



大方重机
DAFANG CRANE

电动单梁（悬挂）起重机 安装、维护、使用说明书

Electric Single Beam Suspension Crane Installation
Maintenance Operation Specification Instructions



河南省大方重型机器有限公司
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手册必读 Manual Instruction

1、手册使用指南 User guide

本说明书适用于我公司生产的电动单梁（悬挂）起重机及由本机型非标设计的葫芦式起重机的安装、使用和维护，供安装、操作和维修人员使用。本手册应放在操作人员随时能翻阅的地方。电动单梁起重机作为起吊和运送载荷的设备，在操作过程中会有许多潜在的危险，因此操作人员必须仔细阅读电动单梁起重机的安全操作章节、测试和检修章节中的相关内容。

This manual is applicable for installation, use and maintenance of electric single-girder (under slung) crane produced by our company. This manual should be put at the place where operator can read at any time. As the equipment of lifting and handling load, many potential risk exist during operation process, operator must read relevant content about safety operation, test and inspection chapters carefully.

2、合理使用 Reasonable application

您所购我公司的电动单梁起重机是用于垂直起吊和水平运送载荷的起重设备，在设备的铭牌和检修计划表上对安全工作载荷(SWL)作了明确标注。工作级别、安全工作时间和启动次数都应当严格遵守。每个类型产品适用范围和要求（详见第2章）都有严格规定。在产品适用范围满足时，相关操作人员必须严格遵守《起重机的安全操作规程》。

注意！在特殊工况下使用时必须事先征得我公司同意。

The electric single-girder crane you bought is applicable for vertical lifting and horizontal transferring of load, safety working load (SWL) is clearly marks on the nameplate and maintenance schedule. Working time and numbers of starting must be strictly abode by. There's strict regulation on applicable scope and requirements (refer to chapter 2). When applicable scope is satisfied, the operators must strictly abide by the "Safe Operation of Crane Hoist".

Note: User must get our company's approval if the crane is used in special conditions.

3、质量保证 Quality assurance

本公司对因违章使用或未经培训的操作人员操作而造成的设备损坏不承担质量保证和赔偿义务。我们只对直接用户承担相应义务。

We have no obligation to provide quality guarantee and compensation if the production is used illegally or damage caused by untrained operators. We only undertake the director's corresponding obligations.

注意！如果用户未按照手册的要求擅自更换、拆装零部件或没有使用本公司原装配件时，质量保证条款将不再适用。为了安全起见，请使用本公司原装配件，并按照本用户手册的要求对产品进行检修和保养。只有这样，产品的设计使用寿命才能得到保证。

Notes: these guarantee rules won't apply if the users are not in accordance with the requirements of the manual, such as: assembling and disassembling the parts without authorization or without using the original accessories. For security, do use the original accessories, in addition repairing and maintenance according to the user manual. Only so can the lifespan be guaranteed.

▲ 特别提示：

为了使本产品更好的发挥效能，给您的工作带来极大地方便，使您的企业产生更加的效益。为此，请您认真阅读、领会“产品使用说明书”，并严格按照：安装、试车、操作维修保养等有关法律法规进行作业。否则，将可能给您带来不必要的麻烦，甚至会威胁您的人身安全。特此告知。

- 严禁：超载、斜拉、重物下站人或作业
- 起重作业 慎之又慎
- 本公司享有对此手册信息进行更改或变动的权利

Special tips:

In order to make the product better play to the effectiveness of your work to bring great convenience, so that your business to produce more benefits. To this end, please carefully read and understand the "product manual", and in strict accordance with: installation, commissioning, operation and maintenance and other relevant laws and regulations. Otherwise, it will bring you unnecessary trouble, and even threaten your personal safety. Hereby inform.

Strictly prohibit:

- No: overload, cable-stayed, under heavy loads or work station
- The lifting operation cautious
- The company has the right to make changes or changes in this manual

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一、概述 Brief Instruction

电动单梁（悬挂）起重机是遵循GB/T 3811《起重机设计规范》及JB/T1306《电动单梁起重机》、JB/T 2603《电动悬挂起重机》、JB/T 7688.1《冶金起重机技术条件》、JB/T 10219《防爆梁式起重机》等国家和行业标准设计、制造的起重机。起重机以CD₁、MD₁等型式的钢丝绳电动葫芦作为起升机构，通过起重机吊钩的上下移动、小车的左右移动及起重机的大车的前后移动组合形成立体的作业空间，实现对起吊物品的移动、翻转等作业。

Electric single-girder (suspension) crane is in compliance with national and industrial standards of GB/T3811 "Design Rules for Cranes", JB/T1306 "Electric Single-girder Crane", JB/T2603 "Electric Under slung Crane", JB/T7688.1 "Specifications for metallurgy cranes" and JB/T10219 "Specification for explosion-proof cranes wire rope hoist" to design and manufacture crane. Crane uses Electric wire rope hoist such as CD₁-type or MD₁-type, as the lifting mechanism to realize the moving or turning over for lifting goods through moving up and down of hook, moving left and right of trolley and moving back and forth of crane.

本产品一般用途：起重机广泛用于机械加工、装配、修理及仓库等多种场合工作；特殊用途起重机适用于在特定工况及环境中工作，例如防爆型单梁起重机、冶金单梁起重机等。

General purpose: This crane is widely used for many occasions such as mechanical processing, assembly, maintenance and warehouses, special-purpose crane is used for working in a particular condition and environment, such as explosion-proof single girder crane, metallurgical single girder crane.

起重机适用于工作级别A3～A6，一般在室内工作。工作环境温度-25℃～+40℃。起重机电源为三相交流，额定频率为50HZ～60HZ，电源电压220V～660V。电动机和电器控制设备上允许电压波动的上下限为10%，起重机内部电压损失不大于3%。

Work duty of crane is A3～A6 and is used indoors. Operating ambient temperature is -25℃～+40℃. Power source of crane is 3-phase A.C., rated frequency is 50HZ～60HZ, source voltage is 220V～660V. The allowable voltage fluctuation for motors and electric control equipments is 10%, crane internal voltage loss is not more than 3%.

起重机主要结构由主梁、端梁、电动葫芦、电气装置、大、小车运行机构组成；主梁采用整体压槽工艺制作，结构简单，工艺性好；端梁也采用整体压槽工艺制作；主端梁之间采用螺栓加减载凸缘连接形式，拆装运输及贮存十分方便。在作业时小车运行速度不大于30m/min，大车运行在地面按钮装置操纵时运行速度不大于45m/min，司机室操纵时运行速度不大于75m/min。

The crane consists of main girder, end carriage, electric hoist, electrical equipments, crane and trolley travel mechanisms and so on. Main girder is made by using the overall pressure groove, simple structure and good process. Manufacture of end carriage is the same to main

girder. The main girder and end carriage are connected by bolts which is easy to disassemble, transport and store. When operating, trolley travel speed is not more than 30m/min, crane travel speed is not more than 45m/min when operated through the ground button device, and is not more than 75m/min when operated through the cab.

起重机的工作级别是按起重机的使用等级和载荷状态确定的；起重机在静载试验时，能承受1.25倍的试验载荷。起重机在动载试验时，能承受1.1倍的额定载荷的试验载荷，在试验过程中工作正常。试验后无裂纹损坏及永久变形，无油漆剥落，各处连接无松动。

Work duty of crane is confirmed by service rating and load status of crane. Crane can bear 1.25 times of test load when doing the static load test. It can bear 1.1 times of rated load when doing the dynamic test, and works fine during the test. There are no crack and damage, no permanent deformation, no peeling paint and no loose after the test.

起重机的静态刚性在额定起升载荷和电动葫芦小车自重在中引起的垂直静挠度 f 与起重机的跨度满足以下要求：①对低定位要求的起重机 $f \leq s/500$ ②对中等定位精度要求的起重机 $f \leq s/750$ ③对高定位精度的起重机 $f \leq s/1000$ ；水平刚性满足起重机在中引起的水平方向引起的变形 $\leq S/2000$ 。对动态刚性一般不作要求。

Vertical static deflection f caused by static rigidity of crane at mid-span under the rated lifting load and trolley dead weight of electric hoist and span of crane meet the following requirements: 1. For crane required low position accuracy $f \leq s/500$ 2. For crane required middle position accuracy $f \leq s/750$ 3. For crane required high position accuracy $f \leq s/1000$. Horizontal rigidity meets the requirements of deformation that caused by crane in the mid-span horizontal direction $\leq S/2000$. Generally don't make the request for dynamic rigidity.

抓斗的装满率不小于90%，电磁吸盘的吸重能力不小于额定值，并能可靠的吸持重物。

The full rate of grab is not less than 90%, lifting capacity of electric magnetic chuck is not less than rated value and can reliable lift the weights.

起重机的小车运行速度的允许偏差为名义值的 $\pm 15\%$ （慢速时为名义值的25%）。起升速度和额定载荷下制动下滑量，符合JB/T 9008.1或JB/T 5317的规定；起升高度不小于名义值的97%；吊具左右极限的偏差为 $\pm 100\text{mm}$ 。

The allowable deviation of trolley travel speed of the crane is $\pm 15\%$ of nominal value (when low speed, deviation is 25% of nominal value). Lifting speed and brake slippage under the rated load are accordance with the regulations of JB/T9008.1 or JB/T5317, lifting height is not less than 97% of nominal value, the deviation of spreader at the left and right limit is $\pm 100\text{mm}$.

起重机按GB 6067配备了超载限制器，大车运行机构和小车运行机构设置了缓冲器及止挡装置。

起重机设有急停开关、短路保护、相序保护，手电门的控制电压 $\leq 50\text{v}$ ，司机室操纵时还设有零位保护、联锁保护等措施。

Crane is equipped with overload limiter according to GB6067, crane travel mechanism and trolley travel mechanism are provided with buffer and stop device. Crane is equipped with emergency stop switch, short circuit protection, phase sequence protection. Control voltage of flashlight door is $\leq 50\text{v}$. There is zero protection and interlock protection when operated by cab.

起重机安装使用地点的海拔高度不超过2000m（超过1000m时应对电动机容量进行校核）。

The altitude of installation location of crane is not more than 2000m (if more than 1000m, motor capacity should be checked).

起重机不适用于在易燃、易爆及腐蚀性气体的环境中工作和吊运 300°C 以上灼热物品及其它危险物品。

Crane does not apply to work in flammable, explosive and corrosive gases environment, lift more than 300°C hot goods and other dangerous goods.

二、起重机的分类 Classification of cranes

（一）、一般用途起重机 General-purpose crane

1. LD型电动单梁起重机 LD-type electric single girder crane

LD电动单梁起重机具有结构合理，整机刚性强的特点。整机与 CD_1 、 MD_1 等型电动葫芦配套使用，是一种轻小型的起重机械。其起重量为 $1\text{t} \sim 32\text{t}$ 。跨度为一般不大于 31.5m ，工作级别为 $\text{A3} \sim \text{A4}$ ，工作环境温度为 $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$ 。

LD electric single girder crane has such features as reasonable structure and fine rigidity. The whole crane is used with CD_1 , MD_1 or other types electric hoist, it's a light and small lifting machine. Its capacity is $1\text{t} \sim 32\text{t}$. Span is generally not more than 31.5m , work duty is $\text{A3} \sim \text{A4}$, working environment temperature is $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$.

本产品广泛用于工厂、仓库、料场等不同场合吊运货物，禁止在易燃、易爆、腐蚀性介质环境中使用。本产品设有地面和操纵室两种操作形式。操纵室有开式、闭式两种，可根据实际情况分别为左面或右面安装两种形式，入门方向有侧面及端面两种，以满足用户在各种不同需要的情况下进行选择。其基本图样如下图1、图2、图3。

This crane is widely used to hoist goods at factories, warehouses, stock ground and other occasions, and prohibit from working in flammable, explosive and corrosive media environment. The crane has two modes: ground controlling and cab controlling. The cab has

open type and closed type, is installed on the left or on the right according to the actual situation, the entry mode has side entry and end entry, to meet the user's various needs. The basic pattern is shown in Figure1, Figure2 and Figure3.

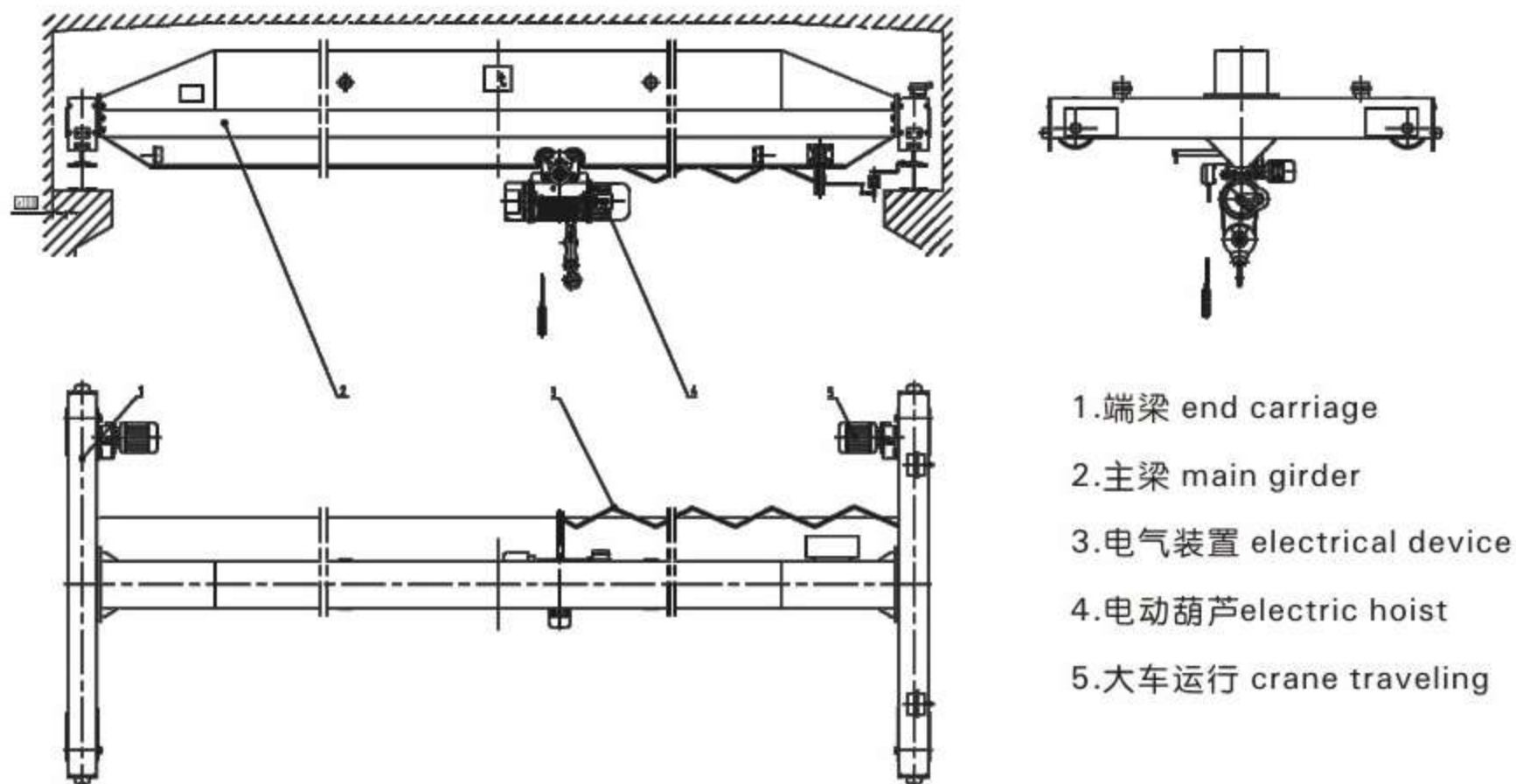


图1 LD型电动单梁起重机（地操）
Figure1 LD type electric single girder crane (ground controlling)

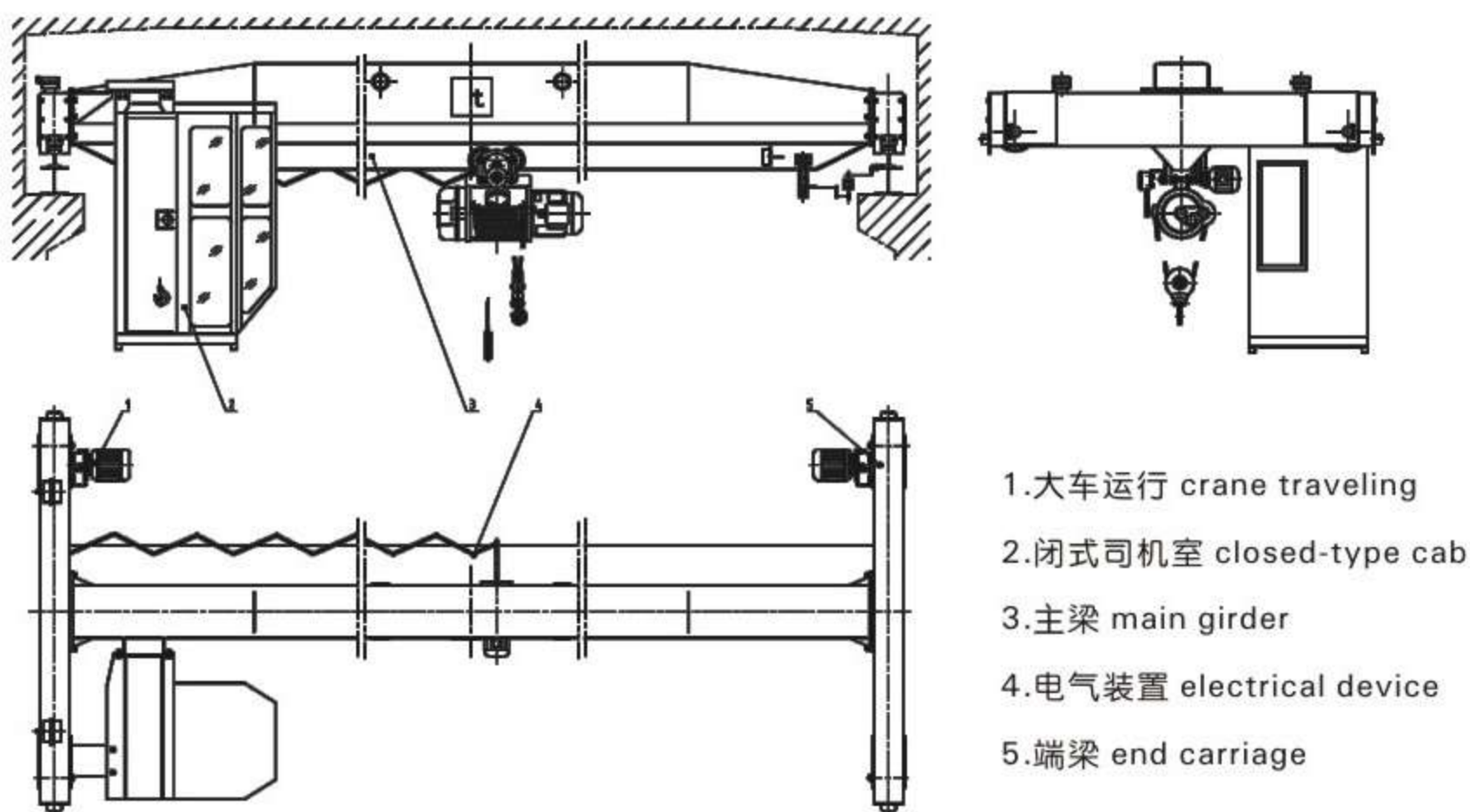


图2 LD型电动单梁起重机（空操）
Figure2 LD-type electric single girder crane (cab controlling)

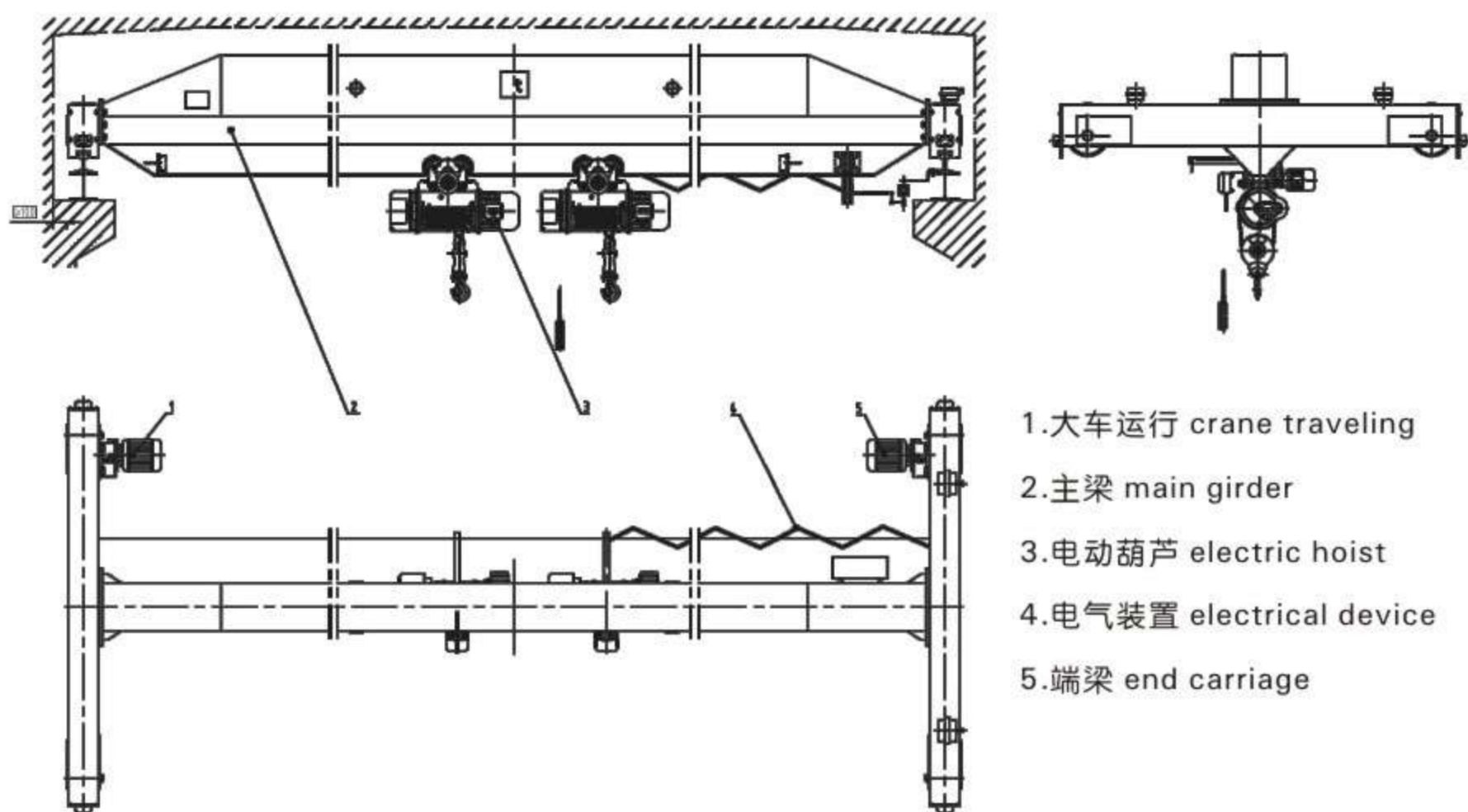


图3 LDE型电动单梁起重机（双葫芦）

Figure 3 LDE-type electric single girder crane (double hoists)

2. LDP型电动单梁起重机 LDP-type electric single girder crane

LDP型电动单梁起重机属于超低净空轻小型起重机，电动葫芦位于主梁一侧，增加了吊钩的服务空间，可以减低厂房的建筑高度以节省造价。该产品因具有小车轮距大，运行平稳，结构紧凑、刚性好、操作灵敏、噪音低、安全可靠、造型美观等优点。

LDP-type electric single girder crane is a ultra-low-clearance, light and small crane. Electric hoist is located on the side of main girder, which increase the service space of the hook and can reduce the height of the plant to save the cost. This crane has such features as big wheelbase of trolley, smooth running, compact structure, good rigidity, sensitive operation, low noise, safe and reliable and attractive appearance.

