dark at the spot to see clearly loaded objects is forbidden to operate.

15) 经常注意作业中吊载附近是否有其他作业人员，以防发生冲撞事故。

Always make certain that whether there is other operator near the load to avoid crash.

16) 注意吊钩是否在吊载的正上方。

Make certain that whether hook is over the load.



17) 注意在狭窄的场所、吊载易倾倒的情况下, 不宜盲目操作。

Do not operate in narrow occasion and the situation that the load is easy slanting.

18) 注意作业中应随时观察前、后、左、右各方位的安全性。

Observe the safety of forward、backward、left and right direction when operate.

19) 确认操作处于易见方位再进行操作。

Operate after we make certain that operation is in visible direction.

20) 确认手电门按钮标记后再操作。

Operate after we make certain of the handle button mark.

21) 确认吊具与吊装钢丝绳处于正常, 没有挂扯其它物体时, 再按动手电门按钮。

Make certain that hook and steel rope are in normal condition and do not hung other objects then can press the handle button.

22) 发现起重机故障时, 应及时与安全维护人员取得联系, 及时排除故障与隐患。

Make contact with security officer on time when note faults and remove the failures.

23) 发现故障时应立即切断总电源。

Cut off the power source when find faults.

24) 重物接近或达到额定载荷时, 应先做小高度、短行程试吊后再平稳地进行起升吊运。

As the heavy objects approach or reach rated load, do try for a short distance and lift with the lowest height.

25) 重物下降至距地面 300 毫米处时, 应停车观察是否安全再下降。

As the heavy objects descend to 300mm near the ground, do stop to observe whether they need safe decline again.

26) 无下降极限位置限位器的起重机, 在吊具处于最低位置时, 卷筒上的钢丝绳必须保证有不少于两圈的安全圈数 (不包括固定绳尾的圈数)。

2 or more-circle wire-rope must be left on the roller on safety grounds when the hook is at the lowest working position for the electric hoist without falling limiter.

27) 翻转吊载时, 操作者必须站在翻转方向的反侧, 确认翻转方向无其他作业人员时, 再进行操作。

Overturn suspended load, operator should stand at the opposite side of overturning direction.

28) 为减小吊载的摆动与冲击, 可以采取反向动作控制。

To reduce the sway and impact of load, adopt reverse action control.

## 十四、标志、运输和储存 Marks, transport and storage

1. 在主梁的跨中显著位置, 设置有醒目的吨位牌 (见图 19)。

Each crane should equipped with placards in obvious locations. (See diagram 19)

a. 额定起重量; rating hoisting capacity

b. 制造厂名和厂标, 商标。Name of manufacturing factory



图 19 吨位牌 Tonare brand



2. 起重机标牌安装在起重机主梁上；由司机室操纵的起重机，产品标牌安装在司机室内。标牌上注明的内容有（见图 20）：

The placard should be equipped on main beam of the crane and should be installed in Cab when the crane has operation room.

The placard should include the following elements: (see diagram 20)

- a. 产品型号及名称；product model and name of product
- b. 工作级别；working system
- c. 额定起重量；rating hoisting capacity
- d. 跨度；span
- e. 起重运行速度；travel speed
- f. 出厂编号、制造日期和制造厂名。

Outgoing No., manufacture date and name of manufacturing factory.

3. 吊钩装置上的标志有下列内容：（见图 21）

The sign on the hook should include the following elements: (see diagram 21)

- a. 起重量；Hoisting capacity
- b. 机构工作级别；Working system
- c. 产品编号和制造日期  
No. of the product and date of Manufacture
- d. 制造厂名称和商标。  
Name of manufacturing factory and trademarks

4. 包装 package

包装方式一般为裸装。The packing style is generally nude.

5. 吊装、运输

为防止起重机主梁在吊装运输及储存中发生变形，除条件不允许者外，一律按使用位置进行吊装、运输和储存。

6. 储存 storage

产品如不能及时安装，应放在干燥、通风良好的室内储存。如放在室外时，应做好以下几点防护措施：

- a. 包装箱封盖严密，对运输过程中的破损和开裂部分应进行修补严密。
- b. 包装箱外应以油毡或塑料包装材料包扎严密，接缝处要有适量的重合搭接，一般不小于 60mm，以防雨水漏入箱内。
- c. 外包装应捆扎牢固或钉固，以防被风刮开。
- d. 包装箱应存放在地势较高的地方，或以其它材料牢固的垫起一定高度，保证能有效地防止雨水浸泡。
- e. 随时检查储存情况，如有产品锈蚀或包装箱破损时，应及时采取补救措施。

图 20 产品标牌 Products Signs

图 21 吊钩组 Hook Group



If the products cannot install timely, should be put in dry, well-ventilated indoor to store. If left outdoors, we should do the following protective measures:

- a. Boxes must sealed tightly, breakage and cracking on the transport process should have close remedial.
- b. Packaging alia should bundle tightly with shingle or plastic packaging materials, seams should have an appropriate amount of coincidence lap, generally not less than 60 mm, to prevent rainwater leaking into the box.
- c. Over pack material should be firmly tied or nails to prevent them from being opened by windborne.
- d. Boxes should be kept at higher levels, or other solid materials aside a certain altitude so as to guarantee effectively in preventing rainwater soaking.
- e. Inspect the storage situation timely, where products or packaging corrosion damage, we should take remedial measures on time.

7. 安全警告标识 (见图 22) Safety Warning Mark (see diagram 22)

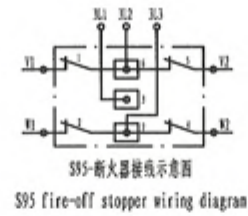
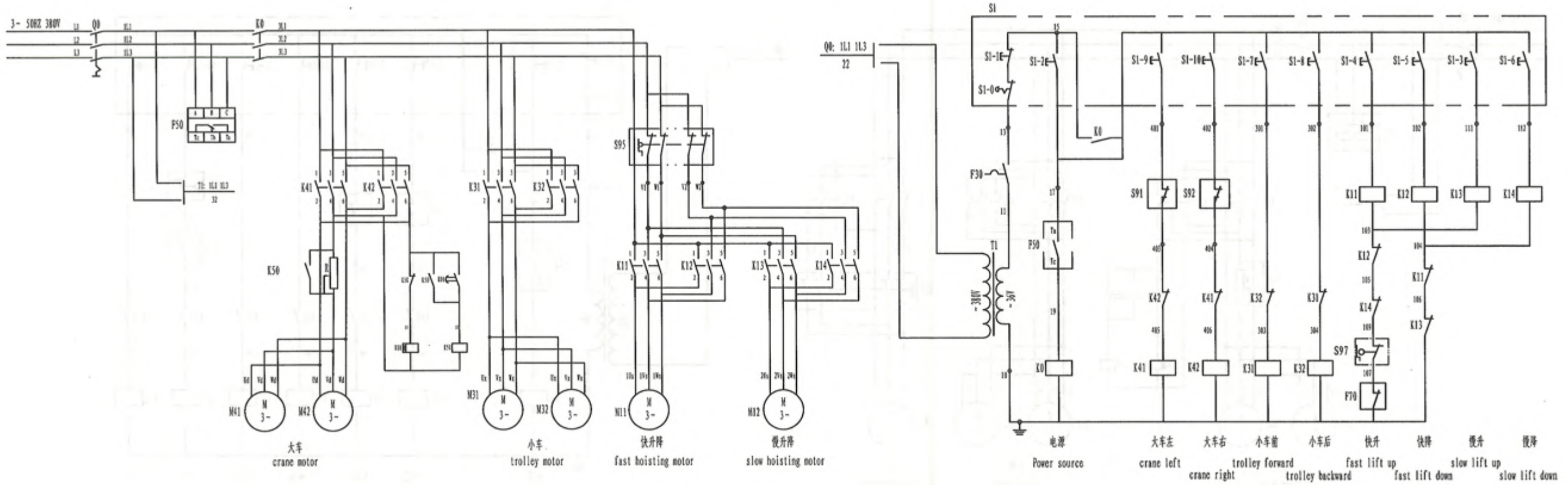