LDP电动单梁起重机起重量一般不大于20t，跨度不大于31.5m，工作环境温度在 $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$ ，工作级别A3 ~ A4，起升高度不大于12m，其基本图样如下图4。

Generally, the capacity of LDP-type electric single girder crane is not more than 20t, span is not more than 31.5m, working environment temperature is $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$, work duty is A3 ~ A4, lifting height is not more than 12m, the basic pattern is shown in Figure 4.

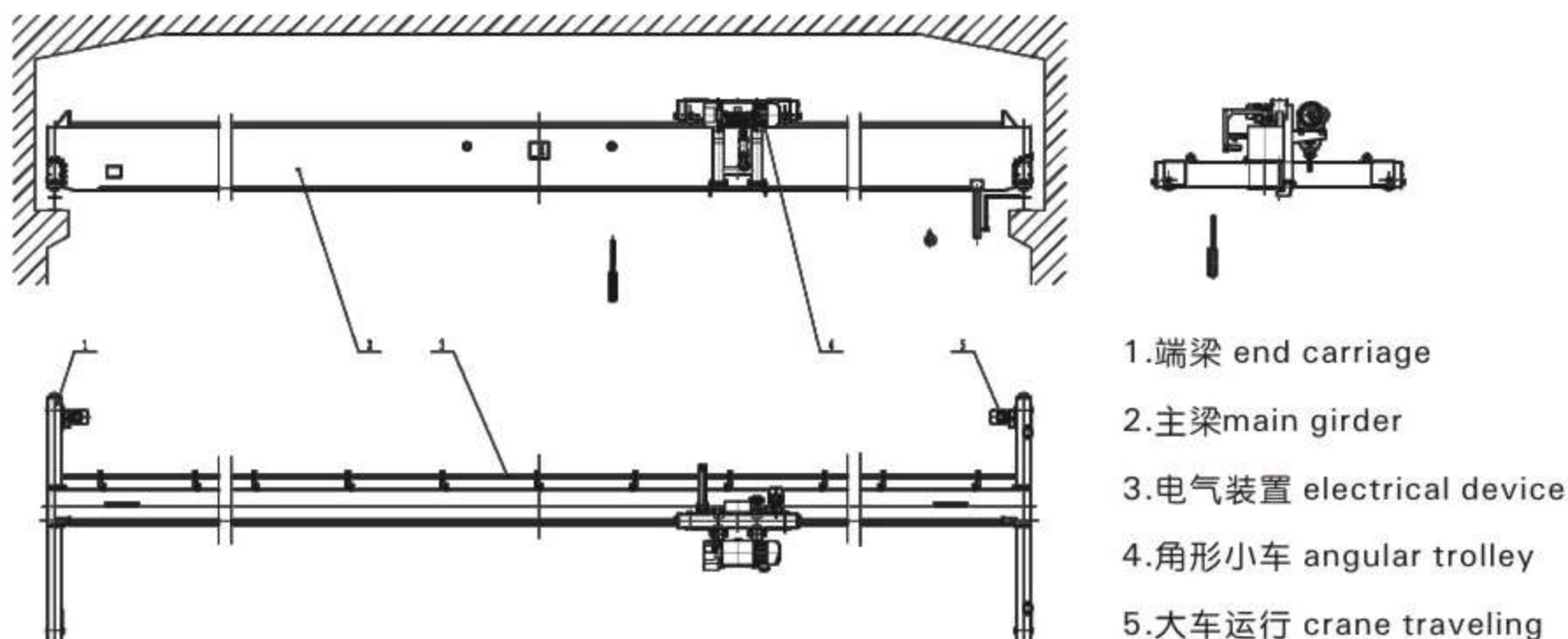


图4 LDP型电动单梁起重机

Figure4 LDP-type electric single girder crane

3. LDZ型电动抓斗起重机 LDZ-type crane with grab

LDZ型电动单梁抓斗起重机是与抓斗葫芦配套使用的车间吊运设备。其起重量不大于10t,跨度为一般不大于31.5m,工作环境温度为-20℃ ~ +40℃。

LDZ-type electric single girder crane with grab is a handling equipment at workshop which is used together with grab hoist. The capacity is not more than 10t, span is not more than 31.5m, working ambient temperature is -20℃ ~ +40℃.

本产品广泛应用于电厂、仓库及料场等不同场合抓取散装物料使用。其基本图样如图5。

This crane is widely used to grab the bulk materials on different occasions such as power plant, warehouse and stockyard, the basic pattern is shown in Figure 5.

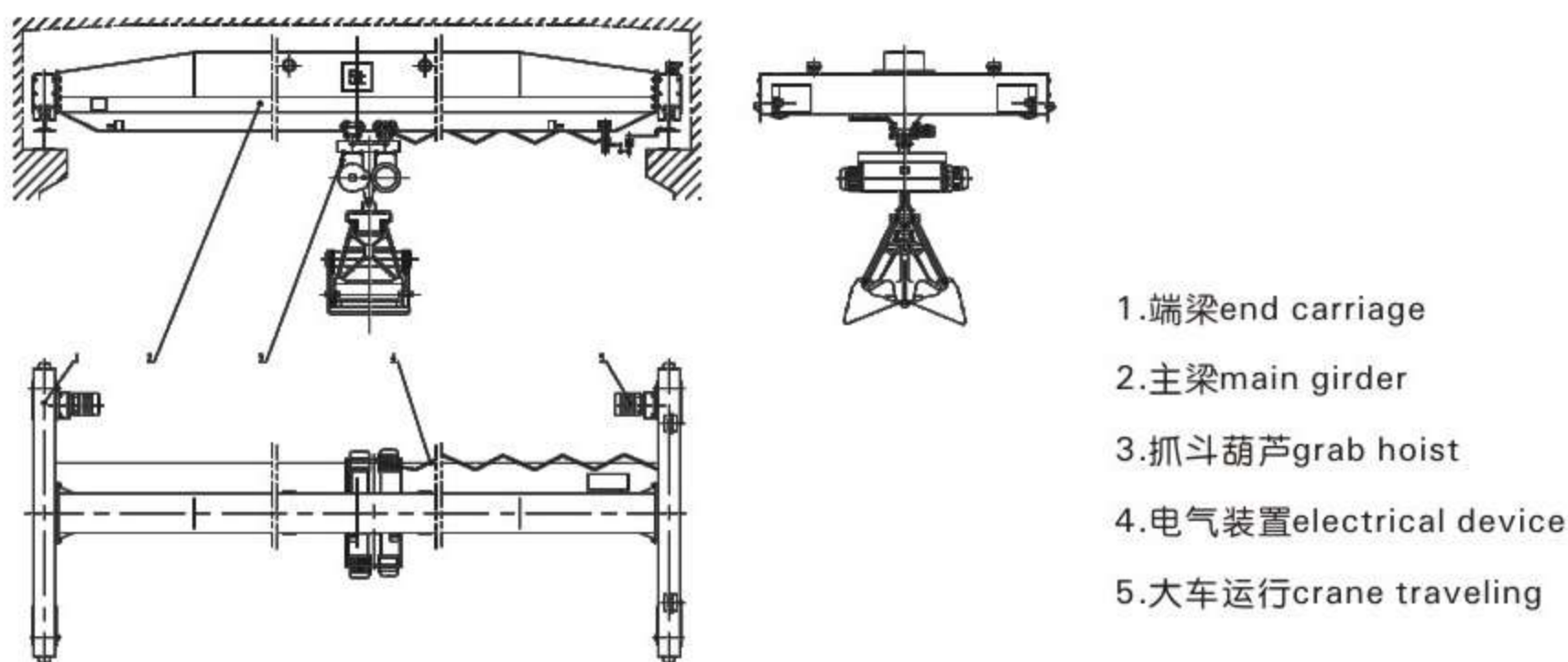


图5 LDZ型电动单梁抓斗起重机

Figure5 LDZ-type electric single girder crane with grab

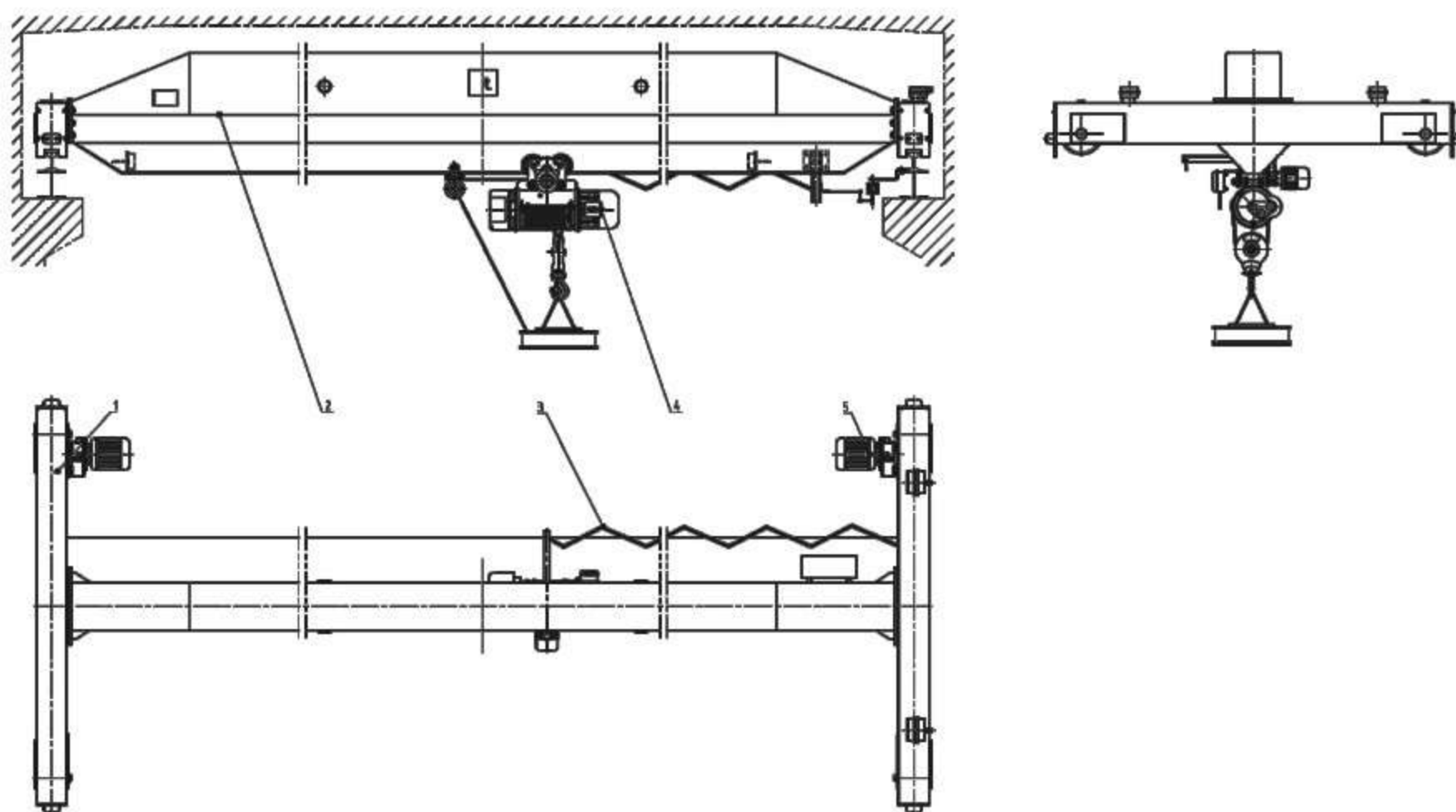
4. LD型电磁电动单梁起重机 LD-type electromagnetic single girder crane

LD型电磁电动单梁起重机（电磁）是普通单梁配合电磁吸盘使用的起重机，起重机适工作级别A3~A4，工作环境温度-20℃~+40℃。

LD-type electromagnetic single girder crane (electromagnetic) is a crane that ordinary single girder crane is used with electromagnetic chuck, work duty is A3~A4, working ambient temperature is -20℃~+40℃.

本产品多用于吸运废钢铁，吸吊初轧钢坯、型钢、方坯、板坯、捆扎线材、钢带卷、捆扎螺纹钢、双层小方坯等物料。其基本图样如图6

This crane is widely used to handle ferrous waste, bloom, structural steel, square billet, steel slab, wire rod in bundle, steel tape and other materials. The basic pattern is shown in Figure 6.



- 1.端梁 end carriage 2.主梁 main girder 3.电气装置 electrical device
- 4.电动葫芦（带电磁吸盘）Electric hoist(with electromagnetic chuck)
- 5.大车运行 crane traveling

图6 LD型电动单梁起重机（电磁）

Figure6 LD-type single girder crane (electromagnetic)

5.HD型低净空电动单梁起重机 LD-type low-clearance single girder crane

HD型低净空电动单梁起重机属于低净空型式的轻小型起重机，与低净空钢丝绳电动葫芦配合使用，主梁为箱型结构，具有外形美观，整机结构紧凑合理，操作简单方便。

HD-type low-clearance single girder crane is a low-clearance, light and small crane, and is used with low-clearance wire rope electric hoist, main girder is a box-type structure. This crane has attractive appearance, compact structure and reasonable, and is easy to operate.

HD型低净空电动单梁起重机的额定起重量一般不大于20t，跨度一般不大于31.5m，工作级别A4，起升高度不大于12m。工作环境温度为-20℃ ~ +40℃。其基本图样如图7。

The rated capacity of HD-type low-clearance single girder crane is rarely more than 20t, span is rarely more than 31.5m, work duty is A4, lifting height is not more than 12m, working ambient temperature is -20℃ ~ +40℃. The basic pattern is shown in Figure 7.

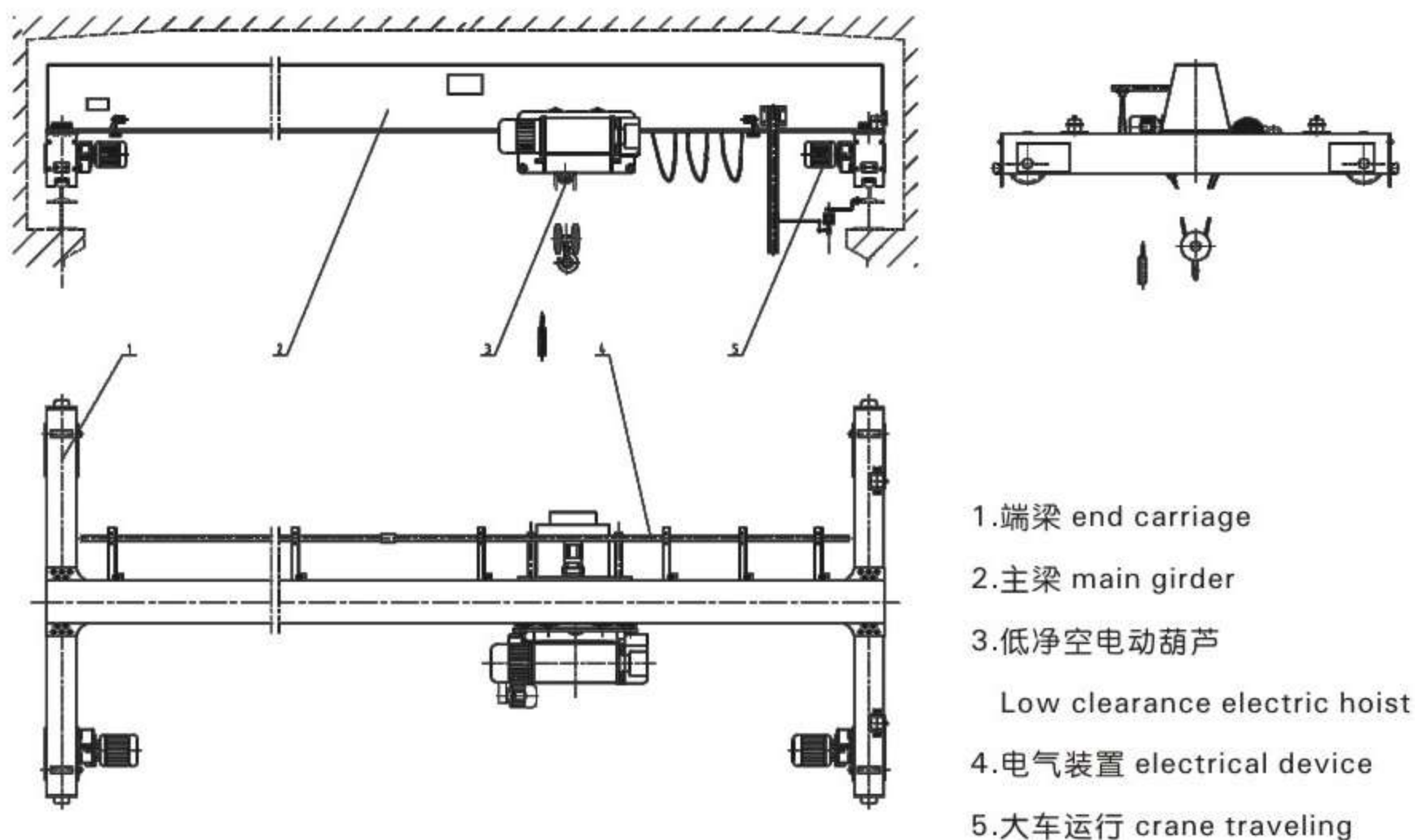


图7 HD型低净空电动单梁起重机
Figure7 LD-type low clearance single girder crane

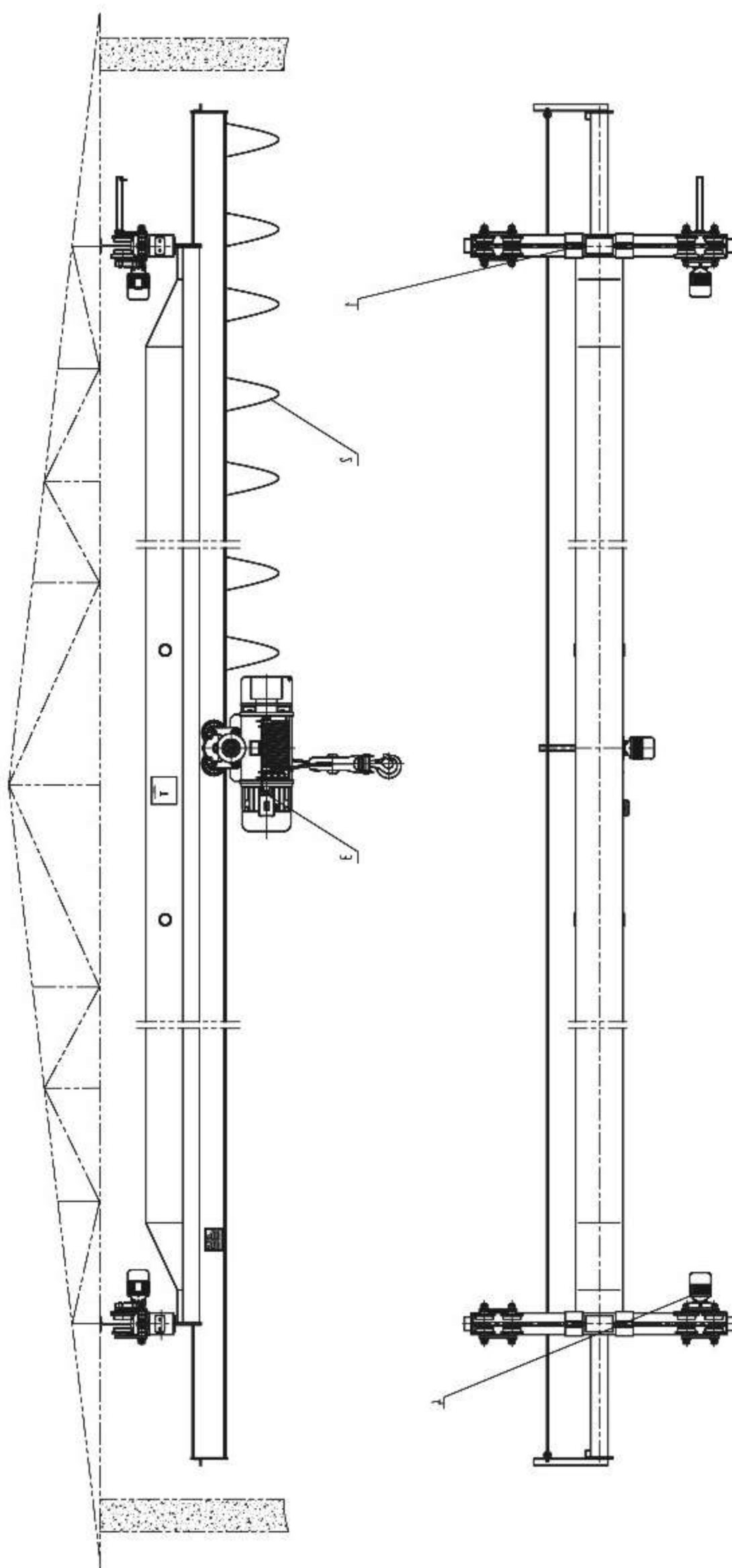
6. LX型电动悬挂起重机 LX-type electric Under slung crane

LX型电动悬挂起重机与CD₁、MD₁型电动葫芦配套使用，是一种有轨运行的轻小型的起重机械。其桥架有主、端梁及运行机构组成，主梁采用工字钢加压延U型槽配合使用，端梁由槽钢组成，结构简单、制造方便，主端梁采用销轴铰接，能保证车轮与轨道均衡接触，不至于悬空，便于拆装运输与贮存；单梁悬挂起重机只适用于地面操作，大车运行速度一般不大于30m/min。

LX-type electric Under slung crane is used with CD₁, MD₁ electric hoist and is a track traveling, light and small crane. Its bridge is composed of main girder, end carriage and traveling mechanism, main girder adopt I-steel with rolling U-type groove, end carriage is composed of channel steel, simple structure and easy to manufacture, main girder and end carriage are connected by hinge pin, which can ensure that wheels will uniform contact with track, and is easy to disassemble, transport and store. Single girder suspension crane applies to only ground operation, crane traveling speed is rarely more than 30m/min.

LX型电动悬挂起重机起重量一般不大于20t，跨度一般不大于22.5m，一般悬臂长度不大于1000mm，工作级别A3～A4，工作环境温度-20℃～+40℃，其基本图8、图9。

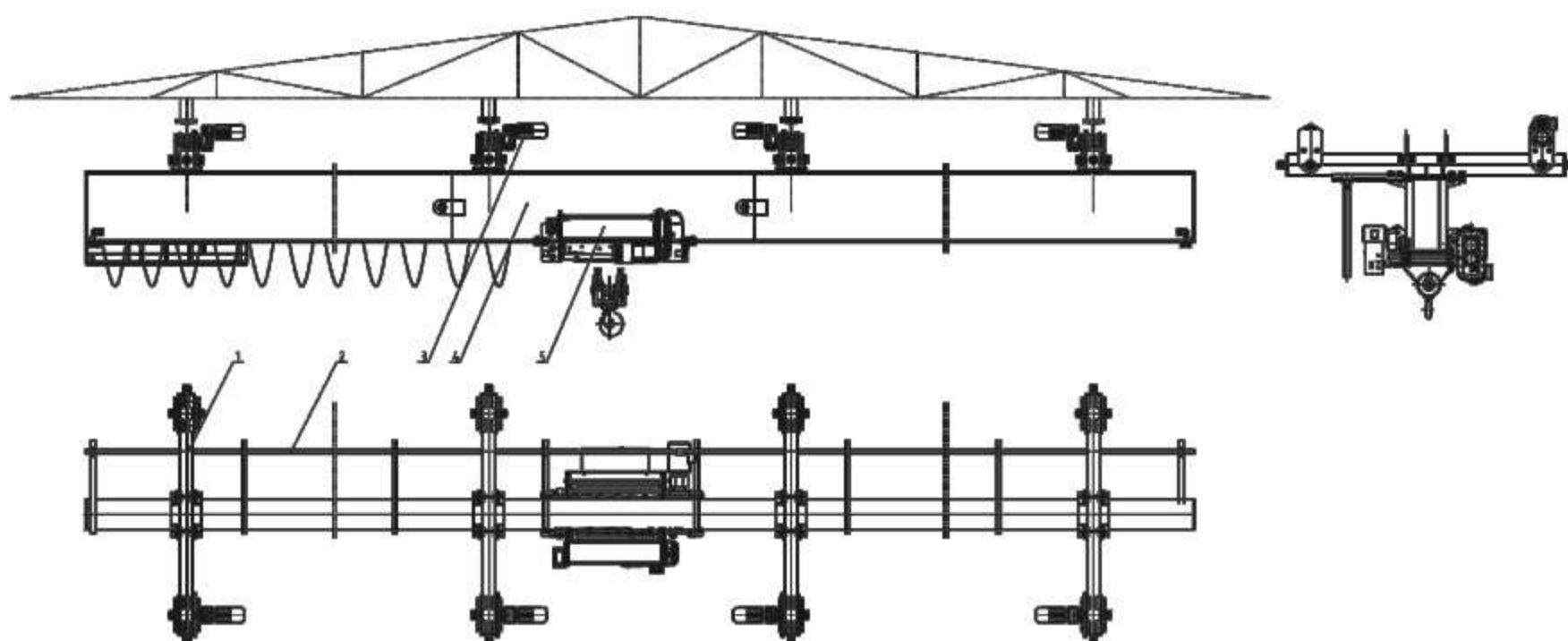
The capacity of LX-type electric suspension crane is rarely more than 20t, span is not more than 22.5m, the length of jib is not more than 1000mm, work duty is A3～A4, working ambient temperature is -20℃～+40℃, the basic pattern is shown in Figure 9 and Figure 10.



1.端梁 end carriage 2.电气装置 electrical device
3.电动葫芦 electric hoist 4.大车运行机构 crane traveling

图8 LX型电动悬挂起重机

Figure8 LX-type electric Under slung crane



- 1.端梁end carriage 2.电气装置 electrical device 3.大车运行 crane traveling
4.主梁 main girder 5.电动葫芦（低净空） electric hoist (low clearance)

图9 LX型多支点电动悬挂起重机

Figure9 LX-type multi-fulcrums electric Under slung crane

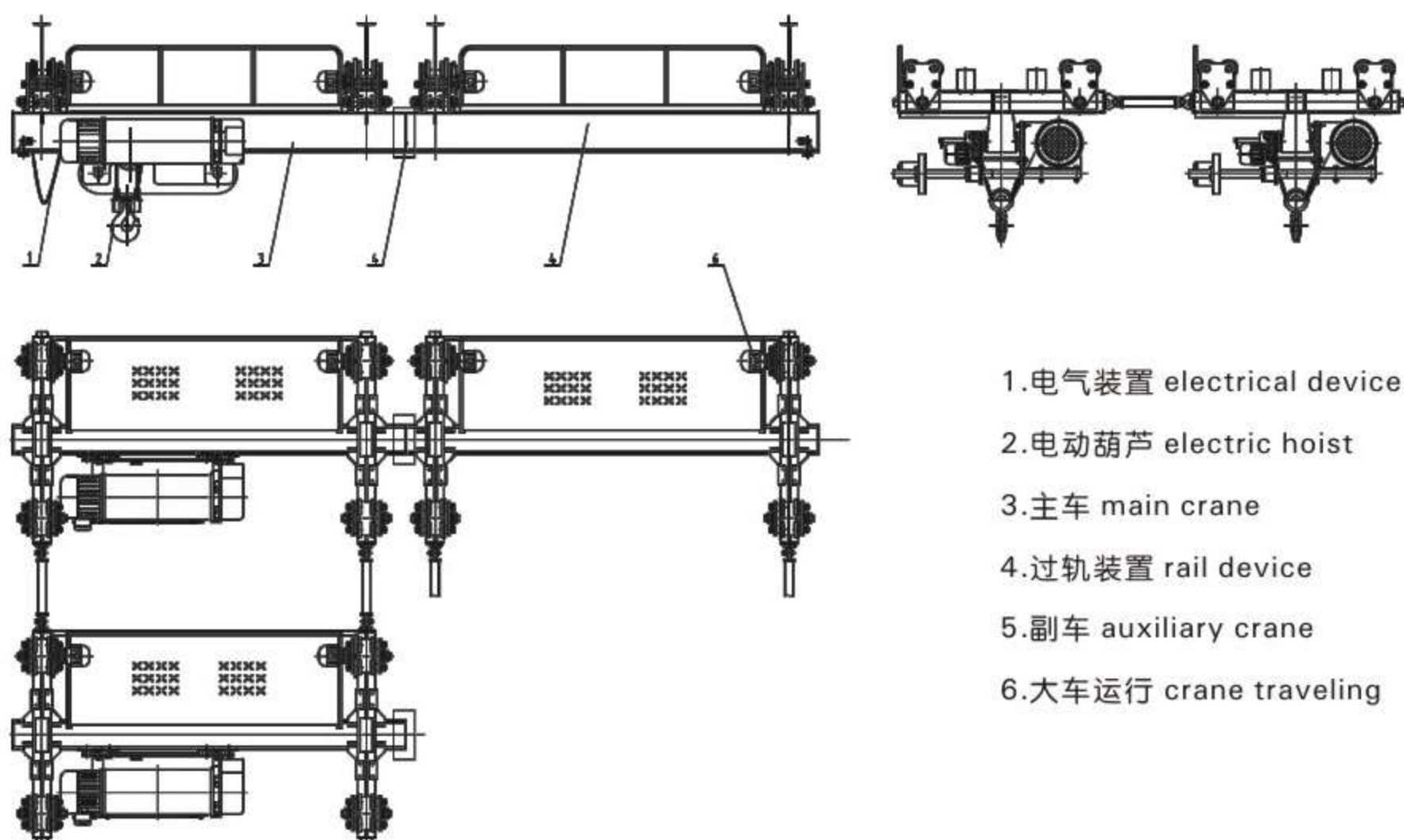
7. XG型悬挂过轨起重机 XG-type Under slung rail crane

XG型电动悬挂过轨起重机是电厂磨煤系统为发电机组配套的专业起重设备，其主要用途是检修磨煤机，其桥架有一套主车和多套副车组成，主副车分别有主梁、端梁组成。

XG-type Under slung rail crane is a professional lifting equipment used in power plant coal mill system for generating units, the main purpose is to maintain the coal mill, its bridge is composed of a set of main crane and several sets of auxiliary crane, main crane and auxiliary crane are respectively composed of main girder and end carriage.

XG型电动悬挂过轨机，其起重量、跨度根据具体客户要求制作，工作级别一般为A3～A4，工作环境温度-20℃～+40℃。基本图样如图10。

XG-type Under slung rail crane, the capacity and span should be done according to customer's specific requirements, work duty is A3～A4, working ambient temperature is -20℃～+40℃. The basic pattern is shown in Figure 10.



- 1.电气装置 electrical device
- 2.电动葫芦 electric hoist
- 3.主车 main crane
- 4.过轨装置 rail device
- 5.副车 auxiliary crane
- 6.大车运行 crane traveling

图10 XG型电动悬挂过轨机

Figure 10 XG-type electric Under slung rail crane

（二）、特殊用途起重机 Special-purpose crane

根据起重机使用场合的不同，可将电动单梁起重机分为防爆电动单梁起重机、冶金电动单梁起重机和绝缘电动单梁起重机等类型，统称为特种电动单梁起重机。

According to the use of crane in different occasions, electric single girder crane is divided into explosion-proof electric single girder crane, metallurgical electric single girder crane and insulated electric single girder crane, which are collectively called special-purpose electric single girder crane.

1、LB型防爆电动单梁起重机 LB-type explosion-proof electric single girder crane

LB型防爆电动单梁起重机是以HB型式防爆电动葫芦作为起升机构的一种空间运输设备。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、迅速地完成物体的位移，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。

LB-type explosion-proof electric single girder crane is a space transportation equipment adopted HB-type explosion-proof electric hoist as the lifting mechanism. Main role is to timely and quickly complete the displacement of objects through the hook or other handling device in the intermittent and cycle working way, and is the important tool and equipment for realizing production mechanization and automatization, relieving the heavy labor and improving labor

productivity in the modernized industrial enterprise.

LB型防爆电动单梁起重机是在普通电动单梁起重机基础上，从电机电器着手设计制造成具有防爆性能的防爆电动机和防爆电器，再辅助以相应机械防爆措施，以保证起重机本身和工作环境产生的电火花、热量或可燃性粉尘不至于产生火灾、爆炸危险与危害。

LB-type explosion-proof electric single girder crane is designed and manufactured to have the explosion-proof motor and explosion-proof electrics on the basis of ordinary electric single girder crane, then is provided with other auxiliary mechanical explosion-proof measures to ensure that electric spark, heat or combustible dust caused by the crane and working environment will not cause a fire, explosions or other hazards.

该起重机根据GB3836.1《爆炸性环境 第1部分：设备 通用要求》及GB3836.2《爆炸性环境 第2部分：由隔爆外壳“d”保护的设备》的规定，电机、电器为隔爆型，当防爆级别为Exd II CT4时，运行机构进行防火花处理，整机符合JB/T 10219《防爆梁式起重机》的规定。

According to the provisions of GB3836.1 "Explosive Atmosphere Part 1: General Requirement for Equipments " and GB3836.2 "Explosive Atmosphere Part 2: the Equipments Protected by Flameproof Enclosure 'd' " , the motors and electrics of this crane is flameproof type. When explosion-proof degree is Exd II CT4, the running mechanism will be taken the spark-proof measures, the whole crane is in accordance with the provisions of JB/T 10219 "Specification for explosion-proof cranes with electric wire rope hoist".

(1) 分类 Classifications

起重机依GB 3836.1中第4章规定，按爆炸性气体环境分为Ⅰ类和Ⅱ类电气设备；依GB 12476.1的规定，可燃性粉尘环境用电气设备仅为一类，则相应的起重机分类为：

According to the provisions of Chapter 4 in GB3836.1, the crane is divided into class I and class II electrical equipments according to explosive gas atmosphere, In accordance with the provisions of GB 12476.1, the electrical equipments used in the combustible dust environment is only divided into a class, the corresponding crane classification is as follows.

Ⅰ类：煤矿用起重机；

Class I: Crane for coal mine

Ⅱ类：除煤矿外的其它爆炸性气体环境用起重机；

Class II: Crane used in other explosive gas environment except coal mine.

粉尘类：可燃性粉尘环境用起重机。

Dust class: Crane used in the combustible dust atmosphere.

Ⅱ类隔爆型“d”和本质安全型“i”的防爆起重机，按爆炸性气体的特性，又可以分为ⅡA、ⅡB和ⅡC类起重机，当ⅡC环境中含乙炔时，应在合同中注明。对于ⅡB级防爆葫芦式起重机可适用于Ⅱ

A级的使用条件；对于ⅡC级防爆葫芦式起重机可适用于ⅡA和ⅡB级的使用条件。

Class II flameproof "d" explosion-proof crane and intrinsically-safe "i" explosion-proof crane can be divided into class IIA, class IIB and class IIC crane according to the characteristics of explosive gas. It should be indicated in the contract when there is acetylene in the IIC environment. The conditions of use for the class IIB explosion-proof hoist crane is applicable to class II A, the conditions of use for the class IIC explosion-proof hoist crane is applicable to class II A and class IIB.

粉尘类起重机按电气设备防尘的能力分为A型和B型两种形式，其中B型是在A型的基础上增加了“热循环试验”要求，分别用DIPA和DIPB表示。适用于防爆电动单梁起重机用电气设备的外壳粉尘防护型式推荐选A型为佳。

Dust type crane is divided into A-type and B-type according to dust-proof capacity of electrical equipments, B type of them increases the requirements of heat cycle test on the basis of A-type, they are indicated by DIPA and DIPB. Dust-proof type of the enclosure of electrical equipments applied to explosion-proof electric single girder crane is recommended to choose A type.

(2) 温度组别 Temperature group

I 类起重机的电气设备或构件表面温度不应超过：

The surface temperature of electrical equipments or components of class I crane should not be more than:

—150℃，当电气设备或构件表面可能堆积煤尘时；

—150℃, when the surface of electrical equipments or components may deposit the coal dust.

—450℃，当电气设备或构件表面不会堆积或采取措施（例如密封防尘或通风）可以防止堆积煤尘时。

—450℃, when the surface of electrical equipments or components can not deposit the coal dust or have been taken measures to prevent the coal dust deposit (such as sealed against dust or ventilation).

Ⅱ类和粉尘类防爆起重机电气设备的最高表面温度组别，见表1。

The maximum surface temperature group of electrical equipments of class II and dust type explosion-proof crane are shown in Table 1.

表1 最高表面温度组别 Table 1 the maximum surface temperature group

温度组别Temperature group		设备最高表面温度（℃） The maximum surface temperature of equipments
爆炸性气体环境用电气设备 Electric equipments used in the explosive gas atmosphere	可燃性粉尘环境用电气设备 Electric equipments used in the combustible dust atmosphere	
T1		450
T2		300
T3		200
T4		135
T5		100
T6		85

（3）爆炸性气体防爆危险区域划分

Division of explosion-proof hazardous area for explosive gas

0区：在正常情况下，爆炸性气体混合物连续地、短时间频繁地出现或长时间存在的场所。

0 zone: under normal circumstances, the location that explosive gas mixture appear continuously in a very short time or exist for a long time.

1区：在正常情况下，爆炸性气体混合物有可能出现的场所。

1 zone: under normal circumstances, the location that explosive gas mixture maybe appear.

2区：在正常情况下，爆炸性气体混合物不能出现，仅在不正常情况下即有可能发生设备故障或误操作情况下，偶尔短时间出现的场所。

2 zone: under normal circumstances, the location that explosive gas mixture can not appear, but under abnormal circumstances, it maybe appear in a short time when equipment is out of order or is operated by mistake.

防爆电动单梁起重机目前仅适用于1区或2区，不适用于0区。

At present, explosion-proof electric single girder crane applies only to 1 zone or 2 zone, and does not apply to 0 zone.

（4）粉尘防爆危险区域划分 Division of explosion-proof hazardous area for dust

20区：在正常运行过程中可燃性粉尘连续出现或经常出现，其数量足以形成可燃性粉尘与空气混合物和/或可能形成无法控制和极厚的粉尘层的场所及容器内部。

20 zone: during normal operation, there are combustible dust appear continuously or regularly the enough quantity will come into being combustible dust and with the air mixture maybe create out-of-control and extremely dust layer on the location and the internal vessel.

21区：在正常运行过程中，可能出现粉尘数量足以形成可燃粉尘与空气混合物，但未划入20区的场所。该区域包括与充入或排放粉尘点直接相邻的场所、出现粉尘层和正常操作情况下可能产生可燃浓度的可燃性粉尘与空气混合物的场所。

21 zone: During normal operation, the location that the quantity of dust is enough to form the mixture of combustible dust and air, but it is not divided into 20 zone. This zone includes the location that is directly adjacent to the places filled with or discharged dust, the location that appear the dust layer and maybe form the combustible mixture of combustible dust and air under normal operation.

22区：在异常条件下，可燃性粉尘云偶尔出现并且只是短时间存在、可燃性粉尘偶尔出现堆积或可能存在粉尘层并且产生可燃性粉尘空气混合物的场所。如果不能保证排除可燃性粉尘堆积或粉尘层时，则应划分为21区。

22 zone: Under abnormal conditions, the location that combustible dust could occasionally appear and exist in a short time, or combustible dust may occasionally deposit or may exist in the dust layer and generate the mixture of combustible dust and air. It should be divided into 21 zone if not guarantee that combustible dust deposit or dust layer are avoided.

防爆电动单梁起重机适用环境条件

Applicable environmental conditions for explosion-proof electric single girder crane

①. 防爆电动单梁起重机是在室内作业，工作环境温度为 $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$ ，空气相对湿度不大于85%（环境温度为 25°C 时），海拔不应超过1000m。超出上述环境条件时应与用户协商确定。

Explosion-proof electric single girder crane is operated indoors, working ambient temperature is $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$, relative air humidity is not more than 85% (when ambient temperature is 25°C), altitude should not exceed 1000m. It should be determined after consultation with the user if there is any exceed above environment conditions.

②. 防爆电动单梁起重机在爆炸性气体环境工作时，其工作区域为GB 3836.14中所划分的1区或2区。

The working area of explosion-proof electric single girder crane is 1 zone or 2 zone divided in GB 3836.14 when operated in explosive gas atmosphere.

③. 防爆电动单梁起重机在可燃性粉尘环境工作时，其工作区域为GB 12476.3中规定的21区或22区。

The working area of explosion-proof electric single girder crane is 21 zone or 22 zone provisioned in GB 12476.3 when operated in combustible dust environment.

④. 使用环境应具有良好的通风，要有必要的设施保障。

The working environment should have good ventilation and the necessary facilities.

(5) 防爆葫芦式起重机电机电器适用爆炸性气体举例

Examples of motors and electrical equipments of explosion-proof hoist crane used in explosive gas atmosphere

表2所示为隔爆型电机电器，各防爆级别与相应温度组别的适用的爆炸性气体。

Applicable explosive gas for each explosion-proof degree and corresponding temperature group of flameproof motor and electrical equipments are shown in table 2.

表2 爆炸性气体 Table2 Explosive Gas

防爆级别 Explosion-proof degree	温度组别 Temperature group			
	T1	T2	T3	T4
II A	乙炔、丙烷、苯乙烯、苯、二甲苯、一氧化碳、丙酮、醋酸、醋酸甲酯、氨、吡啶 Acetylene, propane, styrene, benzene, xylene, carbon monoxide, acetone, acetic acid, methyl acetate, ammonia, pyridine.	乙醇、丁烷、丙烯、醋酸乙酯、二氟甲烷、氟乙烯、噻吩、环戊烷、二甲胺 Ethanol, butane, propylene, acetic acid, ethyl two Lu methane, ethylene foot, thiophene, cyclopentane, dimethylamine	戊烷、癸烷、乙基环戊烷、松节油、石脑油、石油（包括军用汽油）、燃料油、氯丁烷、四氢噻吩 Pentane, decane, ethyl cyclopentane, turpentine, naphtha, petroleum (including military gasoline), fuel oil, butyl chloride, thiophene	乙醛、三甲胺 Acetaldehyde, trimethylamine
II B	丙炔、丙烯腈、氰化氢、焦炉煤气 Propyne, acrylonitrile, hydrogen cyanide, coke oven gas	乙烯、环氧烷、丙烯酸、甲酯呋喃 Ethylene, ethylene oxide, acrylic acid, methyl furan	二甲醚、丙烯醛、四氢呋喃、硫化氢 Dimethyl ether, acrolein, tetrahydrofuran, hydrogen sulfide	
II C	氢、二硫化碳 Hydrogen, carbon disulfide	乙炔 Acetylene		

表3所示为粉尘防爆型电机电器，各防粉尘结构形式与相应温度组别的适应的可燃性粉尘。

Applicable combustible dust for each dust-proof structure and corresponding temperature group of dust explosion-proof motor and electrical equipments are shown in table 3.

表3 粉尘名称 Table 3 Dust Name

粉尘防爆型式 Dust explosion-proof type	温度组别 Temperature group		
	TA,T1或TB,T1	TA,T2或TB,T2	TA,T3或TB,T3
TA或B A or B	T镁、红磷、电石、肥皂粉、青色燃料、苯酚燃料、聚乙烯、聚丙烯、聚氨酯、聚氯乙烯、硬质橡胶、天然树脂、松香、小麦粉、玉米淀粉、砂糖粉、棉纤维、人造短纤维、无烟煤粉、木炭粉、煤焦炭粉等 magnesium, red phosphorus, calcium carbide, soap power, green fuel, phenol fuel, polyethylene, polypropylene, polyurethane, polrvinyl chloride, hard rubber, natural resin, rosin, wheat flour, corn starch, sugar power, cotton fiber, staple fiber, anthracite culm, charcoal dust, coal and coke power etc.	筛米粉、可可粉、麦芽粉、亚麻粕粉、椰子粉、泥煤粉、褐煤粉、有烟煤粉、瓦斯煤粉、焦炭用煤粉、褐煤焦炭粉等 rice flour, cocoa power, malt flour, Linseed mdal, coconut power, pulverized coal mud, brown coal dust, pulverized bituminous coal, coal dust for gas, coal dust for coke etc.	

防爆电动单梁起重机用防爆电气设备有防爆电动机、防爆开关箱、防爆手电门、防爆行程开关、防爆超载限制器、防爆起升限位器、防爆接线盒和门开关等。防爆电动单梁起重机的电源引入采用软电缆导电，电气设备之间的连线，采用橡套铜芯多股电缆，并带有一芯接地芯线，配线采用铜芯多股橡套电缆，电缆中间不允许有接头，必要时设防爆接线盒。防爆电器外壳明显处设有“严禁带电打开”警告牌。

Explosion-proof electric single girder crane is equipped with explosion-proof motor, explosion-proof switch box, explosion-proof flashlight doors, explosion-proof limit switch, explosion-proof over-load limiter, explosion-proof hoist limit device, explosion-proof junction boxes, gate switch and so on. Power wire adopt the flexible cable, the connection between electrical equipments use the rubber sheath multiple copper cores cable with ground core wire, wiring cable use the rubber sheath multiple copper cores cable, too. There should be not allowed to have the joints in the middle of cable. If necessary, explosion-proof junction boxes is

provided. There is warning board "Do not open if there is electricity" on the obvious place of the enclosure of explosion-proof electrical equipment.

该类起重机适用工作级别为A3。工厂用防爆电动单梁起重机操作方式多为地面操作，运行速度一般为20 m/min，不应大于25 m/min。亦可根据具体情况选择为遥控操作和司机室操，其基本形式见图11、图12。矿用防爆电动单梁起重机目前只能为地面操作，运行速度为20 m/min，其基本型式如图13、14所示。

The work duty of the crane is A3. The operation mode of explosion-proof electric single girder crane for factory is usually ground controlling, traveling speed is 20m/min and should not be more than 25m/min. But the remote operation and cab operation are also selected according to specific conditions, the basic patterns are shown in Figure 11 and Figure 12. At present, the operation mode of this crane for mine can only be ground controlling, traveling speed is 20m/min, the basic patterns are shown in Figure13 and Figure14.

当防爆级别为EXdIICT4时，车轮踏面及轮缘部分应采用不因撞击、摩擦而引燃爆炸性气体混合物的铜合金或其它材料制造；电缆滑车的牵引线应采用不锈钢钢丝绳；吊钩应采取能防止撞击或摩擦而产生危险火花的措施；起重机的大小车运行速度不大于16m/min。

When explosion-proof degree is EXdIICT4, the wheel tread and flange parts should adopt copper alloy or other materials that cannot ignite the explosive gas because of the impact and friction. The pull wire of cable pulley should adopt the stainless steel wire rope. The hook should be taken measures to prevent dangerous sparts caused by the impact and friction. The traveling speed of crane and trolley is not more than 16m/min.