图 22 警告标识  
warning logo



# 电气原理图 electric principle drawing

电气主回路 Mian circuit										电气控制回路 control circuit												
总断路器	新相、相序、过压、欠压保护器	总接触器	大车电动机		小车电动机		快升降电动机		慢升降电动机		控制变压器	急停	失压保护	大车电动机		小车电动机		超载保护	快升降电动机		慢升降电动机	
			大车左	大车右	小车前	小车后	快升	快降	慢升	慢降				大车左	大车右	小车前	小车后		快升	快降	慢升	慢降
Main circuit-breaker	loss of phase, phase-sequence, overvoltage, undervoltage protector	total contactor	crane left	crane right	trolley forward	trolley backward	fast lift up	fast lift down	slow lift up	slow lift down	control transformer	sudden stop	no-voltage protection	crane left	crane right	trolley forward	trolley backward	overload protection	fast lift up	fast lift down	slow lift up	slow lift down



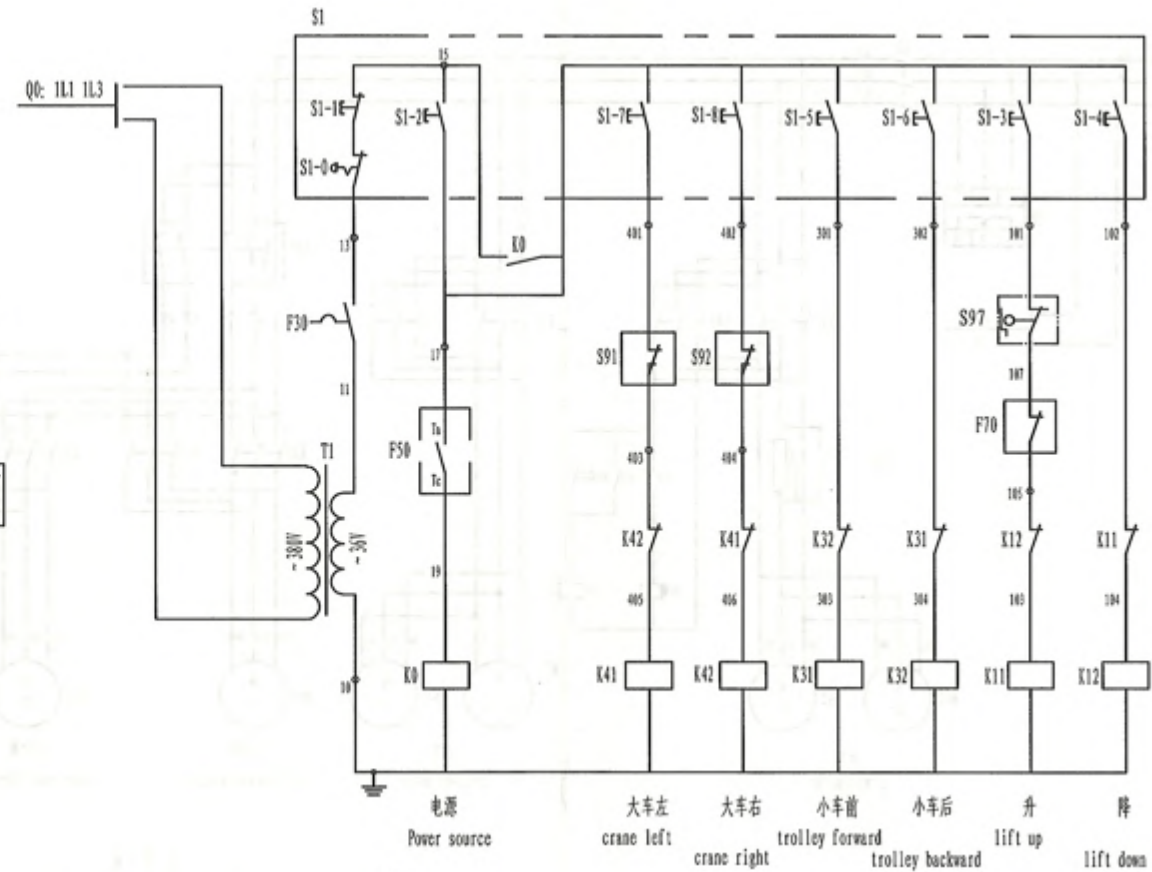
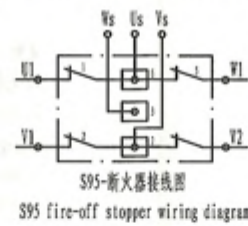
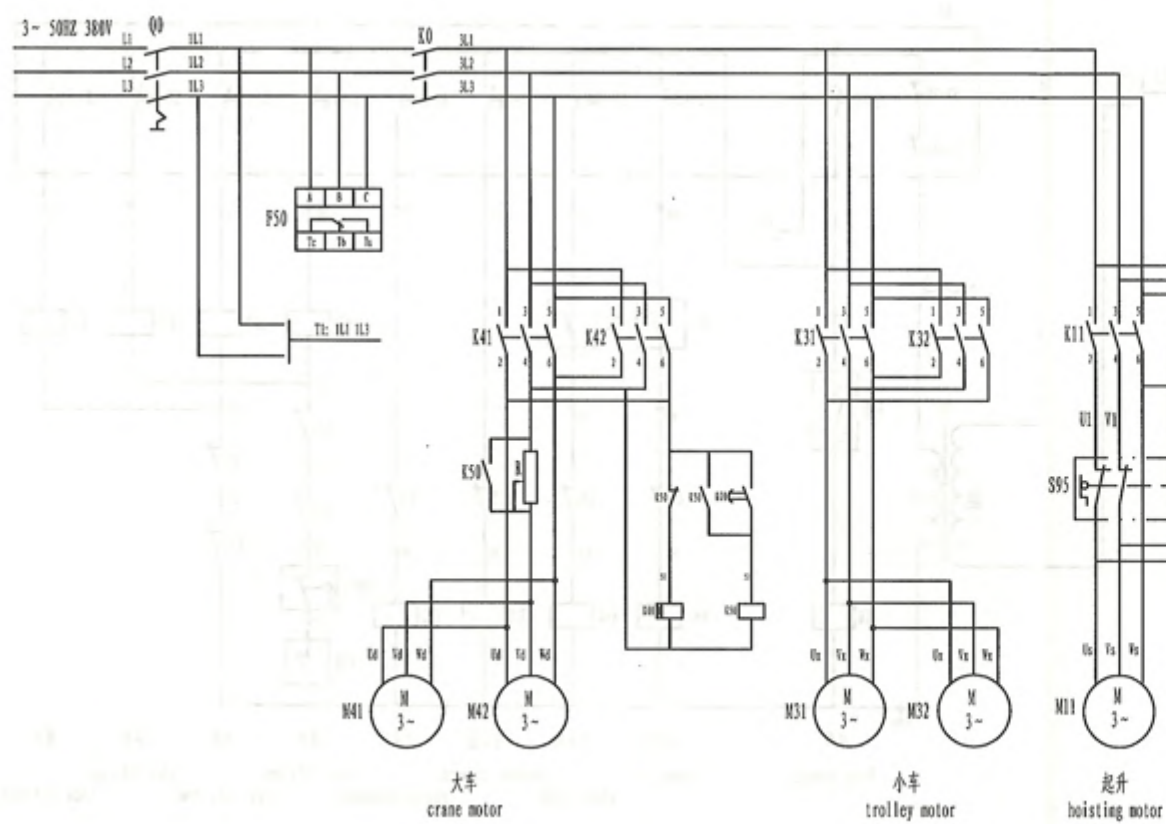
- 说明:
1. 起升限位S95及超载限制器F70的具体接线参考其说明书;
  2. 10吨以下的标准葫芦为一个小车电机;
- Instruction:
1. Refer to operation manual for specific wiring of hoist limit S95 and overload limiter F70.
  2. Standard electric hoist below 10T should has one motor of trolley.