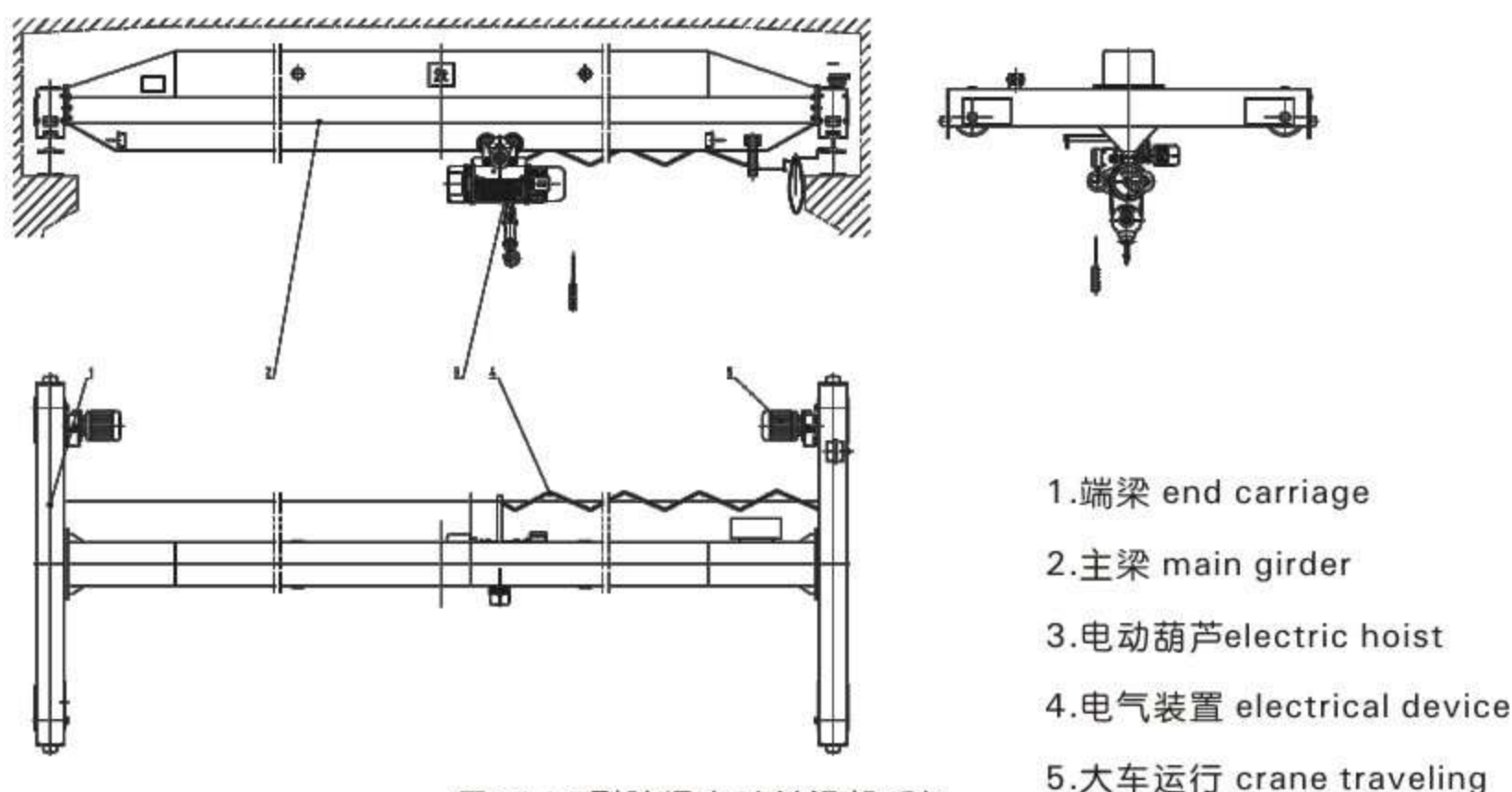
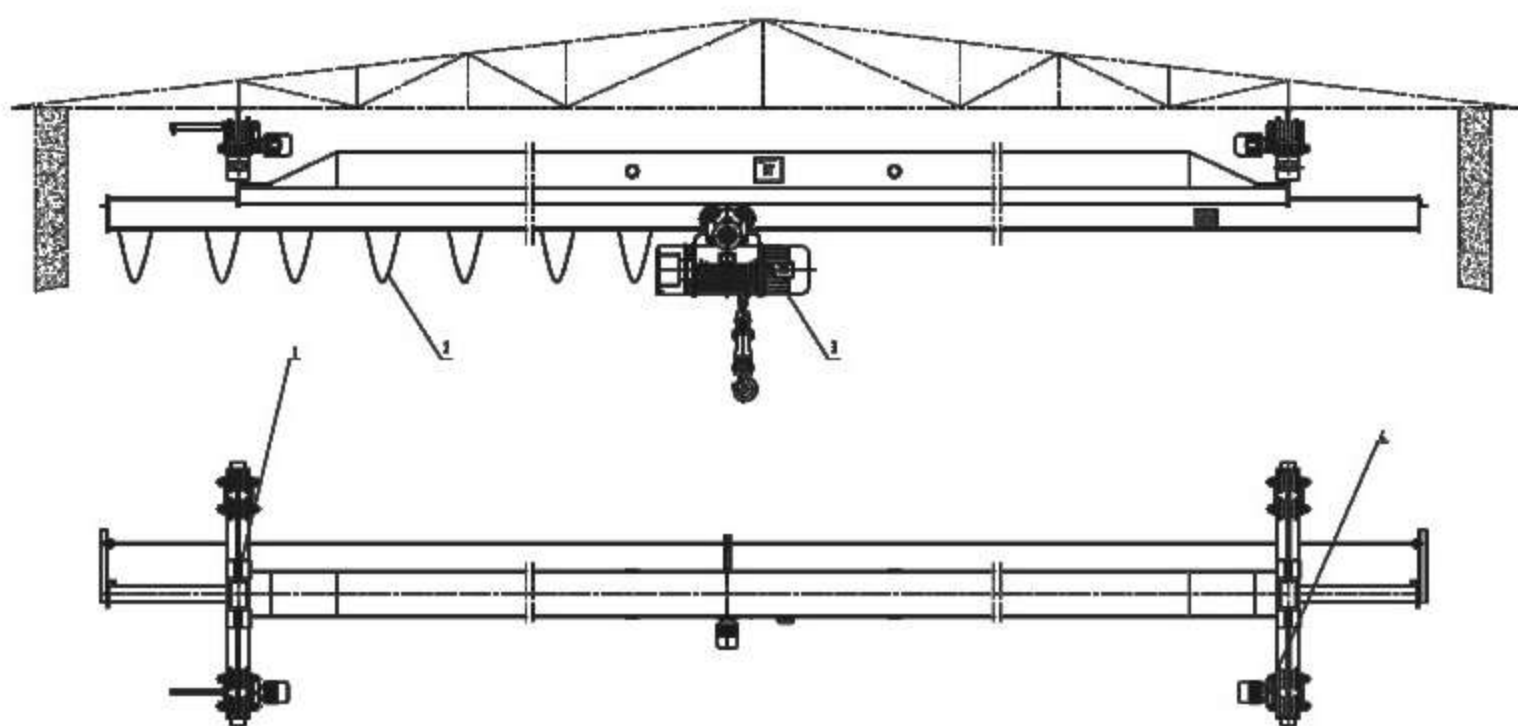


图11 LB型防爆电动单梁起重机

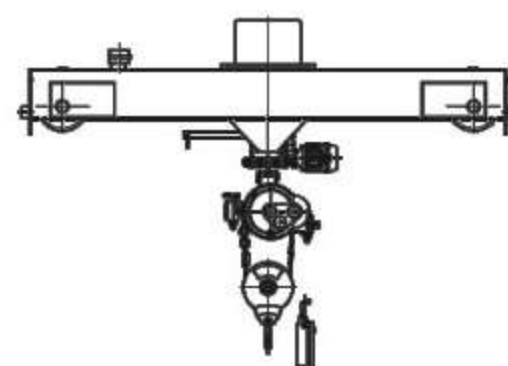
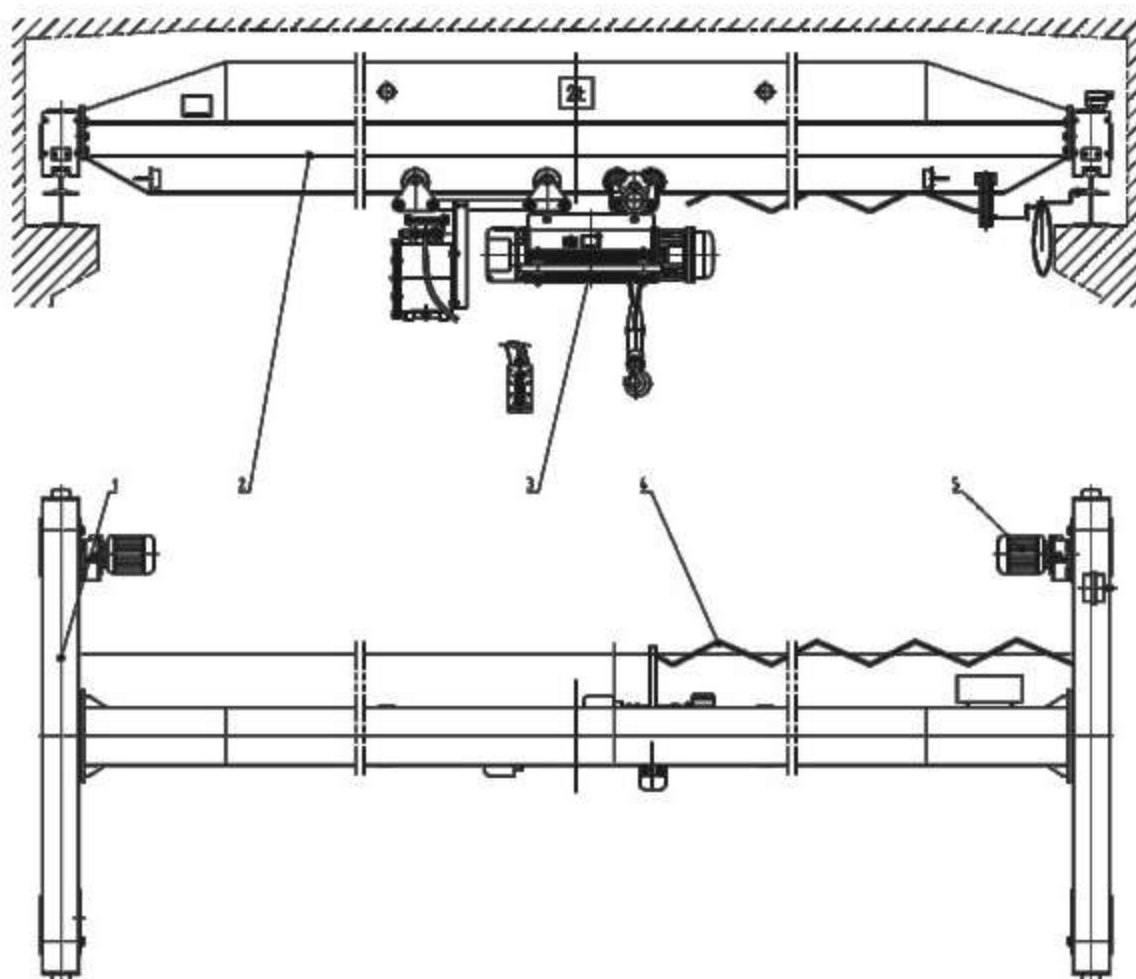
Figure 11 LB-type explosion-proof electric single girder crane



- 1.端梁 end carriage 2.电气装置 electrical device
3.电动葫芦 electric hoist 4.大车运行 crane traveling

图12 LXB型防爆电动单梁悬挂起重机

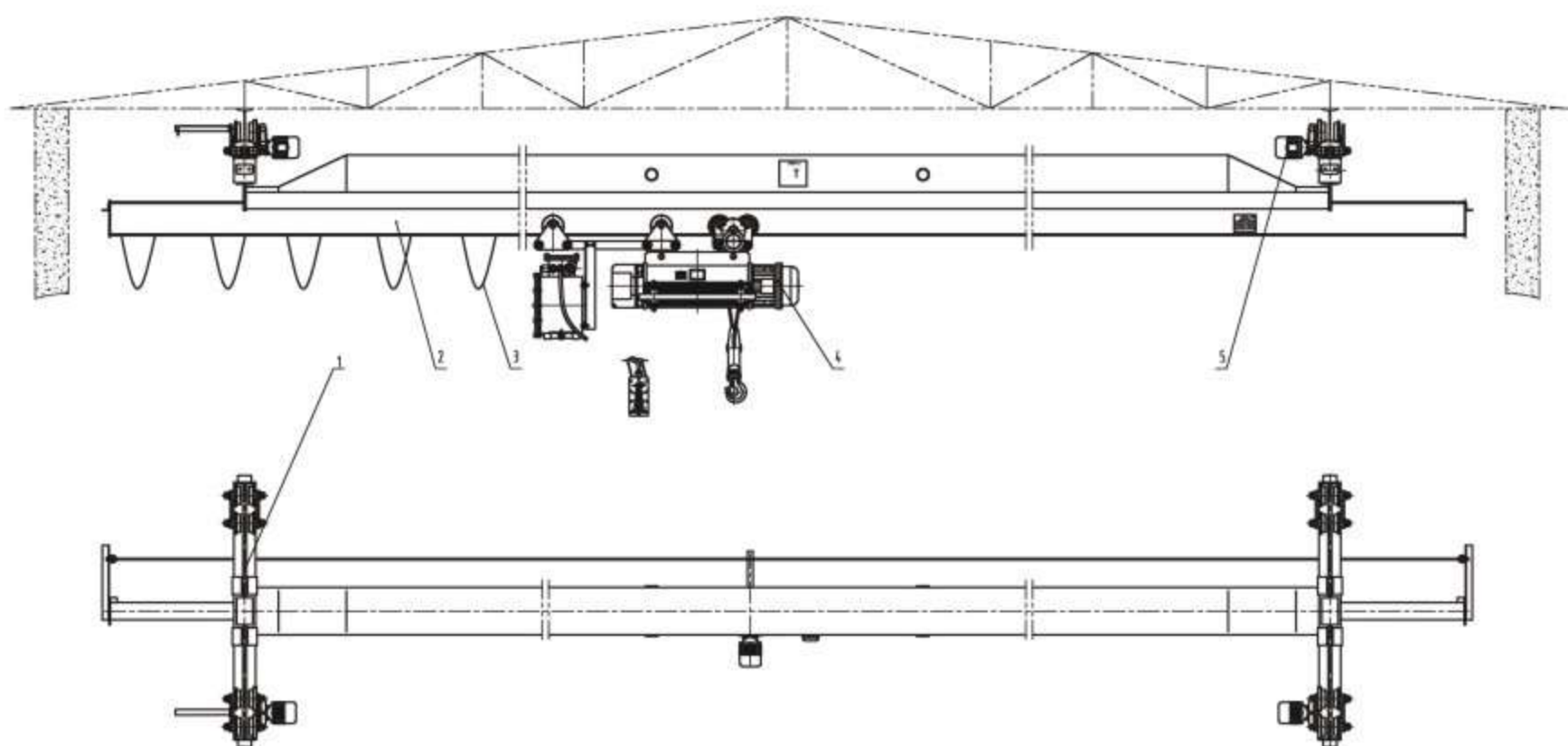
Figure12 LXB-type explosion-proof electric single girder Under slung crane



- 1.端梁 end carriage
2.主梁 main girder
3.电动葫芦 electric hoist
4.电气装置 electrical device
5.大车运行 crane traveling

图13 LB型矿用防爆电动单梁起重机

Figure 13 LB-type explosion-proof electric single girder crane for mine



1.端梁end carriage 2.主梁 main girder 3.电气装置electrical device
4.电动葫芦 electric hoist 5.大车运行 crane traveling

图14矿用防爆电动悬挂起重机

Figure14 explosion-proof electric Under slung crane for mine

2、冶金电动单梁起重机 Metallurgical electric single girder crane

冶金电动单梁起重机按GB 3811《起重机设计规范》和JB/T 7688.1《冶金起重机技术条件》标准设计，是以冶金电动葫芦作为起升机构的车间吊运设备，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 成冶金生产过程中所需起吊运输重物的位移，是现代工业企业中冶金和铸造场所提高劳动生产率的重要工具和设备。

Metallurgical electric single girder crane is designed according to GB 3811 "Design Rules for Cranes" and JB/T 7688.1 "Technical Conditions of Metallurgical Crane", it is a lifting equipment for workshop that uses metallurgical electric hoist as the lifting mechanism, main purpose is to achieve timely and quickly the displacement of the lifting goods required in metallurgical production through hook or other lifting devices in the intermittent and cycle work way, it is very important tool and equipment that improve the labor productivity used in metallurgy and casting places in the modernized industrial enterprise.

冶金电动单梁起重机适用于在工作级别A6，工作环境温度 $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ ，无易燃、易爆及腐蚀性介质环境条件下工作。起重量最大为10吨，跨度一般为31.5米以下。其基本型式如图14所示。

Work duty of metallurgical electric single girder crane is A6, working ambient temperature is $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$, it is used under no flammable, explosive and corrosive medium environment

conditions, the maximum capacity is 10t, span is usually 31.5m, the basic pattern is shown in Figure 14.

起重机操作方式可根据具体情况选择为地面操作、遥控操作和司机室操作（注意：本产品推荐尽量采用遥控操作方式，以保护人员安全），其中司机室采用闭式司机室操作，司机室一般应符合GB/T 20303.5的要求。地面操作运行速度一般为20 m/min、30 m/min，司机室操作运行速度一般为30

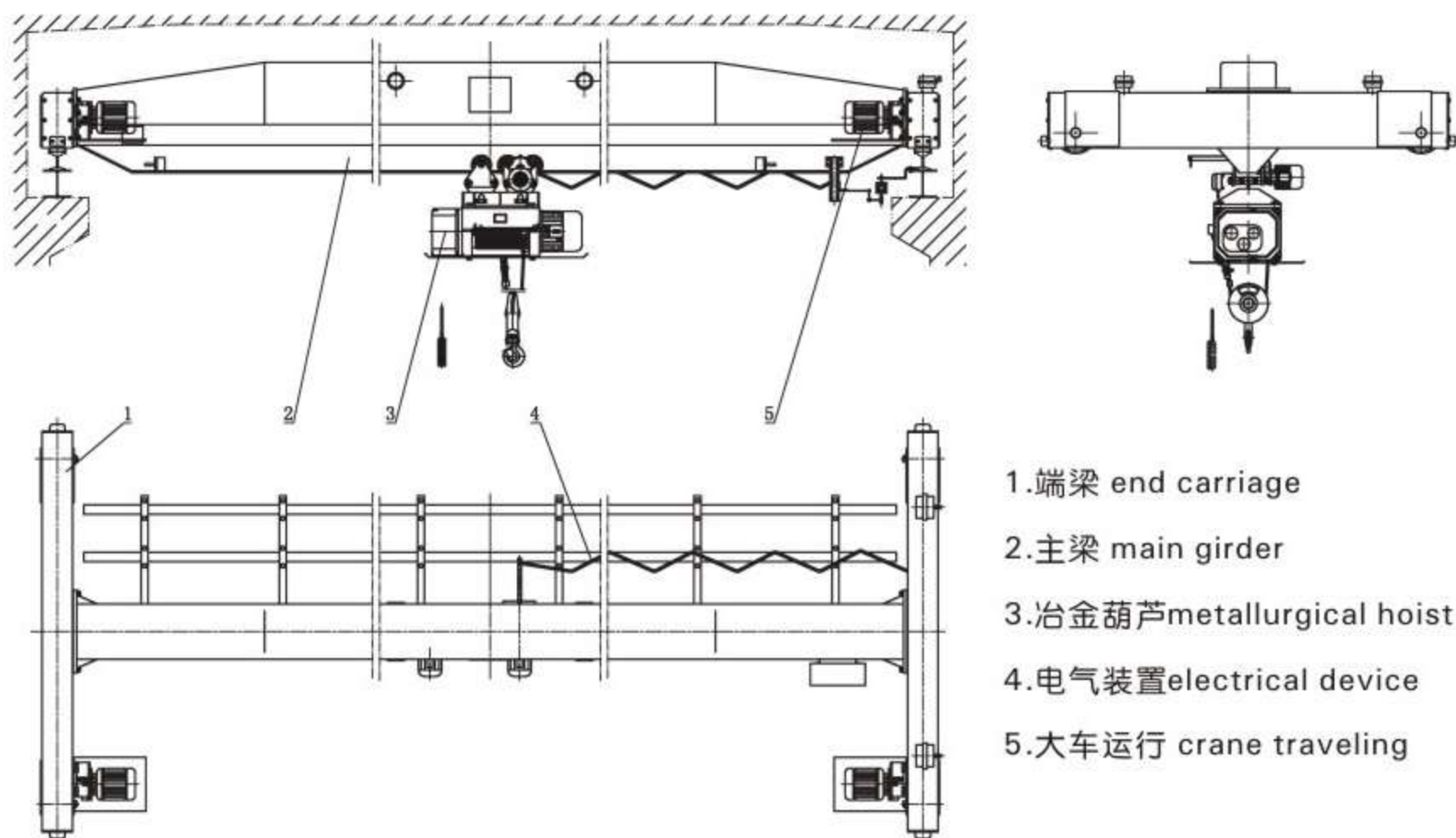


图15 LDY型冶金电动单梁起重机

Figure15 LDY-type metallurgical electric single-girder crane

m/min、45 m/min，遥控操作时运行速度用户根据实际需要而定。

The operation mode of crane has ground controlling, remote controlling and cab controlling which are selected according to specific conditions(Note: The crane is recommended to adopt the remote controlling in order to protect the safety of personnel.), cab operation uses closed-type cab, and should be in accordance with the requirements of GB/T 20303.5. Traveling speed for ground operation is 20m/min and 30m/min, traveling speed for cab operation is usually 30m/min and 45m/min, traveling speed for remote operation should be determined according to actual requirements.

环境温度超过40℃的场合，应选用H级绝缘的电动机，主梁底部采用特殊隔热处理，行车带有隔热层，涂有耐热漆。

The H class insulation motor should be used when ambient temperature is over 40℃. The

bottom of main girder takes the special heat-insulating measures, the crane has thermal-protective coating and is coated with heat-resistant paint.

冶金电动单梁起重机的配套起升机构为YHII型冶金电动葫芦，其工作级别为M6，主要用于冶金环境吊运熔融金属。其主要特点如下：

The lifting mechanism for metallurgical electric single girder crane is YHII-type metallurgical electric hoist, its work duty is M6, the main purpose is to hoist the molten metal in metallurgical environment. The main features are as follows.

电动葫芦的运行电机及起升电机的绝缘等级为H级，防护等级为IP54。

The insulation class of traveling motor and lifting motor of electric hoist is H class, protection class is Ip54.

电动葫芦采用双制动结构：电机制动及机械制动（棘轮棘爪制动），机械制动直接制动卷筒，较普通的电磁制动安全系数大大提高。

The electric hoist uses the double brake structure: motor braking and mechanical braking (ratchet and pawl brake), the drum is braked directly by mechanical braking which the safety factor is greater than the ordinary electromagnetic braking.

钢丝绳采用钢芯钢丝绳，增大其破断拉力，安全系数增大。

The wire rope use steel-cored wire rope to increase the breaking force and safety factor.

3、绝缘电动单梁起重机 Insulation electric single girder crane

绝缘电动单梁起重机是通过起重机自身条件增加绝缘措施，能适应在高压电源环境中安全可靠地工作的电动单梁起重机，是以绝缘电动葫芦作为起升机构的车间吊运设备，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、迅速地完成任务过程中所需起吊运输重物的位移。

Insulation electric single girder crane is a electric single girder crane that can be operated safely and reliably in high voltage power supply environment through increasing the insulation measures and is a lifting equipment for workshop that uses the insulation electric hoist as a lifting mechanism. The main purpose is to achieve timely and quickly the displacement of the lifting goods in the process of production through hook or other lifting devices in the intermittent and cycle work way.

绝缘电动单梁起重机必须能安全可靠地适用于有色金属电解铝、铜、镁、铅、锌等冶炼车间环境及其他要求绝缘的环境中作业。安装使用地点的海拔高度不超过2000m（超过1000m时应对电动机容量进行校核），且吊运物品的吊具部位的辐射热温度不得超过300℃。能适应的环境温度范围为：-5℃ ~ +50℃，且在环境温度+50℃时的相对湿度应不超过50%。

Insulation electric single girder crane must be able to work safely and reliably in smelting shop environment of non-ferrous metal electrolytic aluminum, copper, magnesium, lead and

zinc. The altitude of the installation site does not exceed 2000m(The motor capacity should be checked if altitude exceeds 1000m.), the radiation heat temperature of the spreaders for lifting goods should not be more than 300°C. The range of ambient temperature is from -5°C to +50°C, and the relative humidity should not be more than 50% when the ambient temperature is +50°C.

绝缘电动单梁起重机应设有三级（三道）绝缘，第一级绝缘选择在吊钩与滑轮之间，第二级绝缘选择在起重小车运行轨道与主梁之间，第三级绝缘选择在起重机运行轨道与土建承轨梁之间啊，其每一级（每一道）绝缘在常温状态（温度20°C~25°C，相对湿度≤85%）下用1000V兆欧表测得的电阻值应≥1MΩ。其绝缘措施如图16、17、18所示。

Insulation electric single girder crane should be provided with three-grade insulation, the first grade insulation is located between hook and pulley, the second grade insulation is located between track for trolley and main girder, the third grade insulation is located between track for crane and bearing-rail beam. Under normal temperature state (temperature is 20°C ~ 25°C, relative humidity is not more than 85%), resistance value of each grade insulation measured by 1000V megger should not be less than 1MΩ. The insulation measures are shown in Figure 16, Figure17 and Figure18.

对于采用司机室操纵的绝缘电动单梁起重机，司机室内宜采用降温措施，为防止腐蚀性气体腐蚀玻璃，影响司机视线，司机室应安装可换式玻璃或有机玻璃。

There should be taken steps to lower the temperature in the cab for insulation electric single girder crane with the cab operation, the cab should be equipped with the removable glass or organic glass in order to prevent the corrosive gas from damaging to glass and the affecting the driver's line of sight.

绝缘电动单梁起重机的结构型式与普通电动单梁起重机的结构型式相同。

The structure of insulation electric single girder crane is the same to the structure of ordinary electric single girder crane.

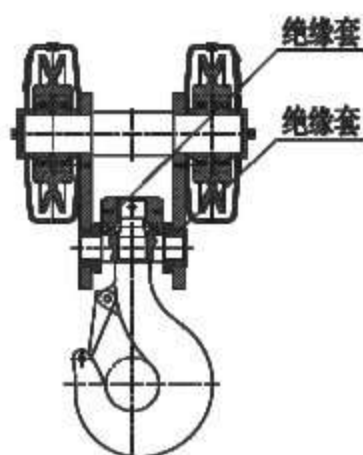


图16 绝缘吊钩

Figure 16 Insulation Hook

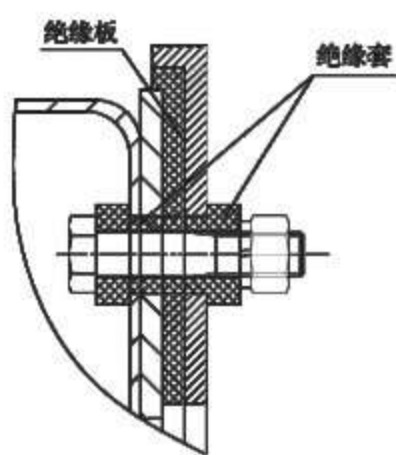


图17主端梁连接

Figure 17 connection between main girder and end carriage

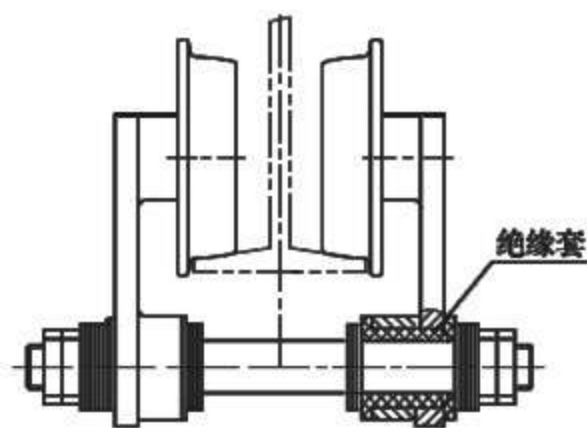


图18葫芦跑车

Figure 18 Trolley with hoist

三、起重机安装与调试 Erection and commission for crane

（一）安装准备及注意事项 Preparation for erection and notes

起重机安装人员在进现场开始安装之前，应会同委托安装单位及制造单位的代表一起开箱，按照随机装箱单，清点核对货物与装箱单所列的零部件数量是否相符，有无短缺和损伤，随机文件是否齐全。然后应检查所有金属结构件外观有无损坏。对照安装图和有关技术文件，认真研究安装方案和安装架设的具体程序。

Before the erection, erection personnel with the deputies of erection company and manufacturer should open the box to check the number of components and spare parts that listed on the packing list and attached documents to see if there is any shortage or damage. Then check whether there is any damage of appearance of all metal structures. Finally refer to the erection drawing and technical requirements, serious study erection plan and erection procedure.

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，起吊时至少须有两个吊点，吊点的捆扎处须有衬垫物，并尽可能选在桥架的两端，即主梁与端梁的连接处。存放时应放置平稳，并用枕木放平垫实。安装前应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，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，否则不准架设。

Accidents such as wresting, bending or striking should be especially avoided while unloading or transporting. When lifting the crane, two lifting points are necessary and there must be underlay in the enlacing point, and are selected at the both ends of bridge as far as possible, that is, the connection of main girder and end carriage. When storing, crane should be flatly and stably set on sleepers. Before erecting, the defects caused by improper handling and improper storage and the parts that exceed the permitted error should be adjusted and repaired according to the technical requirements. The defects for metal structures must be corrected on

the ground, or erection is not allowed.

(二) 运行轨道 Traveling track

a. 起重机运行轨道跨度S的极限偏差应满足国家标准GB10183《桥式和门式起重机 制造及轨道安装公差》的规定要求:

The limit deviation of span(s) of crane traveling track should meet the requirements of national standard GB10183 "Cranes-overhead cranes and gantry cranes cranes -Tolerances for manufacture and tracks laying".

当 $S \leq 10\text{m}$ 时, $\Delta S = \pm 3\text{mm}$; when $S \leq 10\text{m}$, $\Delta S = \pm 3\text{mm}$;

当 $S > 10\text{m}$ 时, $\Delta S = \pm [3 + 0.25 \times (S - 10)] \text{ mm}$ when $S > 10\text{m}$, $\Delta S = \pm [3 + 0.25 \times (S - 10)]$

b. 轨道的接头可为直头，亦可制成 45° 角的斜接头，斜接头可使车轮在接头处平稳过渡。

Track joint can be straight joint, and can also be a 45° angle inclined joint that make the wheels travel smoothly at the joints.

c. 轨道接头的接缝, 一般为1~2mm。

The seam of track joint is usually 1 ~ 2mm.

d. 接头处两轨道的横向错位和高低差均不得大于1mm。

The transverse stagger and vertical stagger of two tracks at the joints should not be more than 1mm.

e. 两轨道在跨度方向的各截面上, 轨道的高低差不得超过15mm。

The vertical stagger of two tracks on each cross section along the span direction should not exceed 15mm.

f. 在轨道的总长度内, 侧向极限偏差为 $\pm 10\text{mm}$, 沿长度方向在水平面内的弯曲, 每2m测量长度内的极限偏差不得超过 $\pm 1\text{mm}$ 。

Within the total length of track, the side limit deviation is $\pm 10\text{mm}$, the bend in a horizontal plane along the length direction, the limit deviation measured within each 2m measuring length should not exceed $\pm 1\text{mm}$.

(三) 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.

主、端梁连接按图19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。

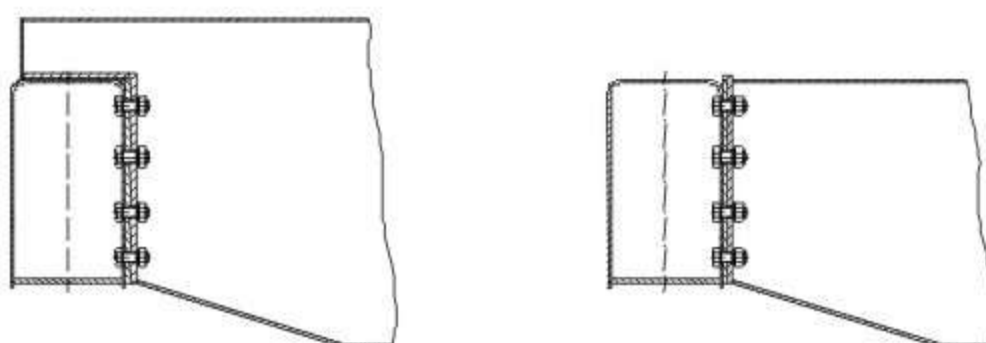
Put main beam on two cradles parallel to each other on the same level. Cradles should be at the variable cross section. We should adjust the lever correctly.

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.

起重机电动葫芦，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19 主、端梁连接Connection between main beam and end carriage

（四）电动葫芦的安装 Installation of electric hoist

电动葫芦的安装可以在主梁吊离地面适当位置后，将其直接安装于运行工字钢轨道上，按要求调整好间隙（运行车轮轮缘内侧与工字钢间隙3~5mm）。

Electric hoist will be mounted directly on the I-steel track after the main girder is lifting out of the ground to the appropriate position, the gap is adjusted according to the requirements. (The gap between traveling wheel flange and I-steel is 3~5mm.)

起重机钢结构及电动葫芦安装、调整后，即可将随机配装电器安装于主机上。

After steel structure of crane and electric hoist are installed and adjusted, the attached electrical equipments will be mounted on the crane.

（五）电气控制系统 Electrical control system

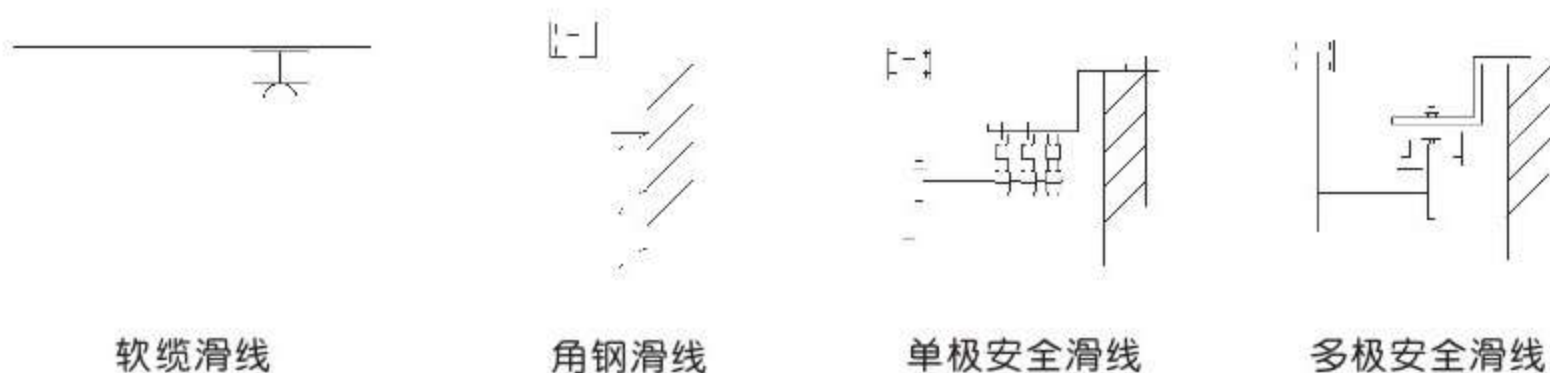
1、供电电源 Power source

起重机标准电源为交流三相四线，额定电压为220V~660V，额定频率为50Hz或60Hz，出口起

重机按使用国家电源种类，特殊电源情况按订货要求。电动机和电器上允许电压波动的上限为额定电压的+10%，下限（尖峰电压时）为额定电压的-15%，起重机内部电压损失不大于3%。

The standard power source is 3-phase 4 wire A.C., rated voltage is 220V ~ 660V, rated frequency is 50Hz or 60 Hz, the power of export cranes is used according to national power types of the users, the special power should be used according to the order requirements. The upper limit of allowable voltage fluctuation for motor and electrical equipments is +10% of the rated voltage, the lower limit () is -15% of the rated voltage, the voltage loss inside the crane is not more than 3%.

2、供电方式 Power supply mode



起重机馈电：(1)安全滑线 (2)软缆

Power supply for crane: 1. Safety slide wire 2. Flexible cable

3、控制电源 Control power source

起重机标准控制电源采用交流AC36V/50Hz，采用隔离控制变压器独立供电控制；特殊控制电源情况根据订货要求配置。

The standard control power source of crane use A.C. 36V/50Hz, and use the isolated control transformer to power independently. The special control supply is used according to the order requirements.

4、电缆要求 Requirements of cable

(1) 小车馈电：采用钢丝绳单、双滑道，异型钢单、双滑道、工字钢滑道及其它特殊滑道，双滑道控制时手柄控制电缆采用单独的一个滑道，操作人员可以移动到任意位置对行车进行控制；对于欧式起重机移动控制电缆安装采用快速接插件连接，方便安装及检修；手柄控制移动电缆运行部分采用扁电缆，垂直部分采用圆电缆，均采用接插件连接，方便快捷安装及检修。

Power supply for trolley: single and double wire rope and deformed steel slideway, I beam and other special slideway, if use double slideway, pendant control use one independent slideway, operator can control the crane in any place. The installation of movable control cable for European-style crane is connected by high-speed connector which is easy to install and maintain, pendant control cable for traveling use the flat cable, cable for lifting use the round cable, they are connected by connector which is easy to install quickly and maintain.

(2) 起重机上全部采用绝缘电线及电缆。控制线是截面积不小于 1.5mm^2 的单芯电缆或多股单芯电缆，电机动力线截面积 $\geq 2.5\text{mm}^2$ 。

The crane all adopts the insulated wire and cable. The control line is single core cable that sectional area is not less than 1.5mm^2 or multi-strand single core cable, the sectional area of motor power line is not less than 2.5mm^2 .

(3) 对冶金类起重机，整车电缆均要求为耐高温电线和电缆，手柄移动电缆为非跟随式。

The whole cable for metallurgical crane use the high temperature resistance wire and cable, pendant movable cable is a non-follow-up type.

起重机上的电缆敷设于壁厚为 $1.5\text{mm} \sim 2\text{mm}$ 的线槽或钢管中。在有机械损伤、化学腐蚀或油污侵蚀的部位均设有防护装置。欧式起重机电缆敷设采用网格式电缆桥架，开放式结构能够有效安全的流通空气，提高散热性能，装配灵活，新颖独特。

The cable for crane is laid in the trunking of $1.5\text{mm} \sim 2\text{mm}$ wall thickness or steel pipe. There are protective devices in the parts of mechanical damage, chemical corrosion or oil stains erosion. The cable laying for European-type crane use the mesh-type cable bridge, open structure can make the air flow effectively and safely, and improve the heat dispersion, flexible assemble.

5、电气控制 Electrical controls

(1) 起重机电器主要由大车电器和葫芦电器两大部分组成，大车电器部分按控制原理分为DK1电器、DK2电器，区别在于DK2电器在控制原理上增加了大车电机单相启动电阻，启动时降低电机启动电流从而减小启动时机械冲击，获得较好的启动效果；葫芦电器按葫芦的类型主要分为 CD_1 型和 MD_1 型葫芦电器；还可以根据起重机型号类别来分类电器型号；司机室操作起重机时大车电器和葫芦电器均安装在司机室。

The electrical equipments for crane is main composed of crane electrics and hoist electrics, crane electrics is divided into DK1 electrics and DK2 electrics, the difference is that DK2 electrics increase the single-phase starting resistance of the motors on the control principle, when starting up, reduce the starting current of motor, thus reduce the mechanical impact, which can obtain better start effect. Hoist electrics is divided into CD_1 and MD_1 type hoist electrics according to the types of hoist. The electrics models can be classified according to the crane types. Crane electrics and hoist electrics are installed in the cab when the crane is operated through the cab.

(2) 起重机配置电器主元件采用正泰、施耐德、西门子等品牌；

Main electrical components of crane use CHINT, Schneider, Siemens and other brands.

(3) 电气箱壳标准防护等级为IP44，起重机室外使用及冶金、欧式类起重机防护等级为IP54，防

尘防水性能更好；

The protection class of the electrical box shell is IP44, crane is used outdoor. Protection class for metallurgical and European-type crane is IP54, dust-proof and water-proof performance is better.

(4) 起重机可配置CD₁、MD₁、YHII、CD₁、MD₁、DF、HC型电动葫芦选择使用；

The crane can be configured with CD₁, MD₁, YHII, CD₁, MD₁, NH, DF, HC type electric hoists to use.

(5) 操纵方式采用空操司机室操作、遥控操作、地操手柄操作、地操手柄+遥控操作、空操+地操手柄及遥控器组合操作等各种方式；空操时大车机构采用凸轮或主令控制器控制，葫芦运行及起升机构采用面板按键控制。

The operation models adopt the cab operation, remote control, ground control, ground control and remote control, cab and ground and remote control etc. When using the cab operation, crane mechanism is controlled by cam or main controller, hoist travel and lifting mechanism is controlled by panel buttons.

(6) 驱动控制方式：Drive control mode

起升机构由接触器直接控制，可实现起升电机单双速、正反转控制；还可以采用变频控制，当变频控制时采用高性能的矢量控制方式驱动电机；变频器通过自学习可自动识别电机的电气参数而达到最佳的控制性能。这种控制方式调速范围大，调速平滑性好，节能效果明显，机械冲击力小，短时过载能力可达150%。变频调速速比为1:10，在此期间的任何速度均可以实现。变频控制时具体调试方法和电气原理图纸详见随机资料；

Lifting mechanism is controlled directly by contactor, which can achieve the single and double speed, forward and reverse control for lifting motor. The frequency control can be also used, when using the frequency control, use the high-performance vector control mode to drive the motor. The inverter can automatically identify electrical parameters of the motor to obtain optimum control performance. This control mode has large speed range, good speed smoothness and effective energy saving, mechanical impact is small, short-term overload capacity can reach 150%. The frequency conversion speed ratio is 1:10, any speed within this range can be realized. when controlled by frequency, specific debug method and electrical drawings see the attached documents.

大车机构由接触器或凸轮控制器直接控制，可实现电机单双速、正反转及电阻调速控制；还可以采用变频控制，当变频控制时采用V/F控制模式驱动电机，达到电动机调速的目的。平滑性好，节能效果明显，机械冲击力小，短时过载能力可达150%。变频调速速比为1:10，在此期间的任何速度均可以实现。变频控制时具体调试方法和电气原理图纸详见随机资料；

Crane mechanism is controlled directly by contactor or cam controller, which can achieve the single and double speed, forward and reverse and resistor speed regulation control for motor. The frequency control can be also used, when using the frequency control, use V/F control mode to drive the motor, then reach the purpose of motor speed regulation. Good smoothness and effective energy saving, mechanical impact is small, short-term overload capacity can reach 150%. The frequency conversion speed ratio is 1:10, any speed within this range can be realized. when controlled by frequency, specific debug method and electrical drawings see the attached documents.

小车机构由接触器直接控制，可实现电机单双速、正反转控制；还可以采用变频控制，采用V/F控制模式驱动电机，达到电动机调速的目的。平滑性好，节能效果明显，机械冲击力小，短时过载能力可达150%。变频调速速比为1: 10，在此期间的任何速度均可以实现。变频控制时具体调试方法和电气原理图纸详见随机资料。

Trolley mechanism is controlled directly by contactor, which can achieve the single and double speed, forward and reverse control for motor. The frequency control can be also used, using V/F control mode to drive the motor, then reach the purpose of motor speed regulation. Good smoothness and effective energy saving, mechanical impact is small, short-term overload capacity can reach 150%. The frequency conversion speed ratio is 1:10, any speed within this range can be realized. when controlled by frequency, specific debug method and electrical drawings see the attached documents.

6、起重机配置的保护装置 Protective device for crane

(1) 配电保护 Distribution protection

起重机配电主回路设总电源自动空气开关、总接触器等保护元器件。

The main circuit of crane distribution is equipped with automatic air switch for general power, main contactor and other protection components.

(2) 短路保护 Short circuit protection

总电源回路设置自动开关，作为起重机的短路保护；控制回路设置小容量自动空气开关作为短路保护。

The general power circuit is equipped with automatic switch as a short circuit protection for the crane. The control circuit is provided with small-capacity automatic air switch as a short protection.

(3) 相序保护 Phase sequence protection

设备采用相序保护器，实时监测供电电源质量，当电源由于外部原因产生过压、欠压、缺相、错相时，控制系统将主电路切断，有效保护设备和人员的安全。

The equipment adopt phase sequence protector to monitor the quality of power supply in

real time. The control system will cut off the main circuit to protect effectively the safety of equipment and personnel when power supply cause the over voltage, under voltage, phase lack and phase dislocation due to external reasons.

（4）起升限位保护 Lifting limit protection

起升机构设有上下极限断火限位开关，极限限位开关可保证吊钩上升和下降到极限位置时，能够自动切断起升机构电源；还可以设置供用户选择的重锤限位开关，上升机极限双重保护。

The lifting mechanism is equipped with fire stopper for the upper and lower limit, limit switch to ensure that they can automatically cut off the power of lifting mechanism when the hook rises or falls to the limit position.

The counter weight limit switch is also provided for the user to choice, the limit of lifting mechanism is equipped with double protection.

（5）起升超载保护 Lifting overload protection

起升机构设有超载保护及报警，超载限制器在载荷达到额定起重量的90%的时候，发出提示性报警信号，当载荷达到额定起重量的110%时，立即切断起升动力电源并发出禁止性报警信号；超载限制器的传感器具有防潮抗震等特点。

Lifting mechanism is equipped with overload protective device and alarm, the overload limiter will send suggestive alarm signal when the load reach 90% of rated capacity. When the load reach 110% of rated capacity, it will cut off the power of lifting mechanism at once and send the prohibitive alarm signal. The sensor of overload limiter has the damp proof and anti-seismic function.

（6）大车行程限位保护 Limit protection for crane travel

起重机的大车运行机构设计极限限位开关保护，限位开关可保证平移机构到极限位置时，能够自动切断运行机构电源；当几台起重机在同一轨道上运行时，还可以增加光电防撞开关，防止同一轨道上的两台起重机相撞，更加可靠安全。

Crane traveling mechanism is equipped with limit switch to ensure that it can automatically cut off the power of travel mechanism when mechanism is horizontal moved to limit position. When several cranes are running on the same track, the photoelectric anti-collision switch is also provided to prevent the collision of two cranes on the same track, which is more reliable and safe.

（7）紧急断电保护 Emergency power-off protection

起重机的控制回路中设有紧急开关，当遇有事故状态时，可随时切断控制回路电源，进而使主回路断电，确保起重机的安全运行。

Control circuit of crane is equipped with emergency switch. It can cut off the power of

control circuit at any time to make the main circuit power off, ensure the safe operation of crane when the accident happened.

(8) 失压保护 Voltage loss protection

起重机的控制回路中设有失压保护,当突然断电或电源电压过低时,总接触器自锁断开,电源恢复后必须重新启动后才可以操作起重机。

The control circuit of crane is equipped with voltage loss protective device. When the power is suddenly failure or the voltage is too low, main contactor will lock automatically and break, the crane must be restarted after the power is restored.

(9) 司机室零位联锁保护（司机室凸轮控制器及主令控制时有）

Zero interlock protection in the cab (when there's cab cam controller and master control)

空操起重机具备零位保护,零位保护功能杜绝了起重机在断电后恢复供电时电动机自动运转情况的发生,防止出现意外事故;控制器回零位后方可启动起重机电源。

The crane operated by cab has zero protective device. The zero protective device eliminate the motor running automatically when the power is failure, which can prevent accidents. The power supply of crane is restored after the controller set to zero position.

(10) 司机室安全门开关保护 Switch protection of safety door of the cab

门开关保护联锁避免了因为起重机上安全门没有关闭而大车突然运行导致人员或物件从门口摔倒、坠落情况的发生。

The switch interlock device of door avoid the personnel or goods dropping from the door because safety door is not closed and crane is operated suddenly.

(11) 接地保护 Ground protection

起重机上金属机构及所有电气设备金属外壳、管槽,变压器低压侧均设有可靠接地,总接地电阻 $\leq 4\Omega$,起重机常温对地绝缘电阻不小于 $1M\Omega$ 。

There are reliable grounding device on the metal structures of crane, metal enclosures of all electrical equipments, pipe chases and low-voltage side of transformer. The total grounding resistance is not more than 4Ω , insulation resistance to ground at normal temperature is not less than $1M\Omega$.

7、单梁起重机常用电气图纸如下: Electrical schematics used commonly are as follows.

(1) 地操控制型DK1电气原理图纸见附图1-1,通用于LD、LDY、LDZ、LX、LDP大车地操控制方式;

Electrical schematics of ground control type DK1 see attached drawing 1-1, generally apply to LD, LDY, LDZ, LX, LDP type crane.

(2) 地操控制型DK2电气原理图纸见附图1-2,通用于LD、LDY、LDZ、LX、LDP大车地操控制方

式；

Electrical schematics of ground control type DK2 see attached drawing 1-2, generally apply to LD, LDY, LDZ, LX, LDP type crane.

(3) 地操加遥控控制型DK1电气原理图纸见附图1-3, 通用于LD、LDY、LDZ、LX、LDP大车地操加遥控控制方式；

Electrical schematics of ground control and remote control type DK1 see attached drawing 1-3, generally apply to LD, LDY, LDZ, LX, LDP type crane.

(4) 地操加遥控控制型DK2电气原理图纸见附图1-4, 通用于LD、LDY、LDZ、LX、LDP大车地操加遥控控制方式；

Electrical schematics of ground control and remote control type DK2 see attached drawing 1-4, generally apply to LD, LDY, LDZ, LX, LDP type crane.