LD 电动单梁起重机电气原理图 (地操 DK2 + MD 电动葫芦)  
Electric principle drawing of LD electrical single beam crane (ground control DK2 + MD type electric hoist)



# 电气原理图 electric principle drawing

电气主回路 Main circuit										电气控制回路 control circuit												
总断路器	断相、相序、过压、欠压保护器	总接触器	大车电动机		小车电动机		快升降电动机		慢升降电动机		控制变压器	急停	失压保护	大车电动机		小车电动机		超载保护	快升降电动机		慢升降电动机	
			大车左	大车右	小车前	小车后	快升	快降	慢升	慢降				大车左	大车右	小车前	小车后		快升	快降	慢升	慢降
Main circuit-breaker	loss of phase, phase-sequence, overvoltage, undervoltage protector	total contactor	crane left	crane right	trolley forward	trolley backward	fast lift up	fast lift down	slow lift up	slow lift down	control transformer	sudden stop	no-voltage protection	crane left	crane right	trolley forward	trolley backward	overload protection	fast lift up	fast lift down	slow lift up	slow lift down

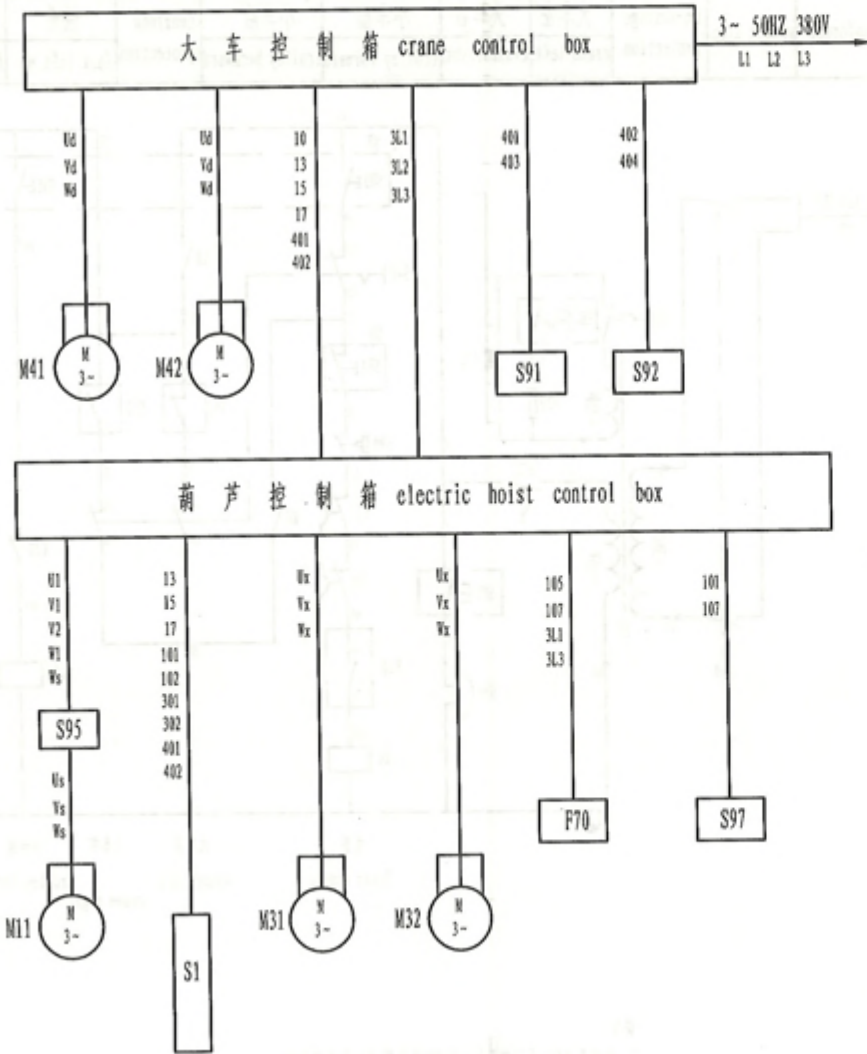


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  2. Standard electric hoist below 10T should has one motor of trolley.