(5) 地操控制CD₁型配车葫芦电气原理图纸见附图2-1, 通用于配LD、LDY、LX型行车地操控制方式；

Electrical schematics of ground control CD₁ type electric hoist see attached drawing 2-1, generally apply to match with LD, LDY, LX type crane.

(6) 地操控制MD₁型配车葫芦电气原理图纸见附图2-2, 通用于配LD、LDY、LX型行车地操控制方式；

Electrical schematics of ground control MD₁ type electric hoist see attached drawing 2-2, generally match with LD, LDY, LX type crane.

(7) 地操加遥控控制CD₁型配车葫芦电气原理图纸见附图2-3和附图3-1, 通用于配LD、LDY、LX型行车地操加遥控控制方式；

Electrical schematics of ground control and remote control CD₁ type electric hoist see attached drawing 2-3 and drawing 3-1, generally match with LD, LDY, LX type crane.

(8) 地操加遥控控制MD₁型配车葫芦电气原理图纸见附图2-3和附图3-2, 通用于配LD、LDY、LX型行车地操加遥控控制方式；

Electrical schematics of ground control and remote control MD₁ type electric hoist see attached drawing 2-3 and drawing 3-2, generally match with LD, LDY, LX type crane.

(9) 地操控制抓斗配车型葫芦电气原理图纸见附图2-8, 通用于配LDZ型行车地操控制方式；

Electrical schematics of electric hoist for ground control type crane with grab see attached drawing 2-8, generally match with LDZ type crane.

(10) 地操控制CD₁型配车葫芦电气原理图纸（带小车限位控制）见附图2-9, 通用于配LDP型行车地操控制方式；

Electrical schematics of ground control CD₁ type electric hoist (with trolley limit control)

see attached drawing 2-9, generally match with LDP type crane.

(11) 地操控制MD₁型配车葫芦电气原理图纸（带小车限位控制）见附图2-10，通用于配LDP型行车地操控制方式；

Electrical schematics of ground control MD₁ type electric hoist (with trolley limit control) see attached drawing 2-10, generally match with LDP type crane.

(12) 司机室控制LD型行车配置CD₁型电动葫芦电气原理图纸见附图1-5和附图2-5；

Electrical schematics of CD₁ type electric hoist for cab control LD type crane see attached drawing 1-5 and drawing 2-5.

(13) 司机室控制LD型行车配置MD₁型电动葫芦电气原理图纸见附图1-6和附图2-6；

Electrical schematics of MD₁ type electric hoist for cab control LD-type crane see attached drawing 1-6 and drawing 2-6.

(14) 司机室控制LD型行车配置抓斗电动葫芦电气原理图纸见附图1-7和附图2-7；

Electrical schematics of electric hoist for cab control LD-type crane with cab see attached drawing 1-7 and drawing 2-7.

(15) 地操控制配单速D II BT4防爆葫芦型起重机电气原理图纸见附图4-1和附图4-2，通用于LB、LXB型行车地操控制方式；

Electrical schematics of ground control crane with single-speed D II BT4 explosion-proof electric hoist see attached drawing 4-1 and drawing 4-2, generally apply to LB, LXB type crane.

(16) 地操控制配单速D II CT4防爆葫芦型起重机电气原理图纸见附图4-3和附图4-4，通用于LB、LXB型行车地操控制方式；

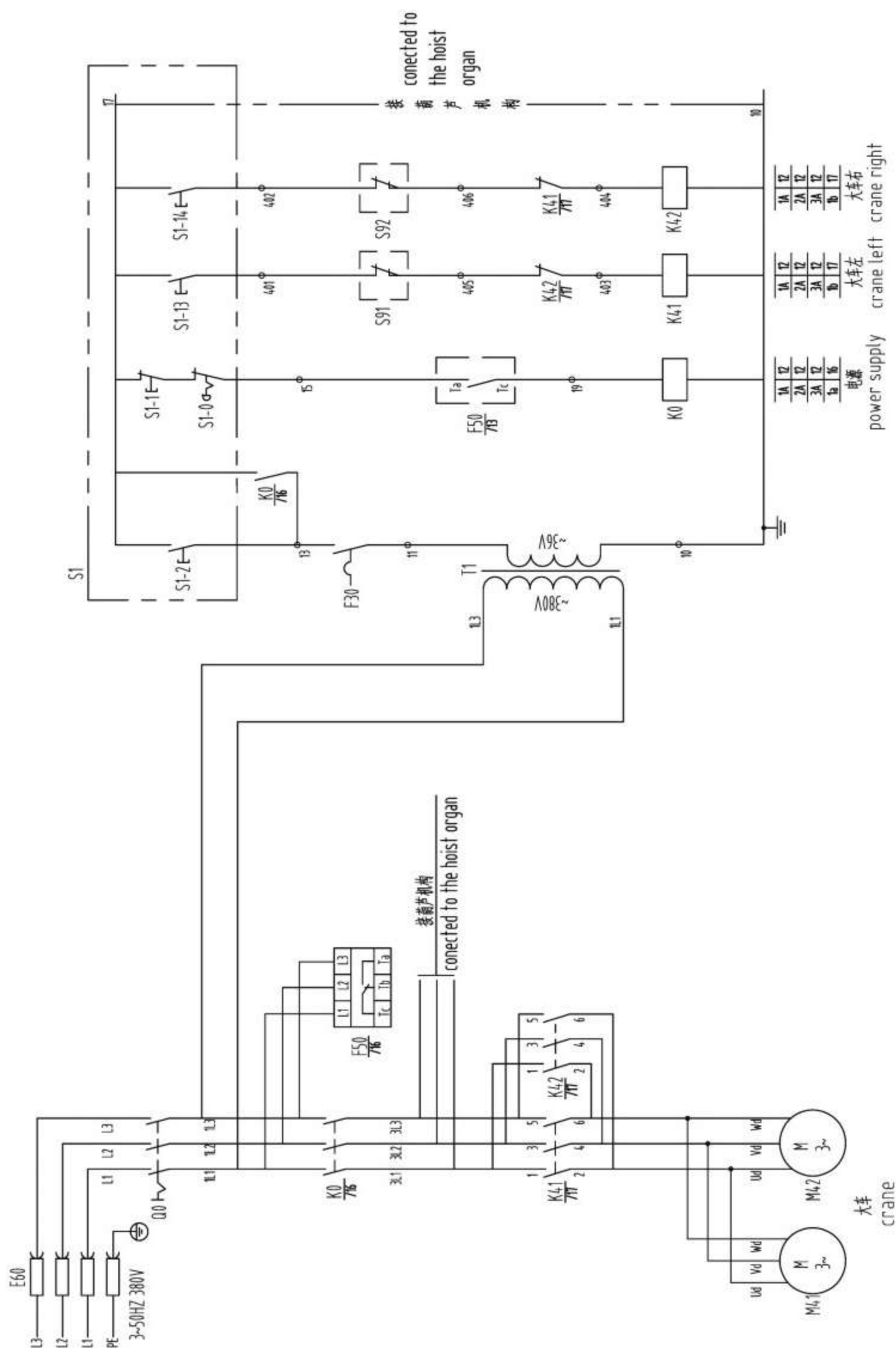
Electrical schematics of ground control crane with single-speed D II CT4 explosion-proof electric hoist see attached drawing 4-3 and drawing 4-4, generally apply to LB, LXB type crane.

(17) 地操控制配双速D II BT4和D II CT4防爆葫芦型起重机电气原理图纸见附图4-5和附图4-6；通用于LB、LXB型行车地操控制方式；

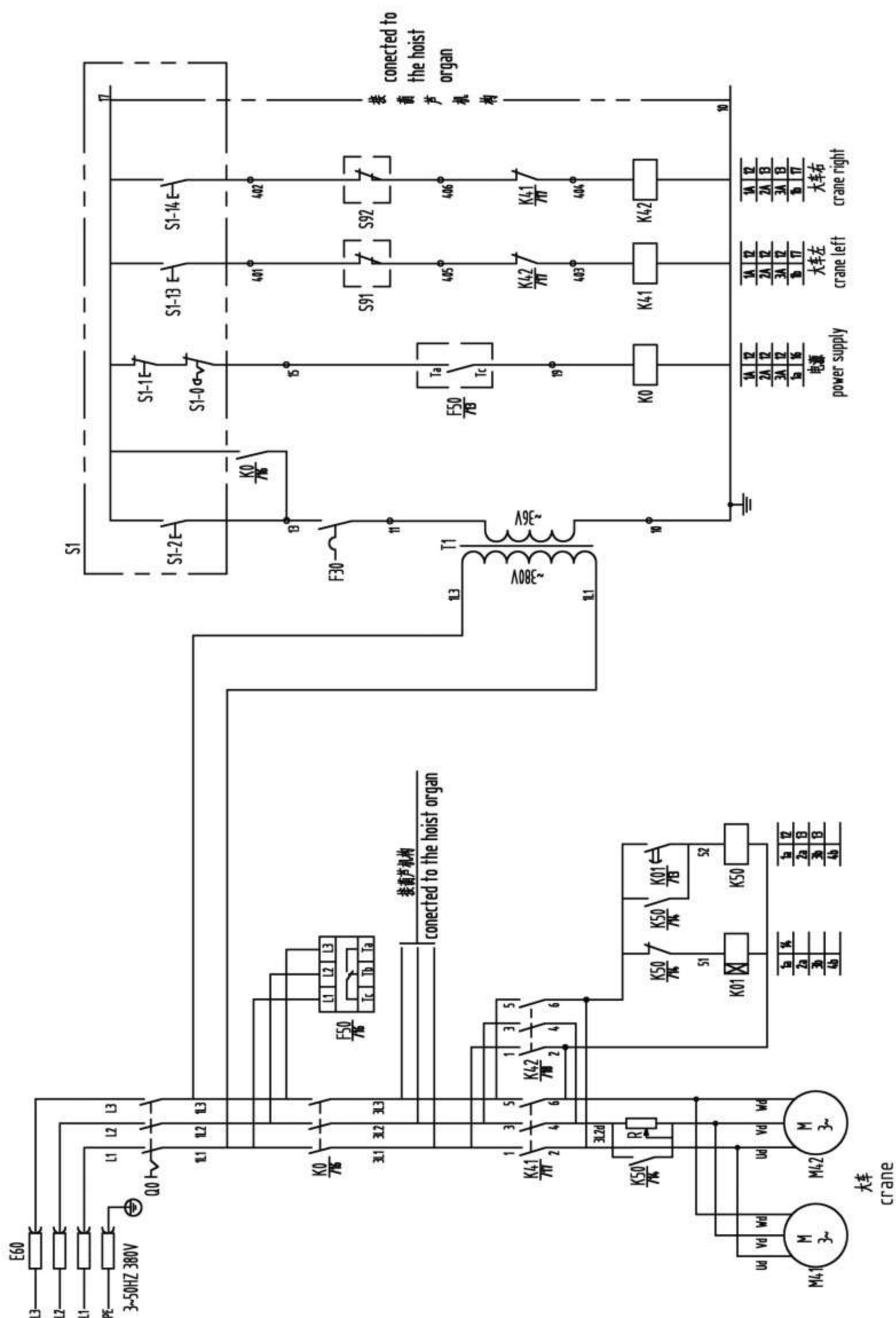
Electrical schematics of ground control crane with double-speed D II BT4 and D II CT4 explosion-proof electric hoist see attached drawing 4-5 and drawing 4-6, generally apply to LB, LXB type crane.

(18) HD型起重机、变频控制类起重机、其它非标类起重机电气原理图纸详见随机资料。

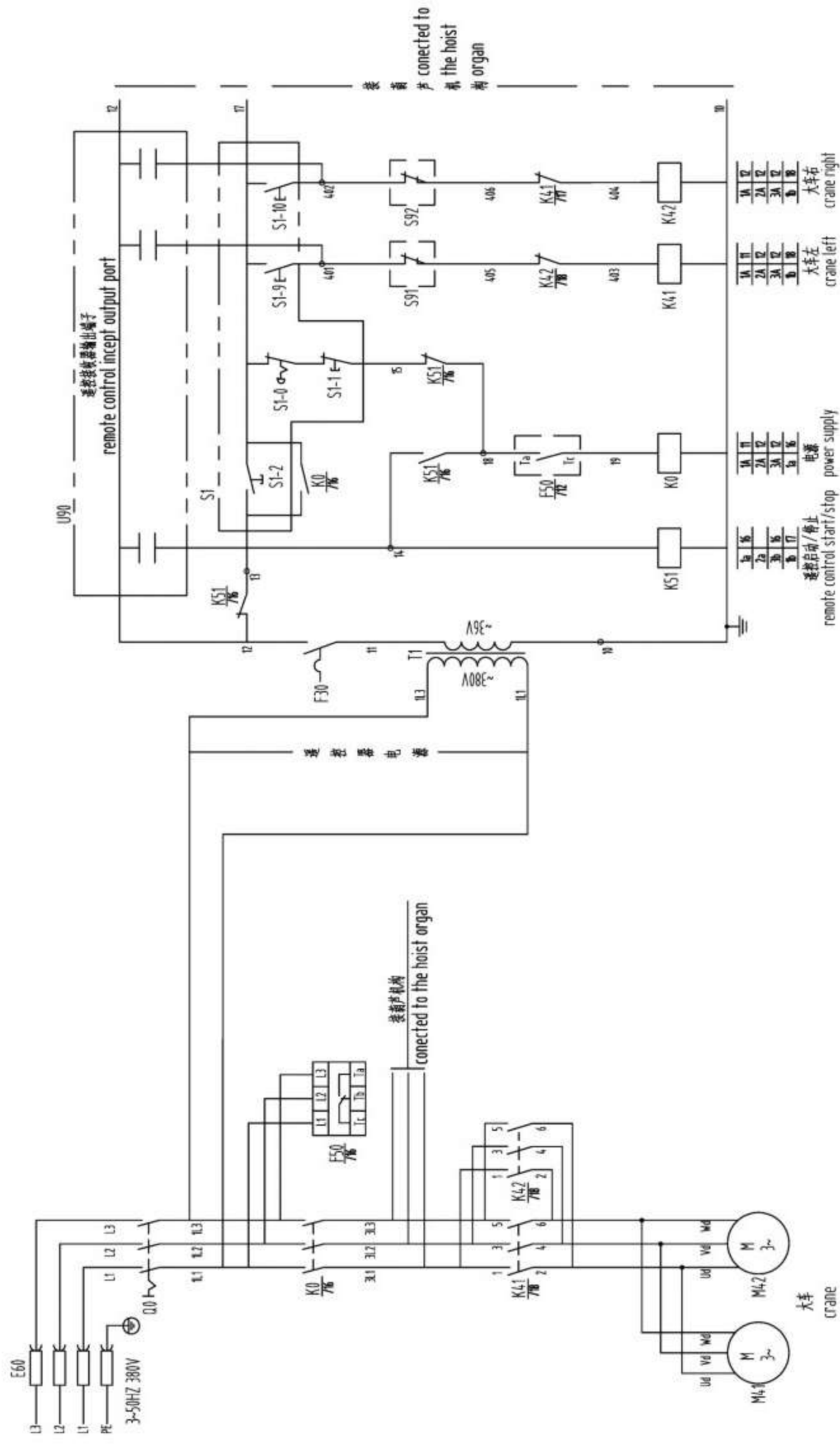
Electrical schematics of HD-type crane, frequency control type crane and other non-standard type crane see the attached documents.



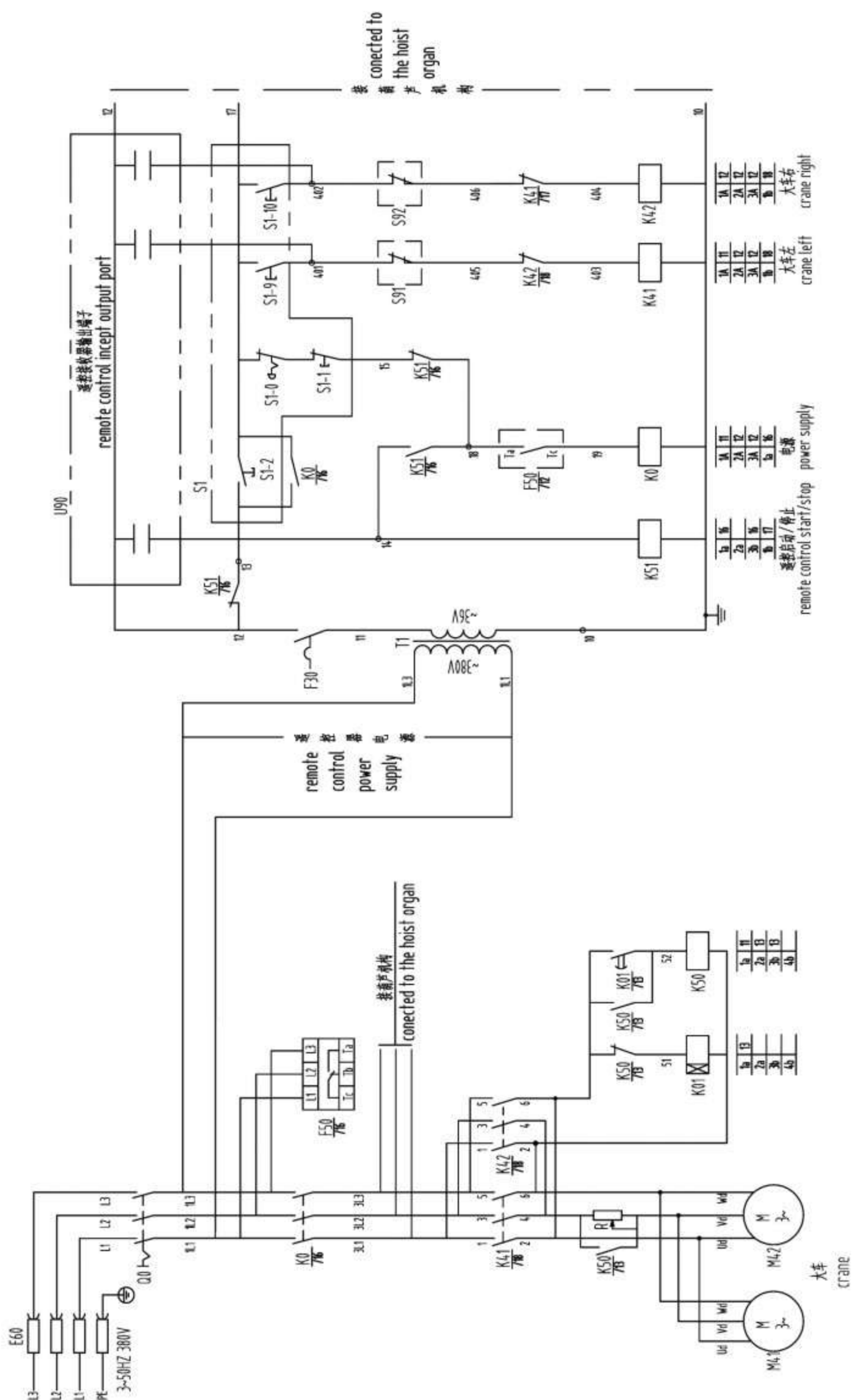
电气原理图 1-1 (Electric Principle Diagram 1-1)



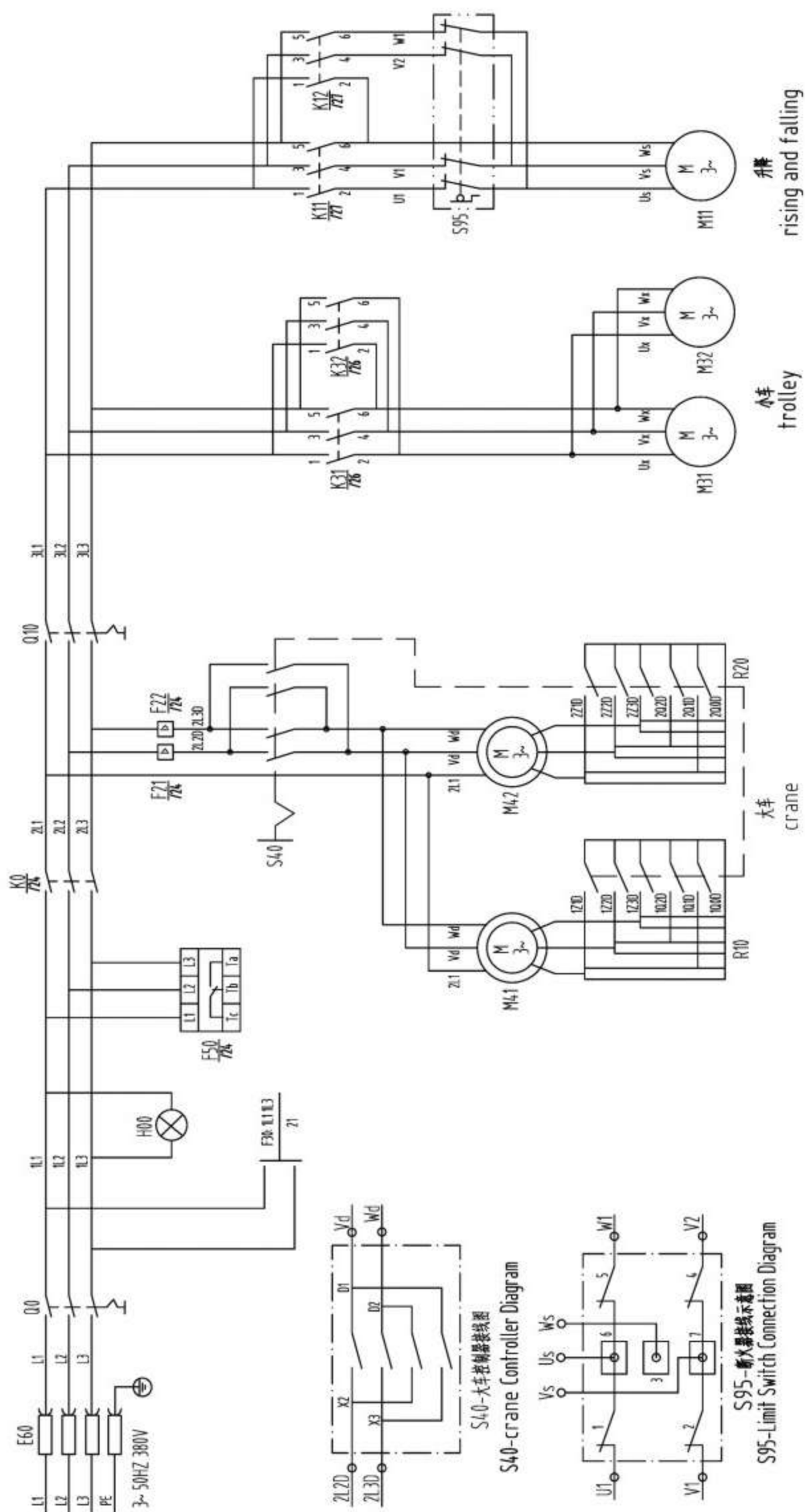
电气原理图 1-2 (Electric Principle Diagram 1-2)



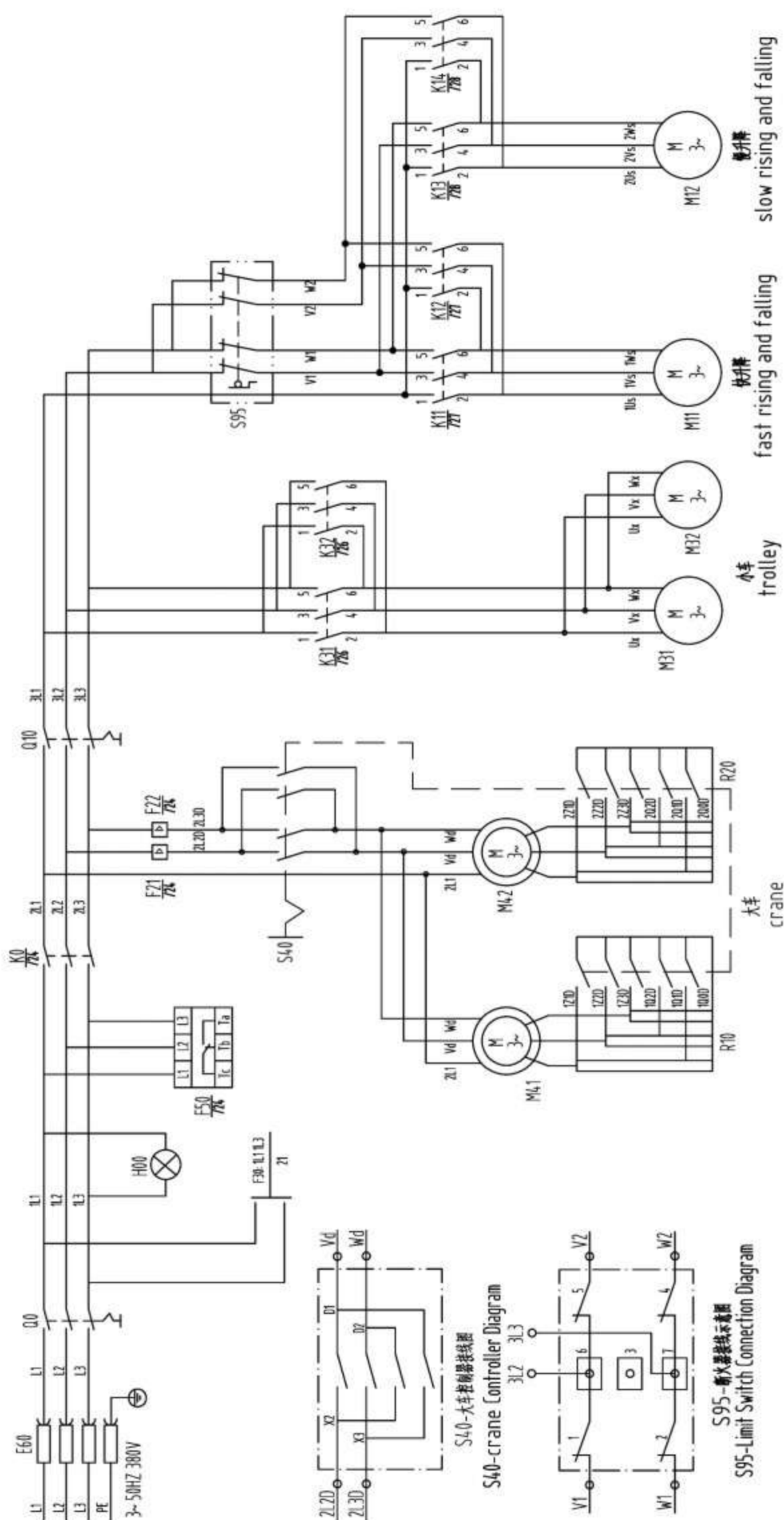
电气原理图1-3 (Electric Principle Diagram 1-3)



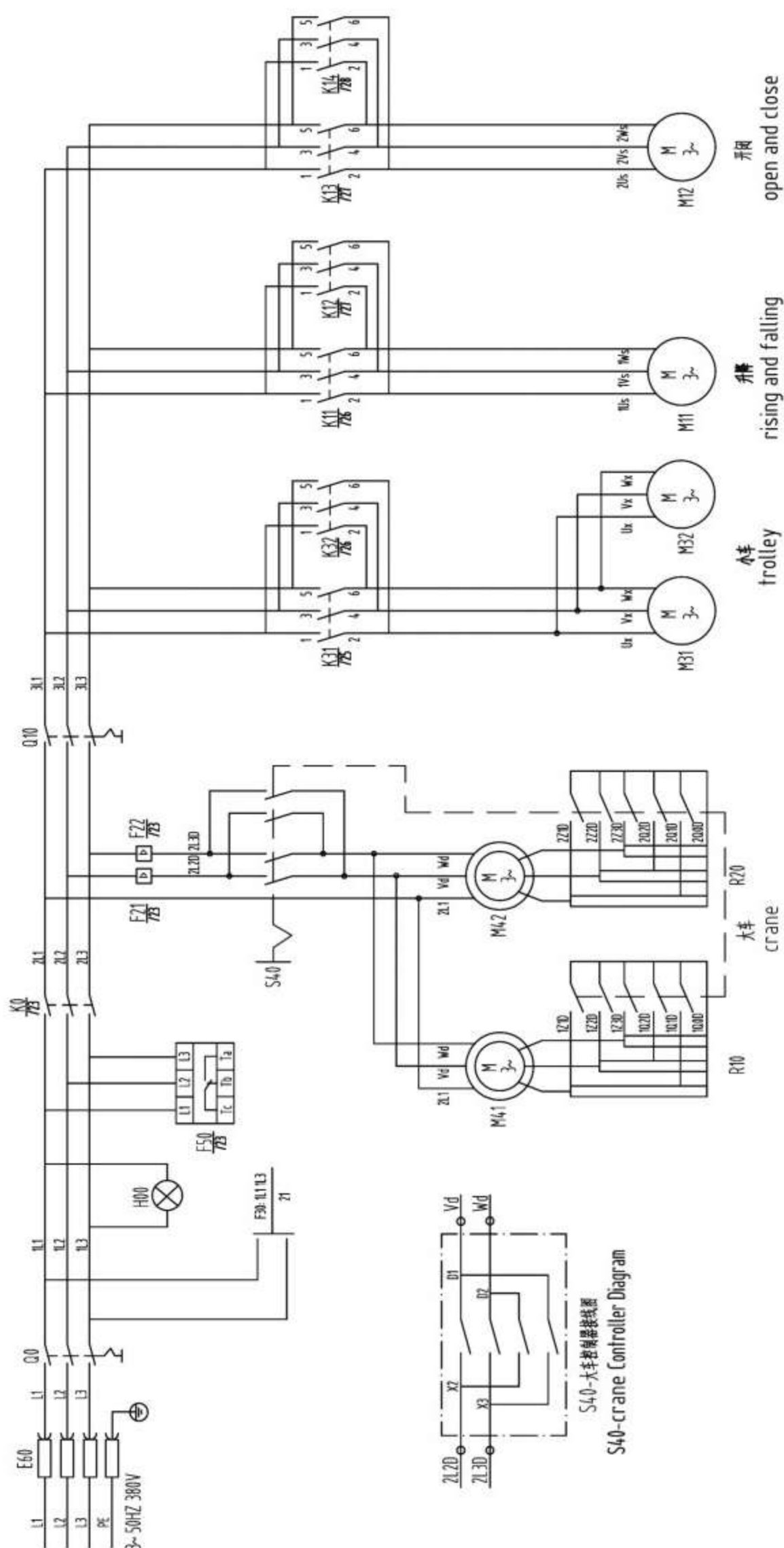
电气原理图 1-4 (Electric Principle Diagram 1-4)



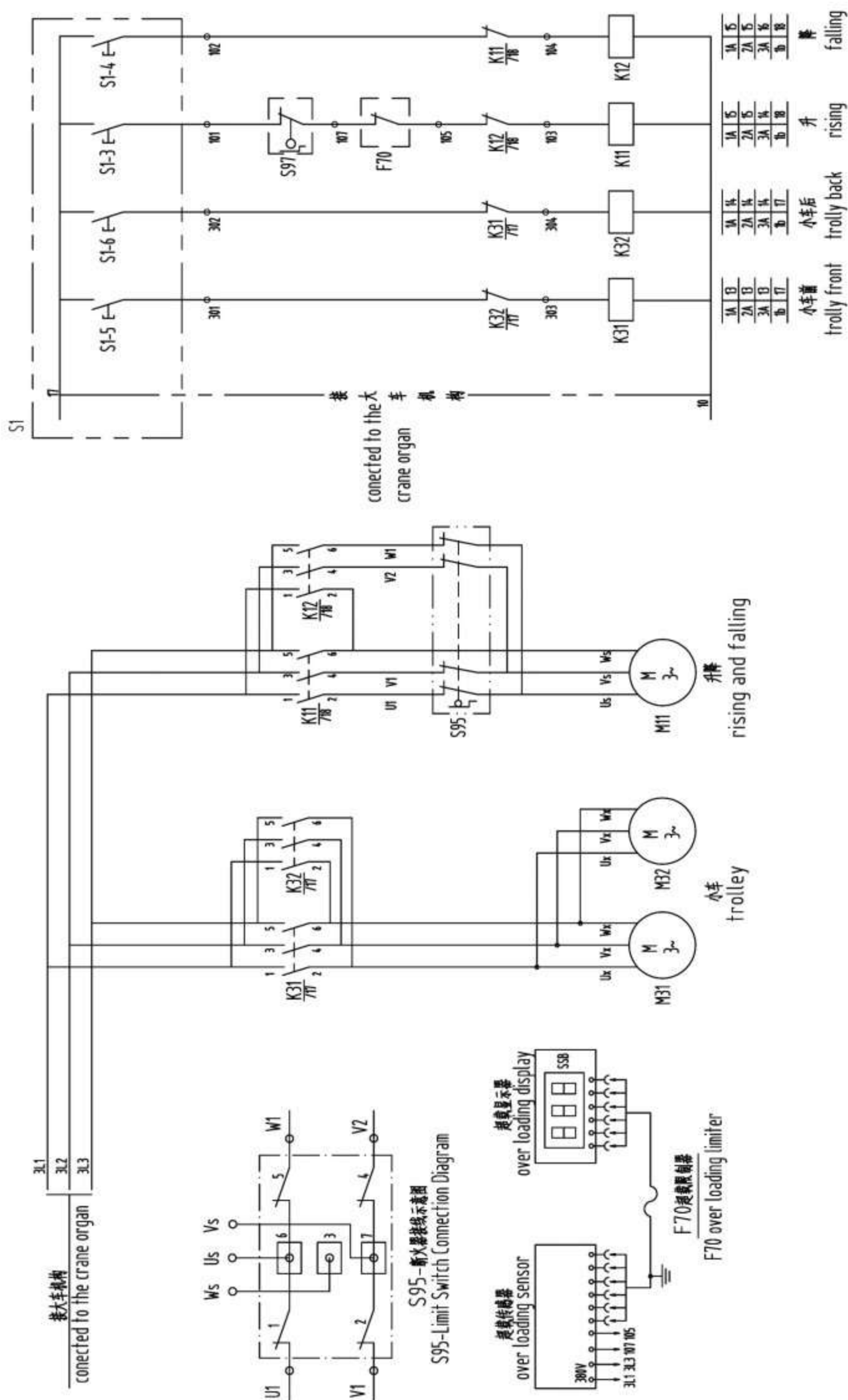
电气原理图 1-5 (Electric Principle Diagram 1-5)



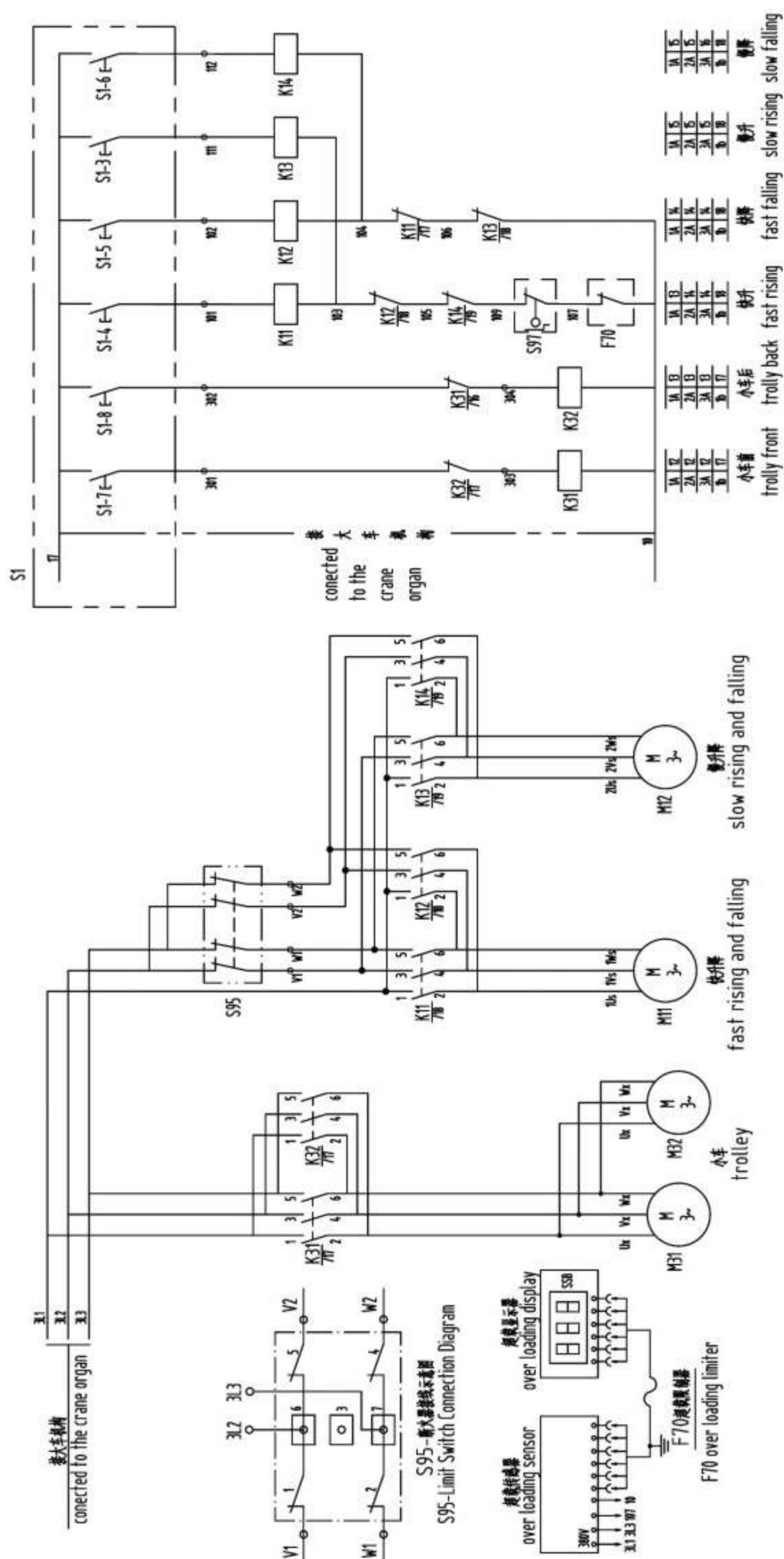
电气原理图1-6 (Electric Principle Diagram 1-6)



电气原理图1-7 (Electric Principle Diagram 1-7)



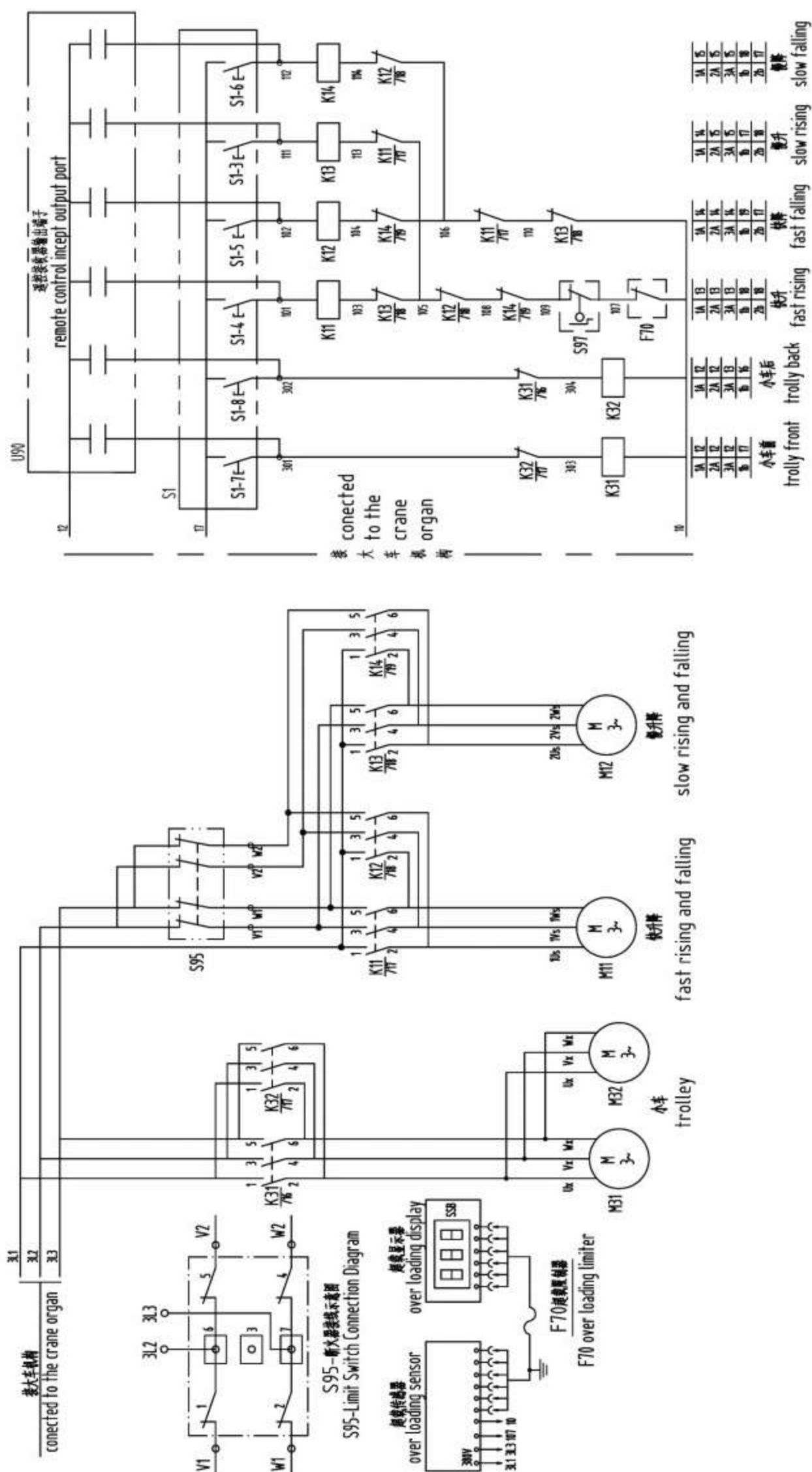
电气原理图2-1 (Electric Principle Diagram 2-1)



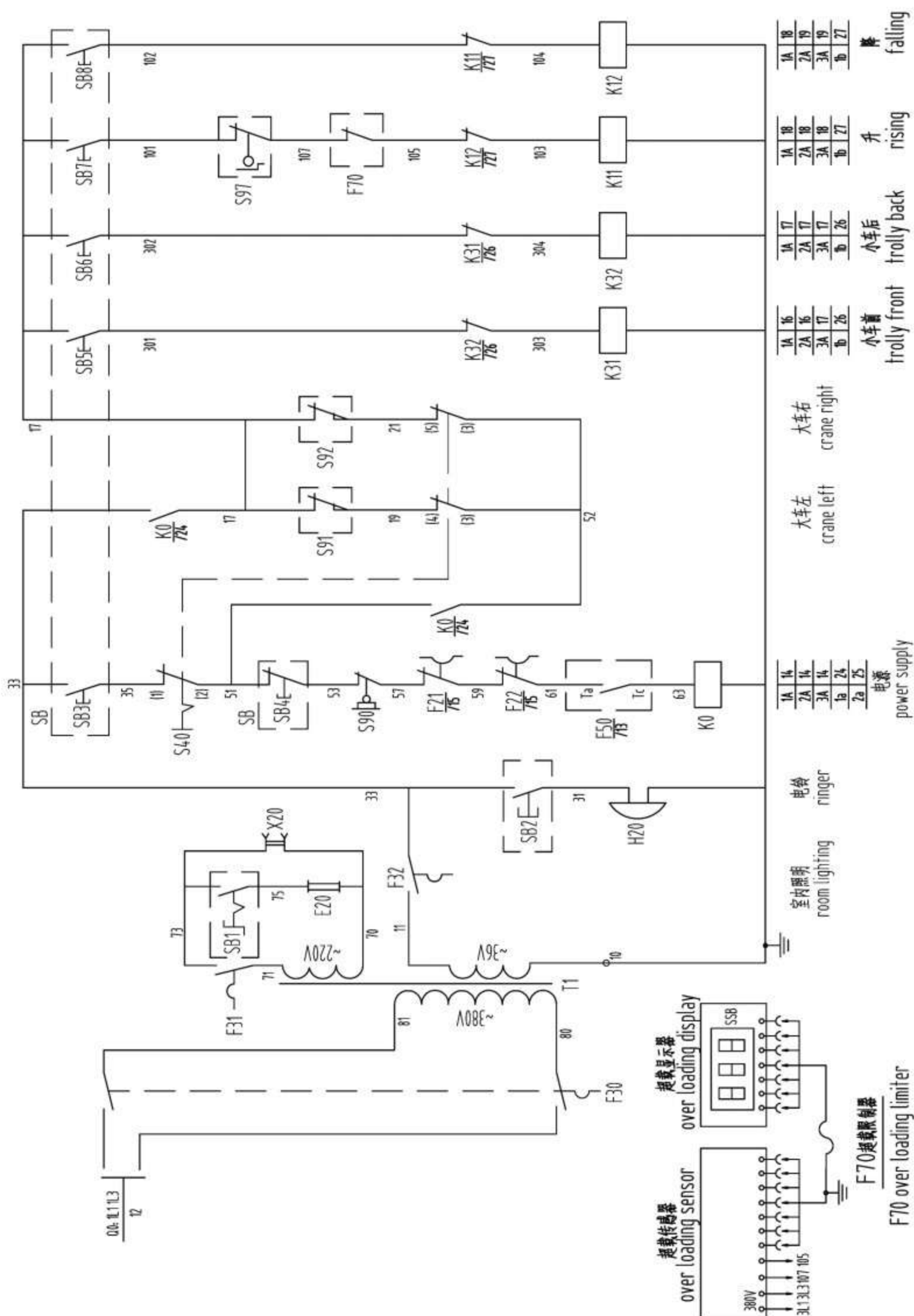
电气原理图2-2 (Electric Principle Diagram2-2)



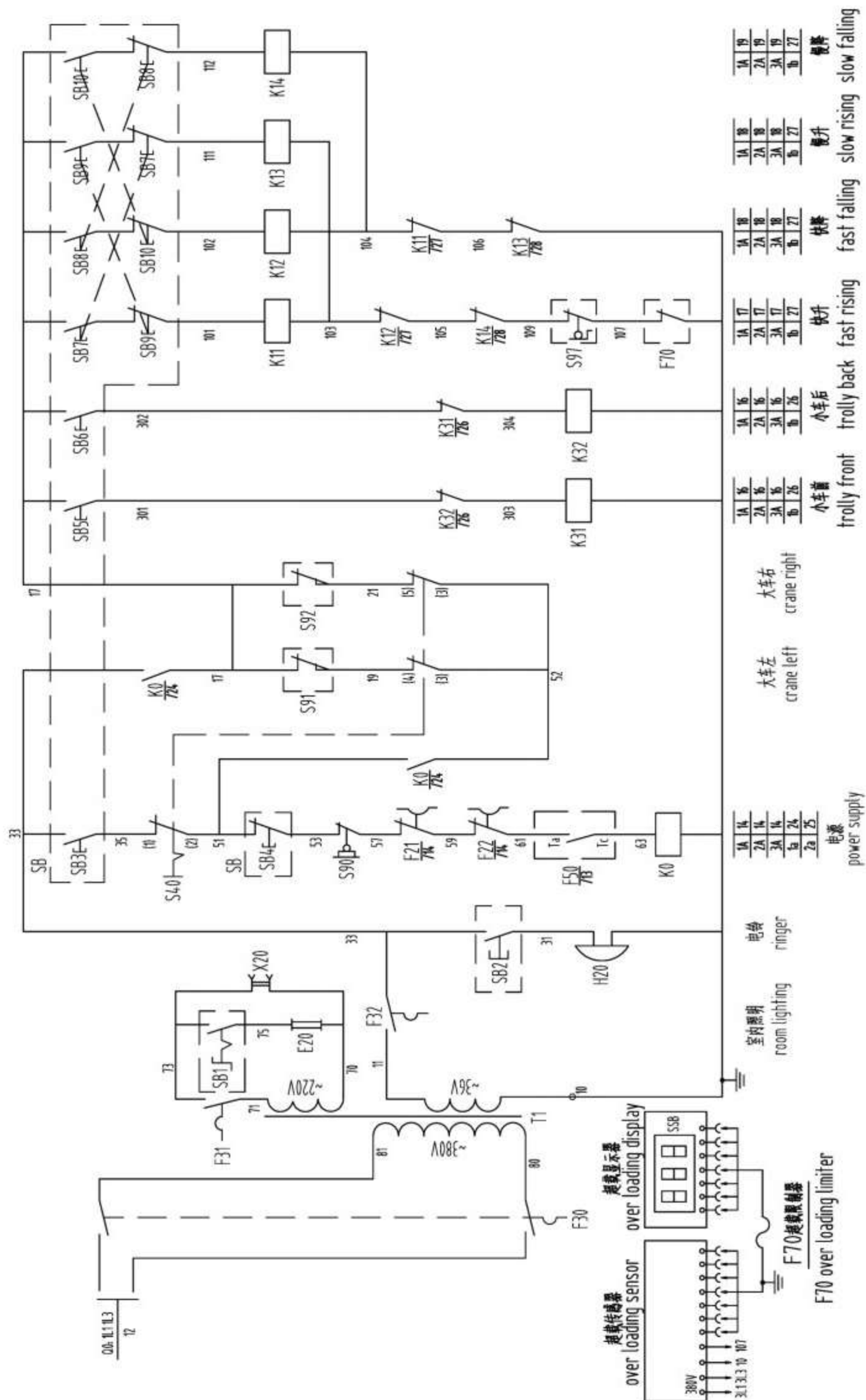
电气原理图2-3 (Electric Principle Diagram2-3)