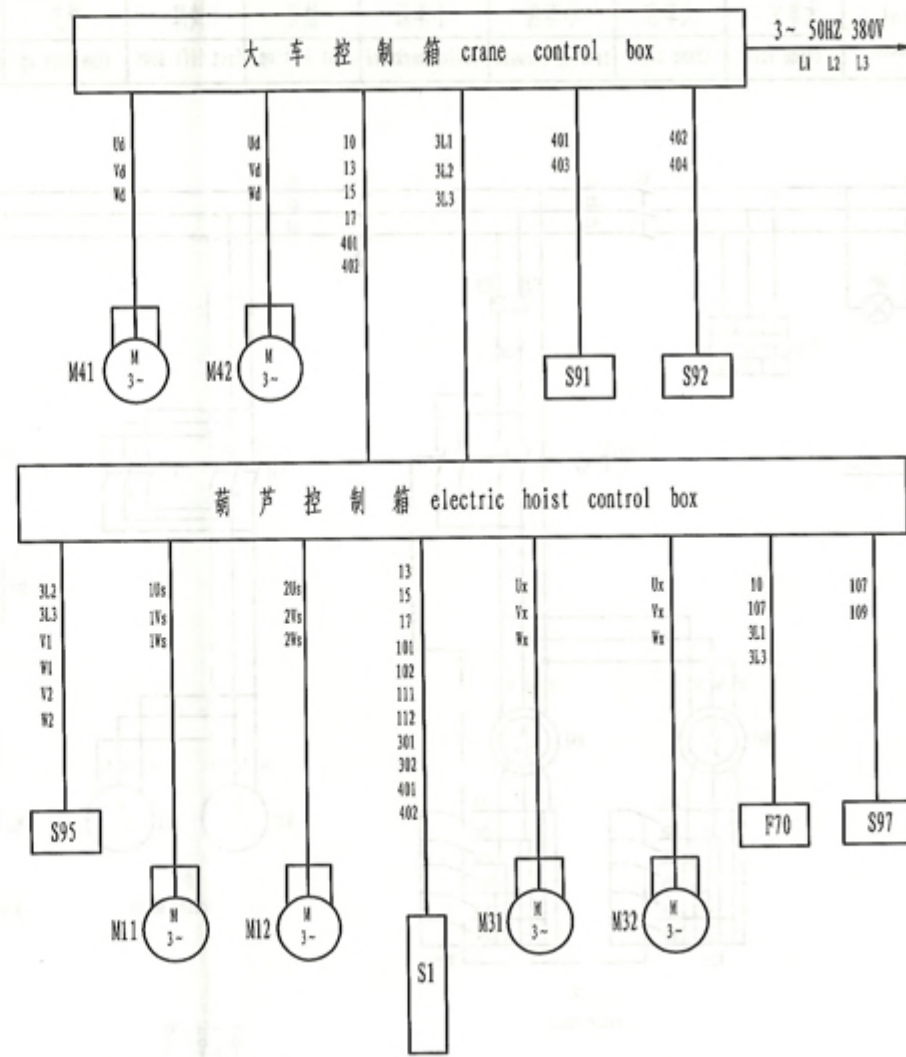
LD 电动单梁起重机电气原理图 (地操 DK2 + CD 电动葫芦)  
Electric principle drawing of LD electrical single beam crane (ground control DK2 + CD type electric hoist)



大车 + CD 电动葫芦  
crane + CD type electric hoist



大车 + MD 电动葫芦  
crane + MD type electric hoist



说明:

1. 手电门从葫芦控制箱出线。
2. 各个线束的长度参考装箱清单。

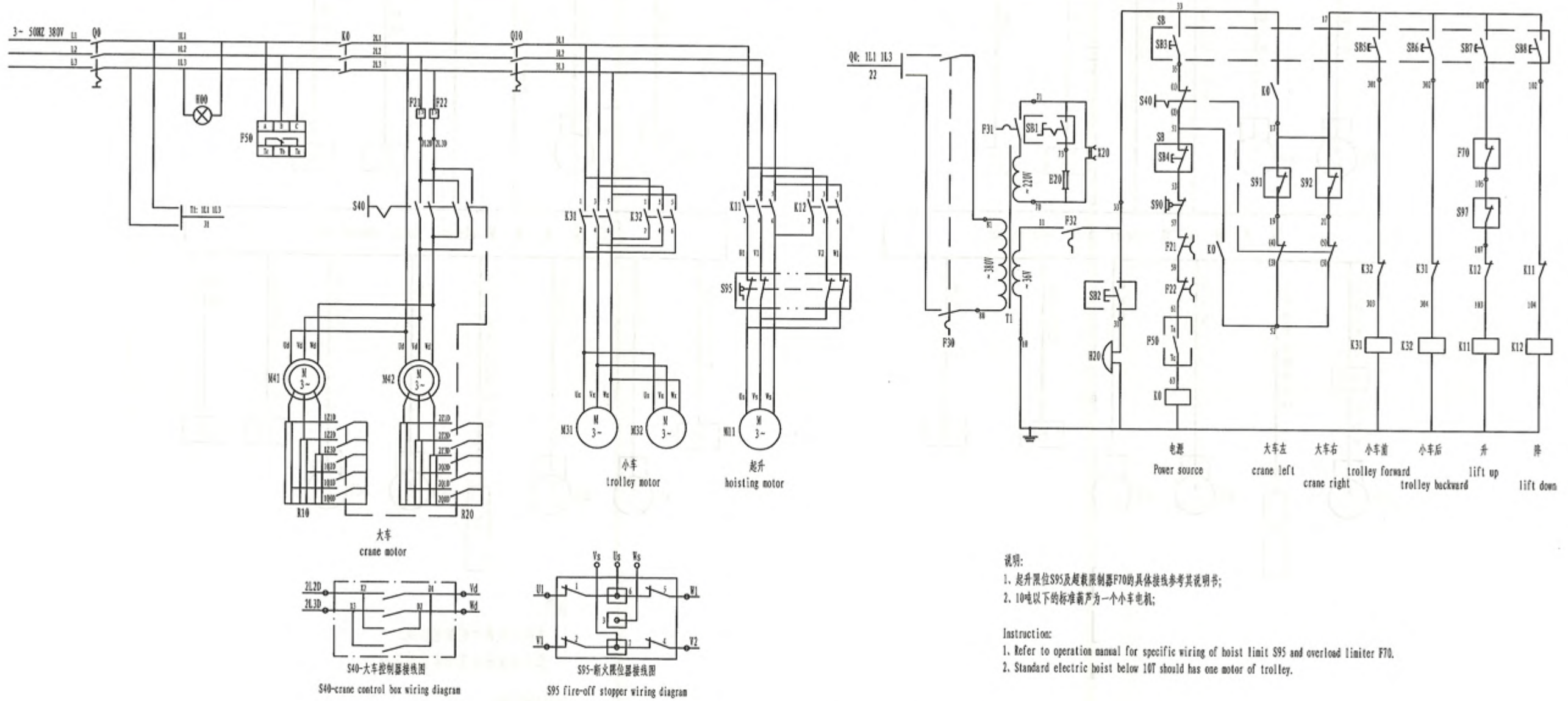
instruction:

1. Push button switch wires are connected with crane control box outlets.
2. Length of each harness refers to packing list.



# 电气原理图 electric principle drawing

电气主回路 Main circuit										电气控制回路 control circuit												
总断路器	断相、相序、过压、欠压保护器	总接触器	大车电动机		小车电动机		快升降电动机		慢升降电动机		控制变压器	急停	失压保护	大车电动机		小车电动机		超载保护	快升降电动机		慢升降电动机	
			crane motor		trolley motor		fast hoisting motor		slow hoisting motor						crane motor		trolley motor				fast hoisting motor	
Main circuit-breaker	loss of phase, phase-sequence, overvoltage, undervoltage protector	total contactor	大车左	大车右	小车前	小车后	快升	快降	慢升	慢降	control transformer	sudden stop	no-voltage protection	大车左	大车右	小车前	小车后	overload protection	快升	快降	慢升	慢降
			crane left	crane right	trolley forward	trolley backward	fast lift up	fast lift down	slow lift up	slow lift down				crane left	crane right	trolley forward	trolley backward		fast lift up	fast lift down	slow lift up	slow lift down



说明:  
 1. 起升限位S95及超载限制器F70的具体接线参考其说明书;  
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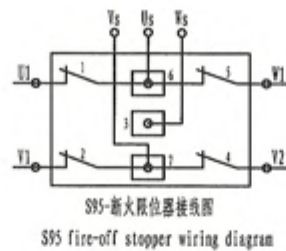
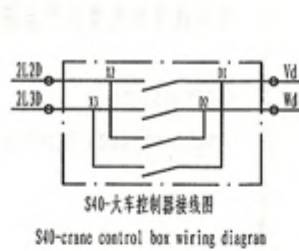
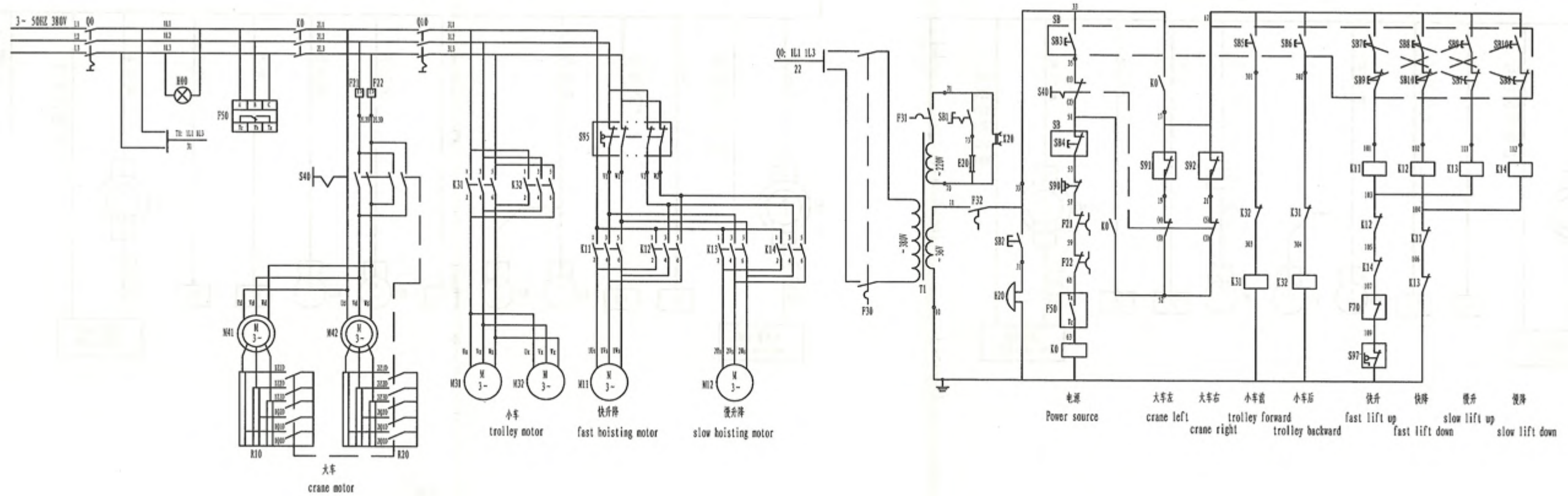
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LD 电动单梁起重机电气原理图 (空操 + CD 电动葫芦)  
 Electric principle drawing of LD electrical single beam crane (driving cab control + CD type electric hoist)



# 电气原理图 electric principle drawing

电气主回路 Main circuit										电气控制回路 control circuit												
总断路器	断相、相序、过压、欠压保护器	总接触器	大车电动机		小车电动机		快升降电动机		慢升降电动机		控制变压器	急停	失压保护	大车电动机		小车电动机		超载保护	快升降电动机		慢升降电动机	
			大车左	大车右	小车前	小车后	快升	快降	慢升	慢降				大车左	大车右	小车前	小车后		快升	快降	慢升	慢降
Main circuit-breaker	loss of phase, phase-sequence, overvoltage, undervoltage protector	total contactor	crane left	crane right	trolley forward	trolley backward	fast lift up	fast lift down	slow lift up	slow lift down	control transformer	sudden stop	no-voltage protection	crane left	crane right	trolley forward	trolley backward	overload protection	fast lift up	fast lift down	slow lift up	slow lift down



说明:

1. 起升限位S95及超载限制器F70的具体接线参考其说明书;
2. 10吨以下的标准葫芦为一个小车电机;

Instruction:

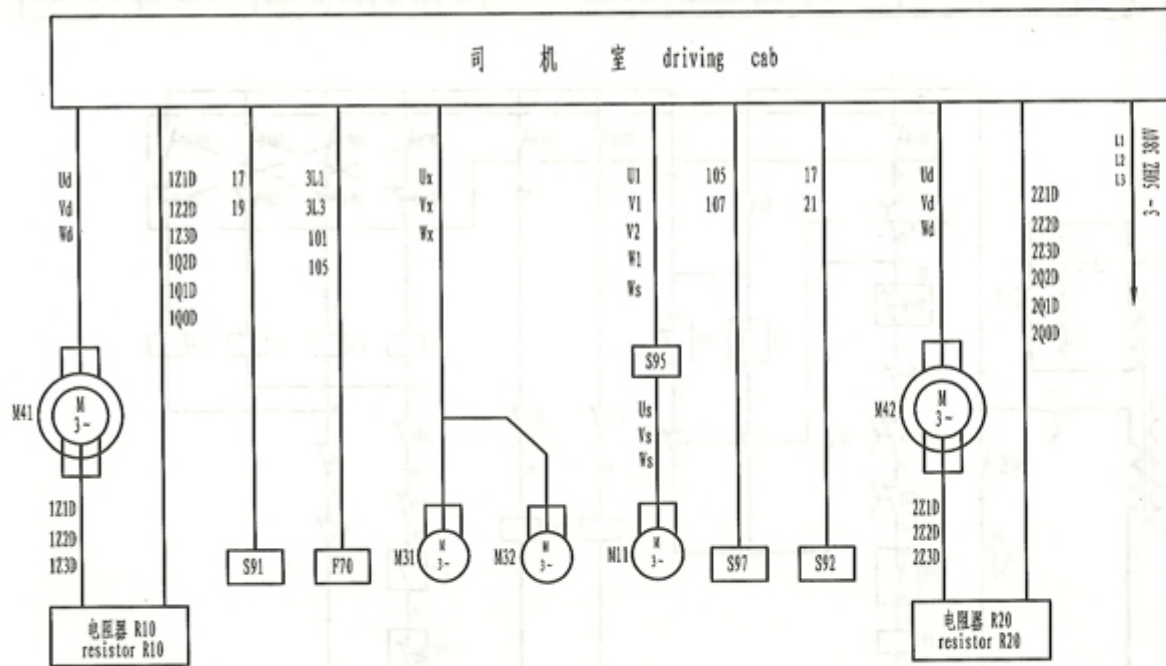
1. Refer to operation manual for specific wiring of hoist limit S95 and overload limiter F70.
2. Standard electric hoist below 10T should have one motor of trolley.

LD 电动单梁起重机电气原理图 (空操 + MD 电动葫芦)

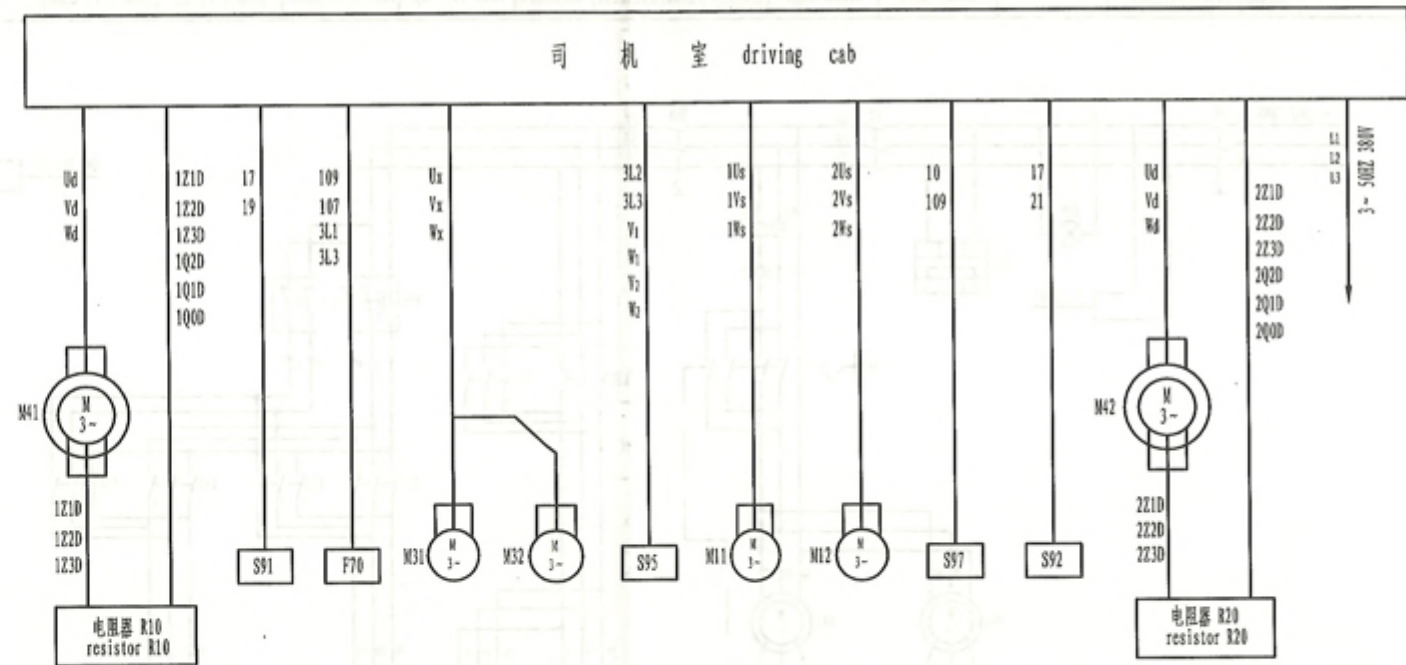
Electric principle drawing of LD electrical single beam crane (driving cab control + MD type electric hoist)



大车空操+CD电动葫芦  
driving cab control + CD type electric hoist



大车空操+MD电动葫芦  
driving cab control + MD type electric hoist



说明:

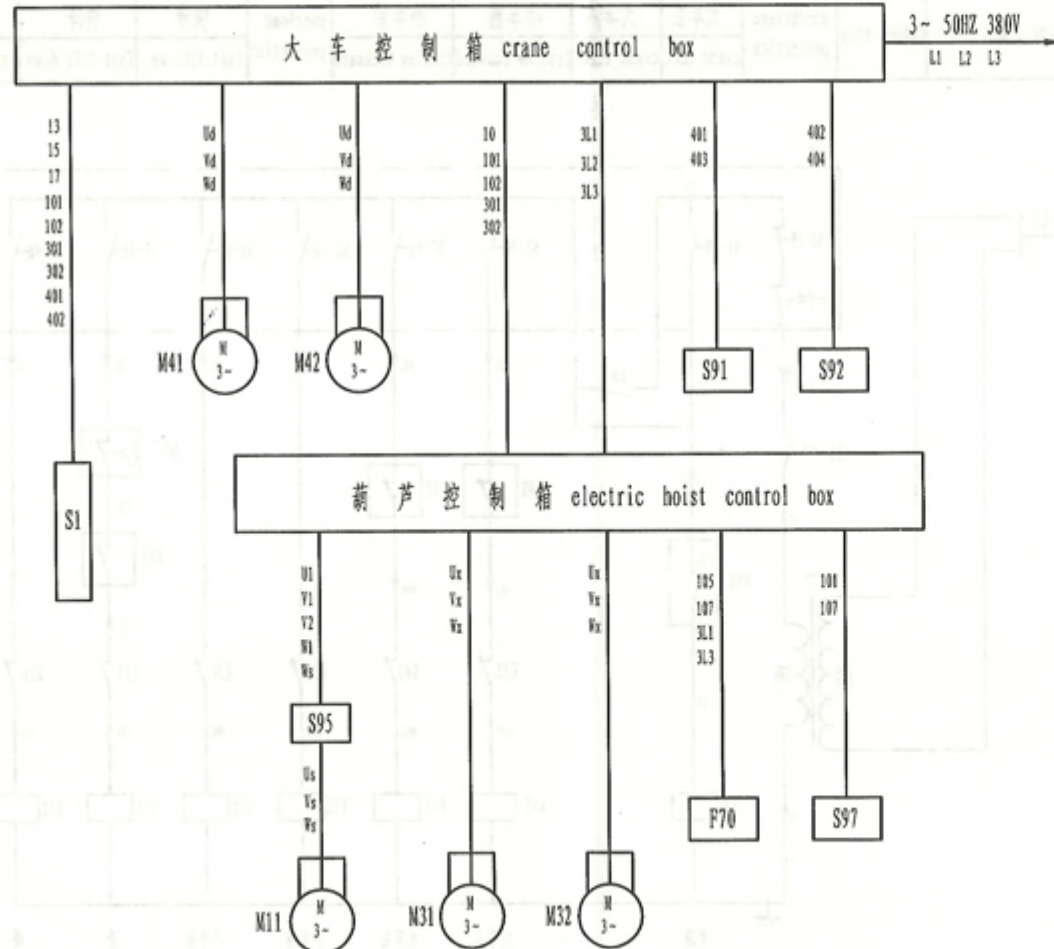
各个线束的长度参考装箱清单。

instruction:

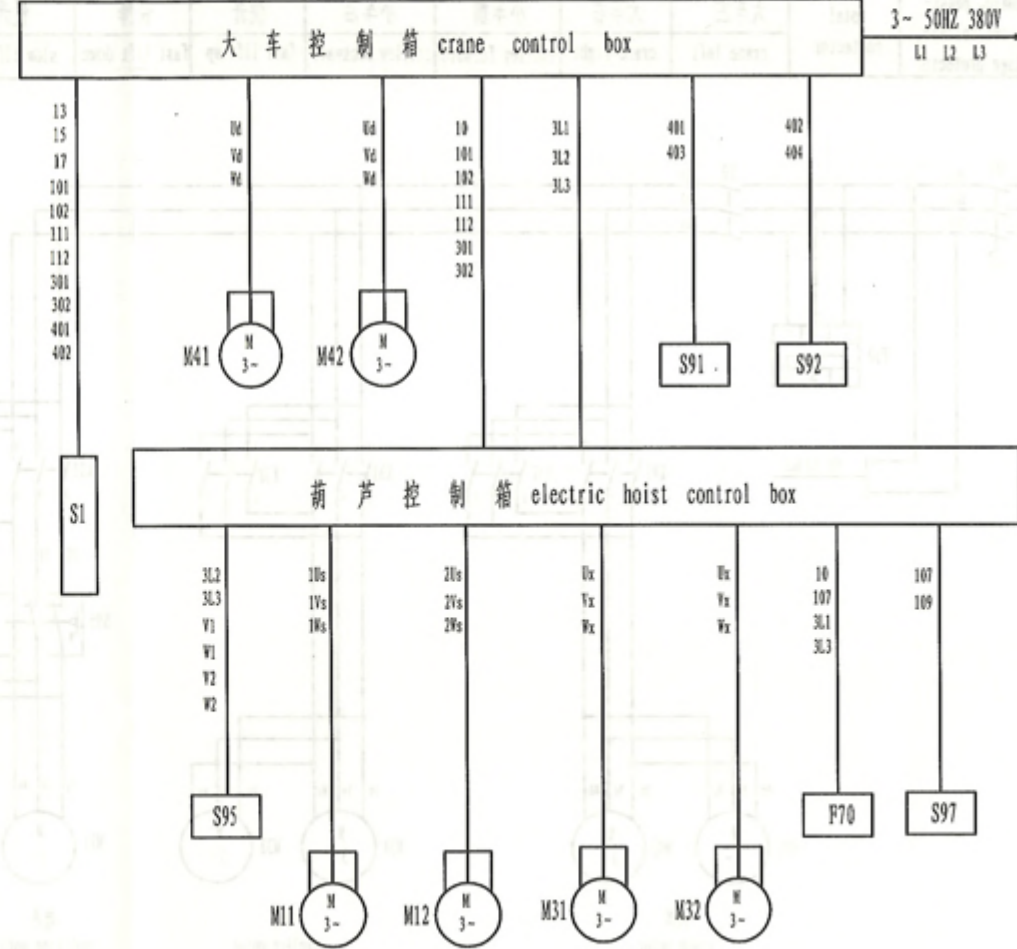
Length of each harness refers to packing list.



大车 + CD 电动葫芦  
crane + CD type electric hoist



大车 + MD 电动葫芦  
crane + MD type electric hoist



说明:

1. 手电门从大车控制箱出线。
2. 各个线束的长度参考装箱清单。

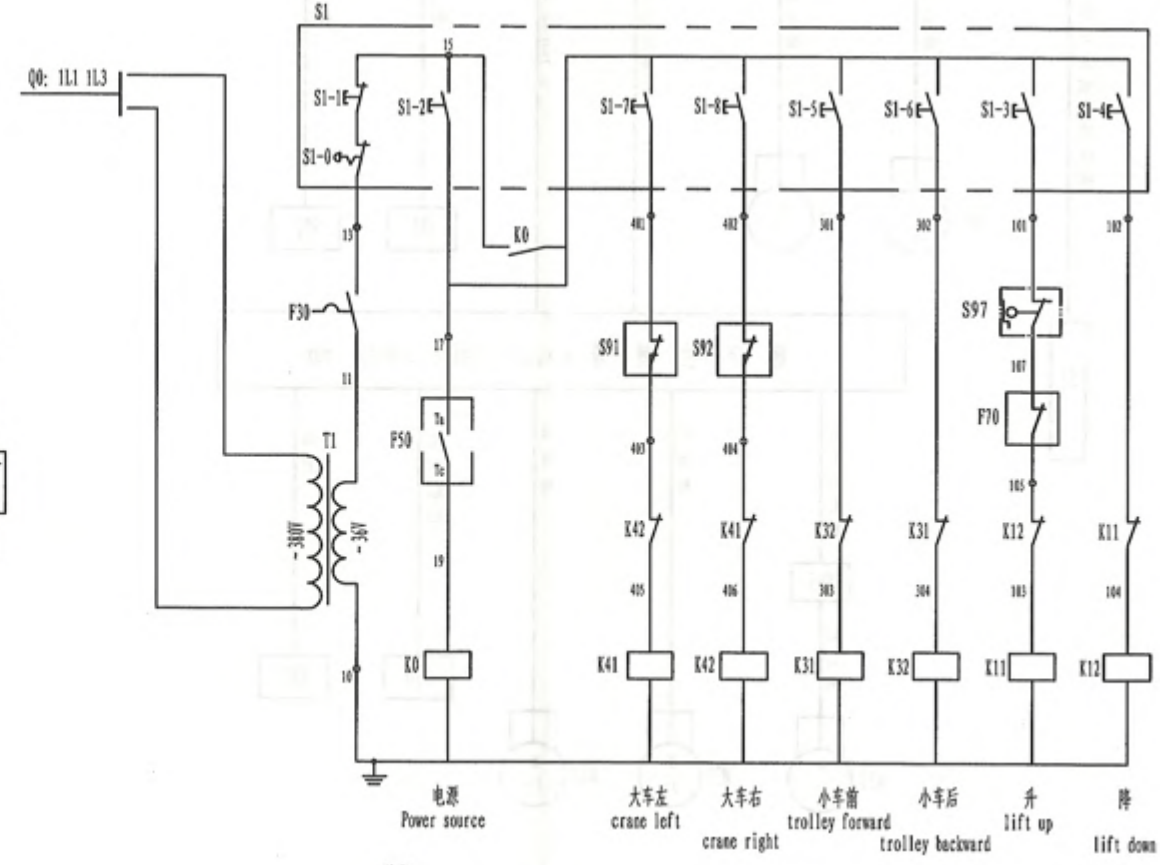
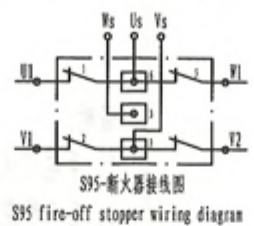
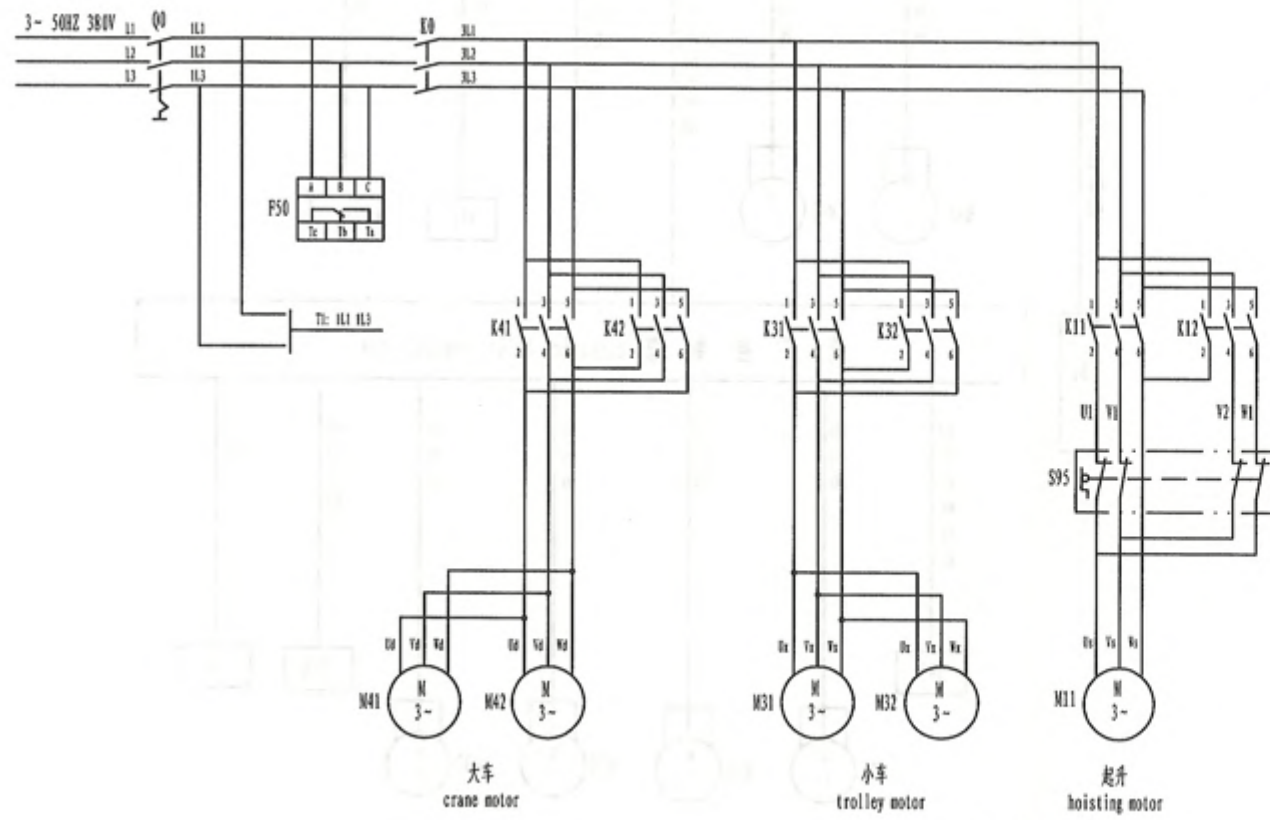
instruction:

1. Push button switch wires are connected with crane control box outlets.
2. Length of each harness refers to packing list.



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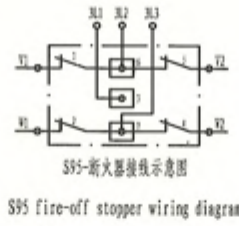
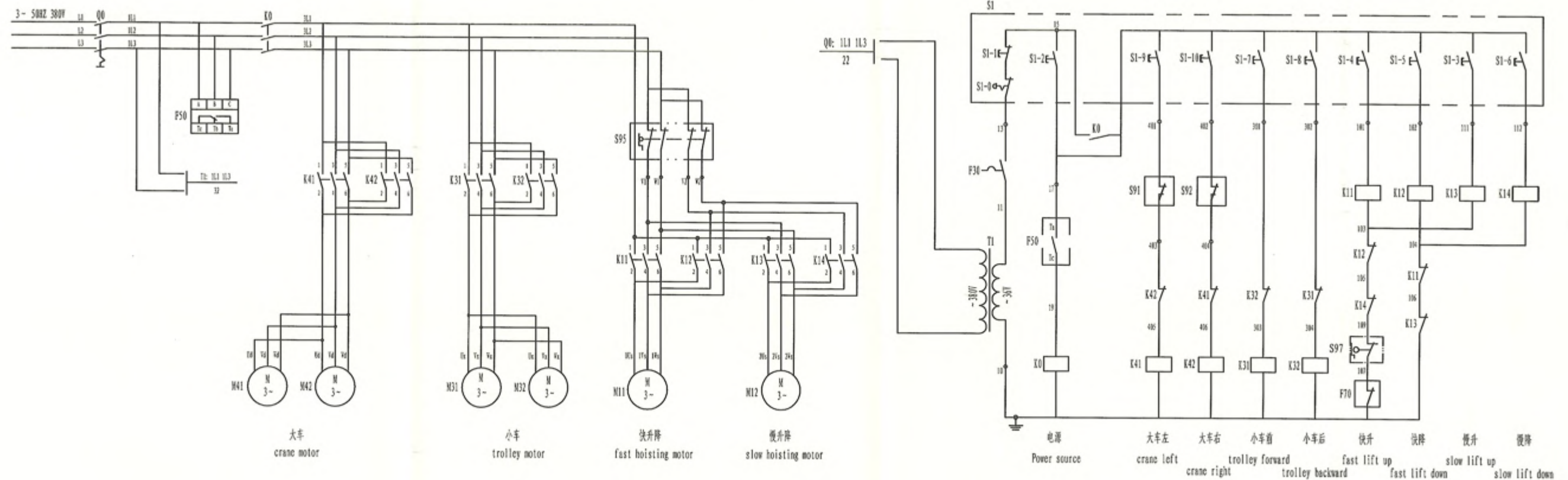
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 1. 起升限位S95及超载限制器F70的具体接线参考其说明书;  
 2. 10吨以下的标准葫芦为一个小车电机;  
 Instruction:  
 1. Refer to operation manual for specific wiring of hoist limit S95 and overload limiter F70;  
 2. Standard electric hoist below 10T should has one motor of trolley;

LD 电动单梁起重机电气原理图 (地操 DK1 + CD 电动葫芦)  
 Electric principle drawing of LD electrical single beam crane (ground control DK1 + CD type electric hoist)



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