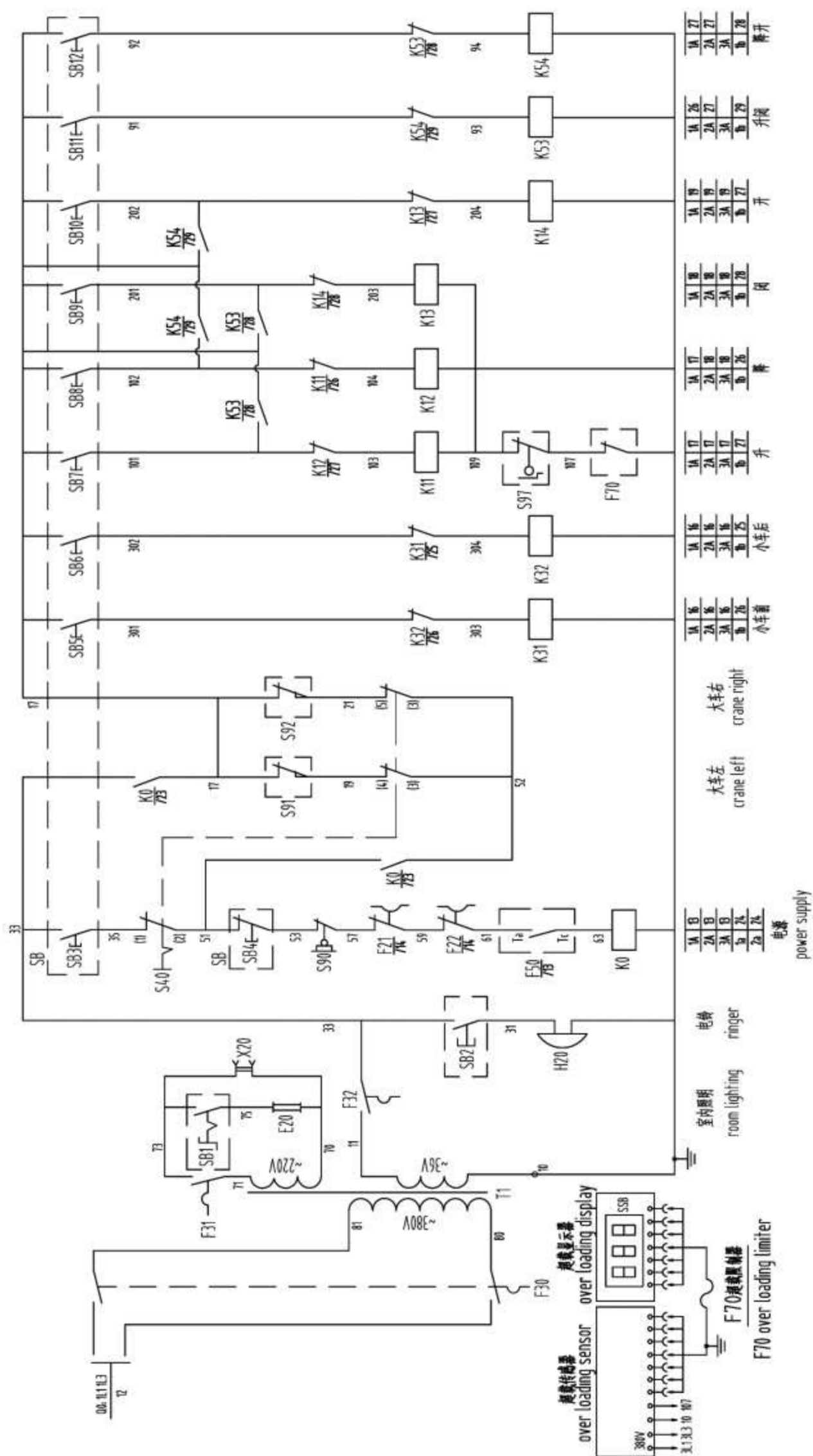
电气原理图2-4 (Electric Principle Diagram 2-4)



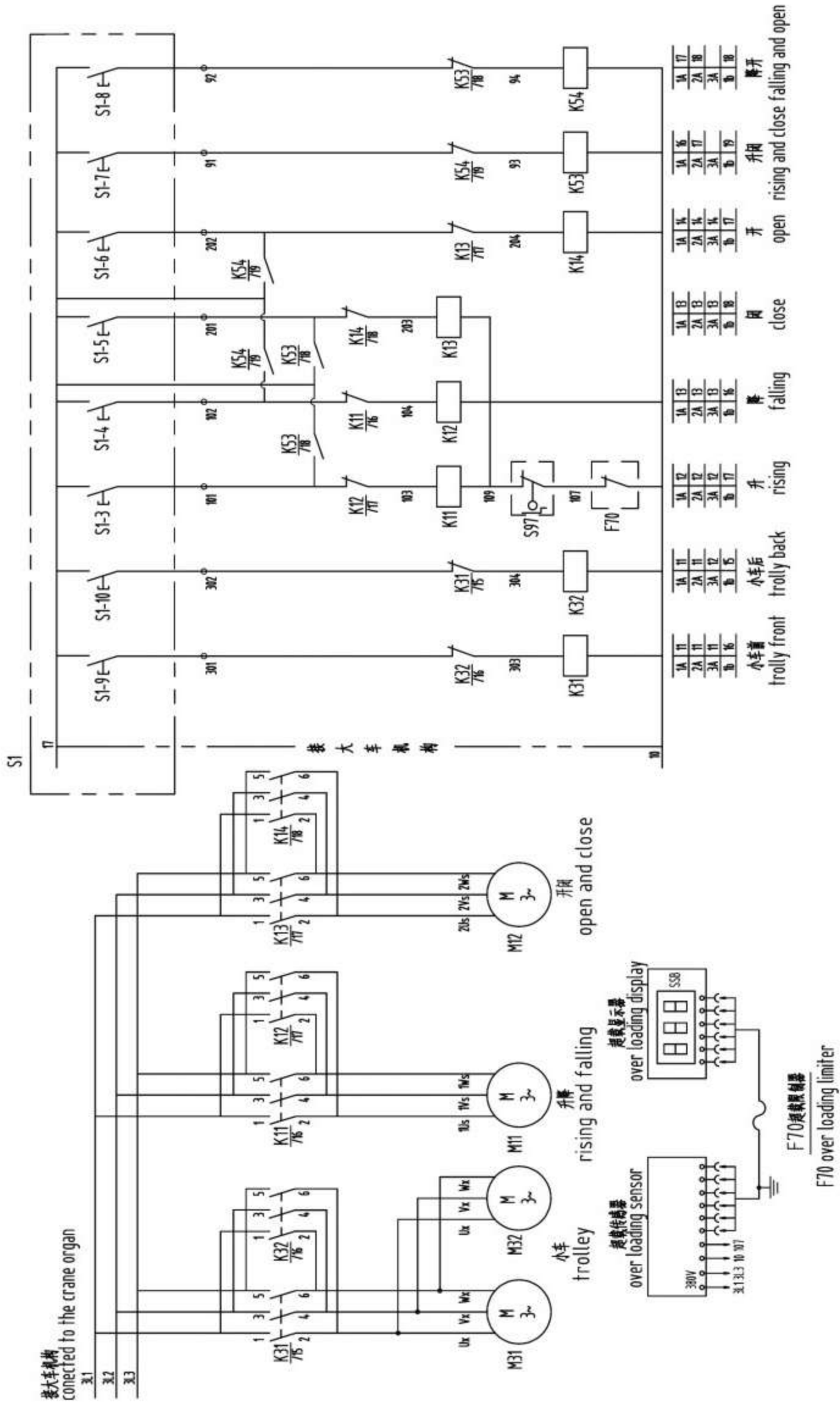
电气原理图2-5 (Electric Principle Diagram 2-5)



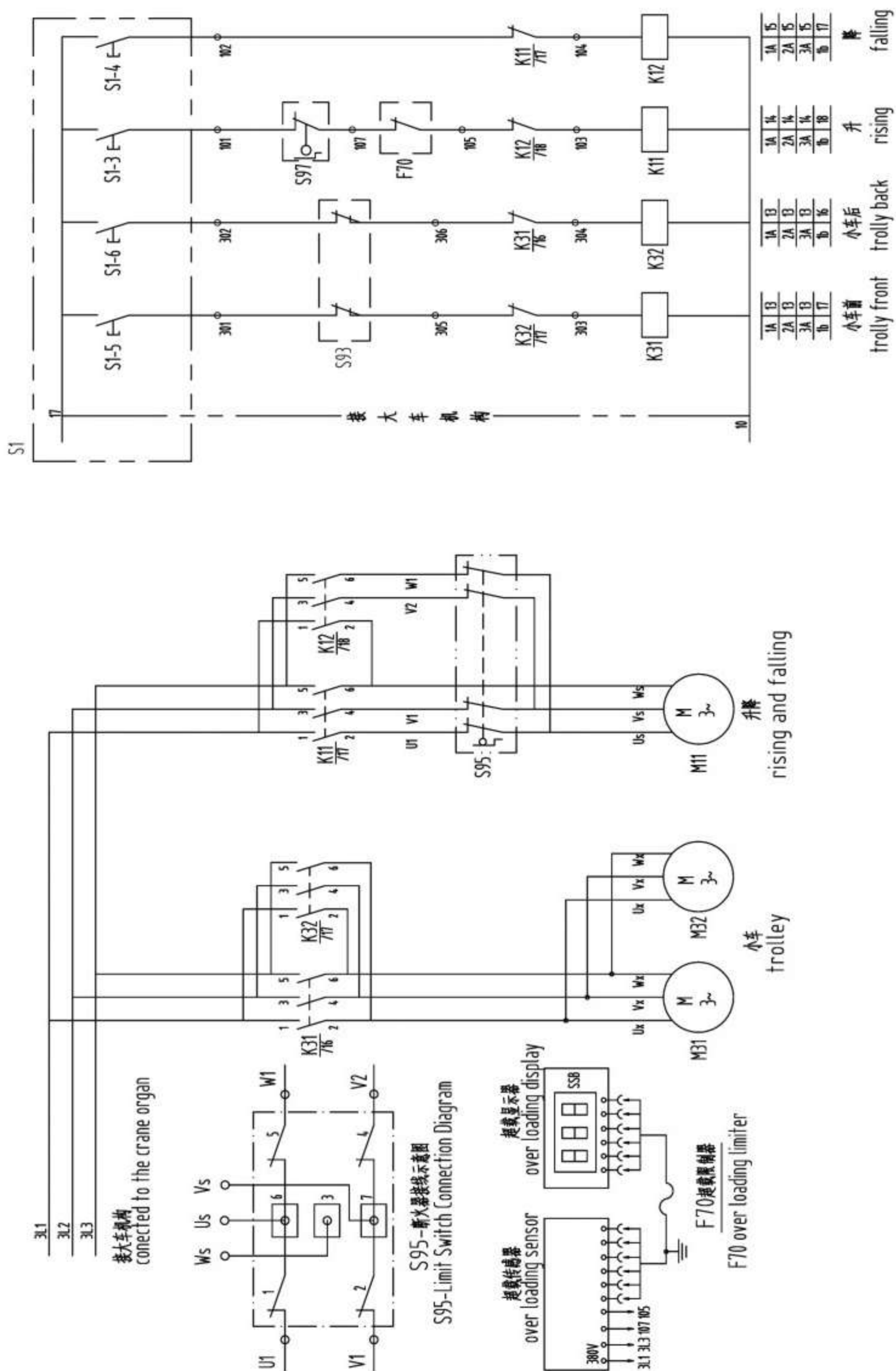
电气原理图2-6 (Electric Principle Diagram2-6)



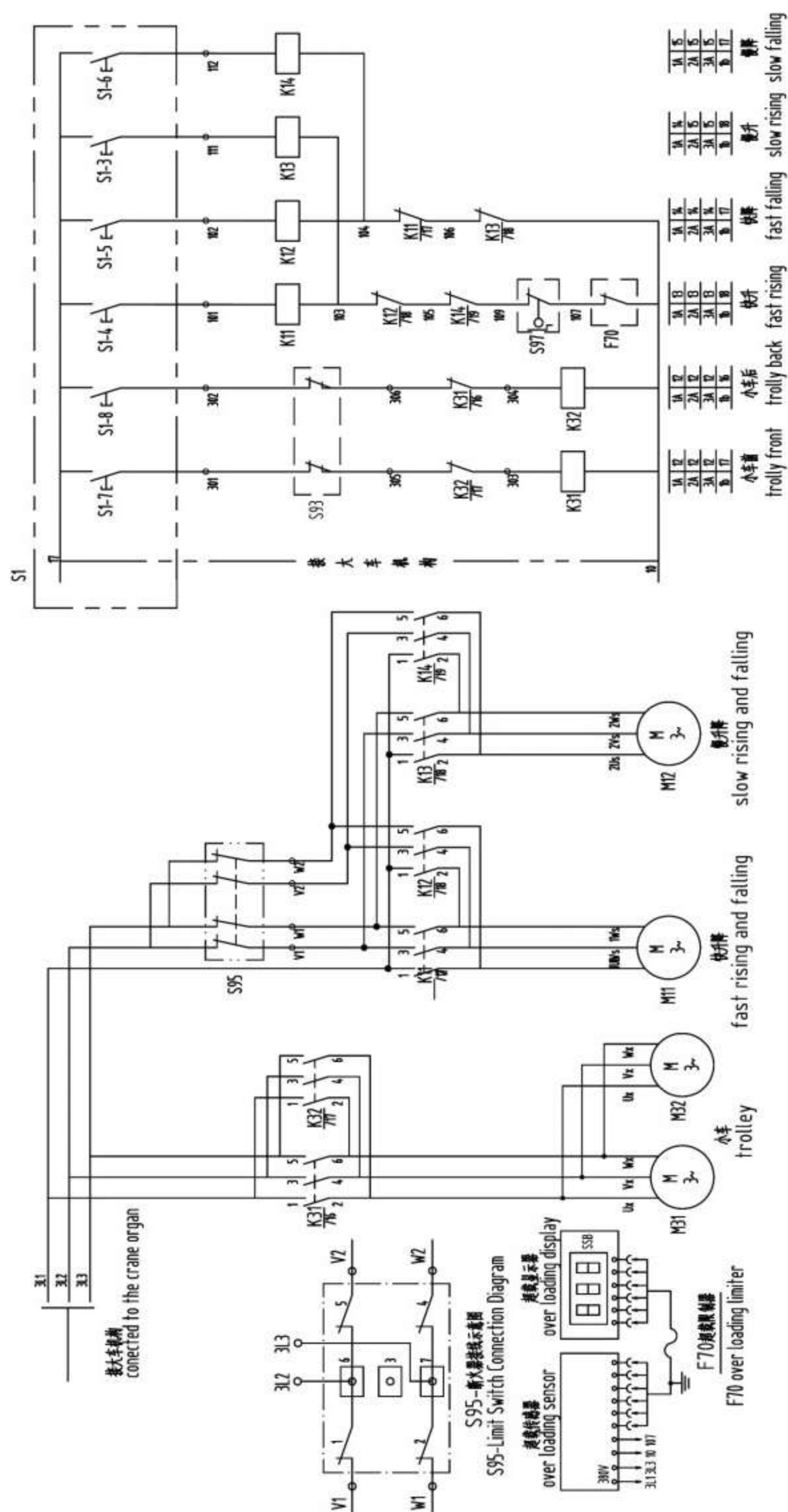
电气原理图2-7 (Electric Principle Diagram 2-7)



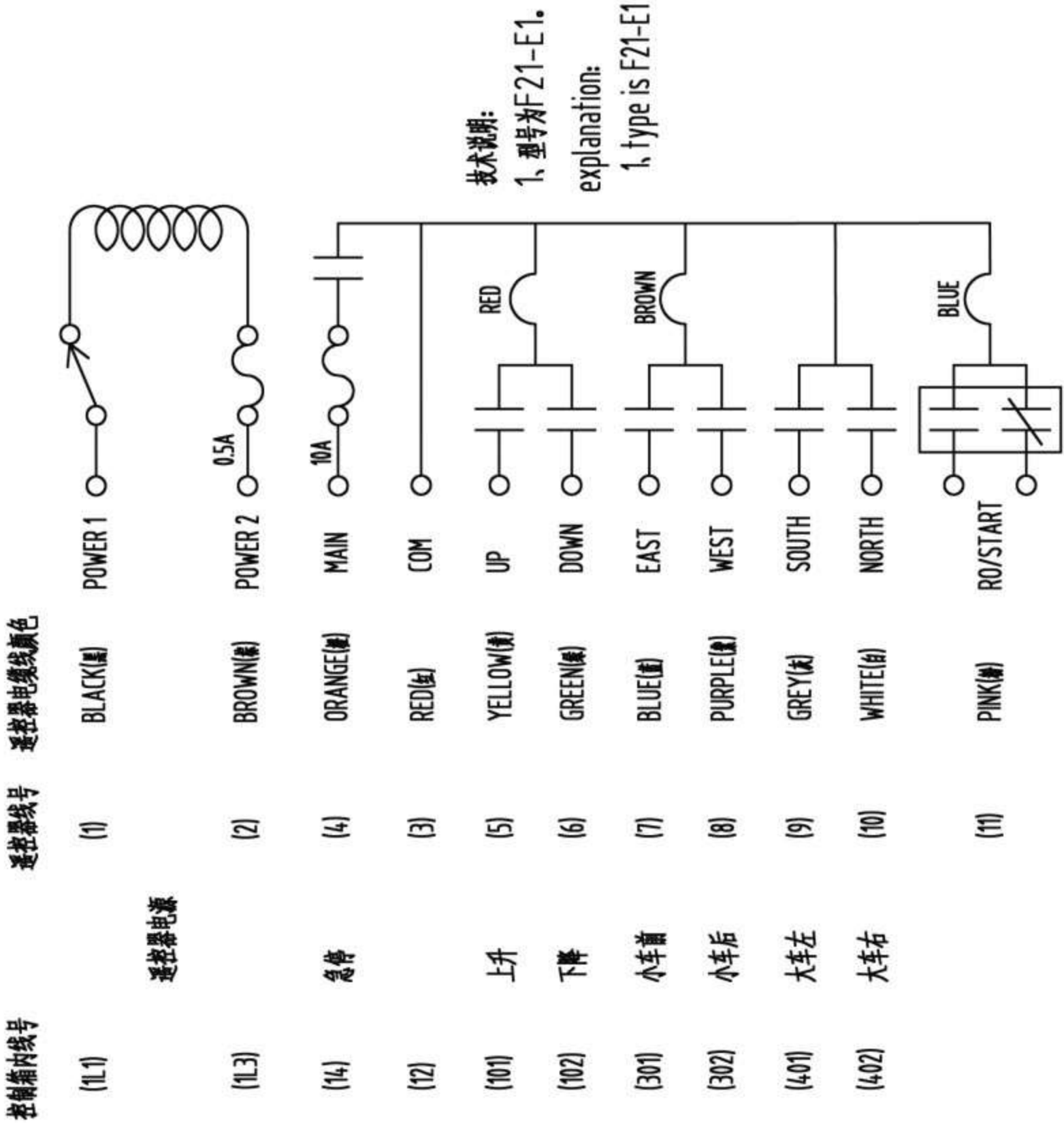
电气原理图2-8 (Electric Principle Diagram 2-8)



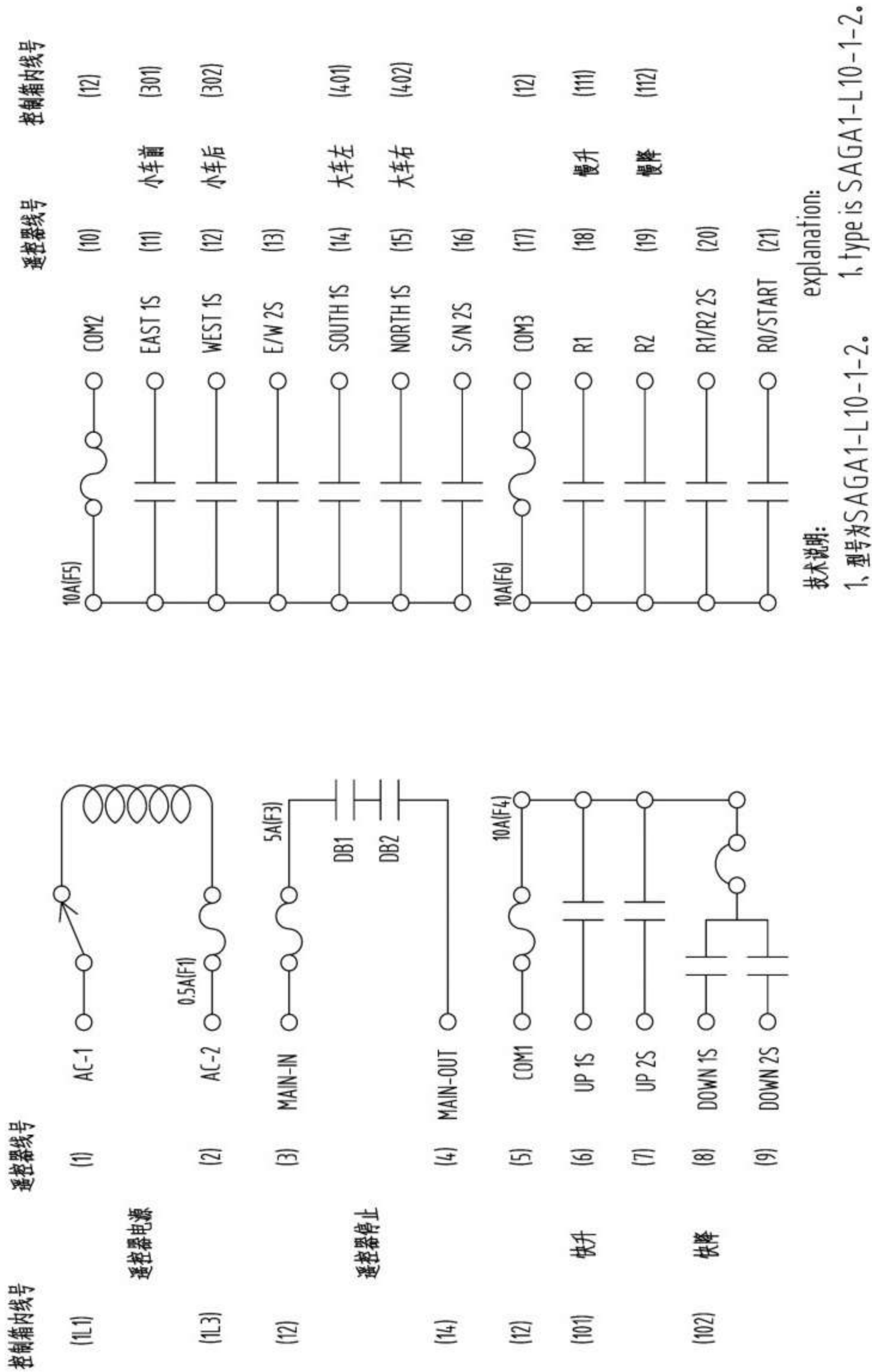
电气原理图2-9 (Electric Principle Diagram 2-9)



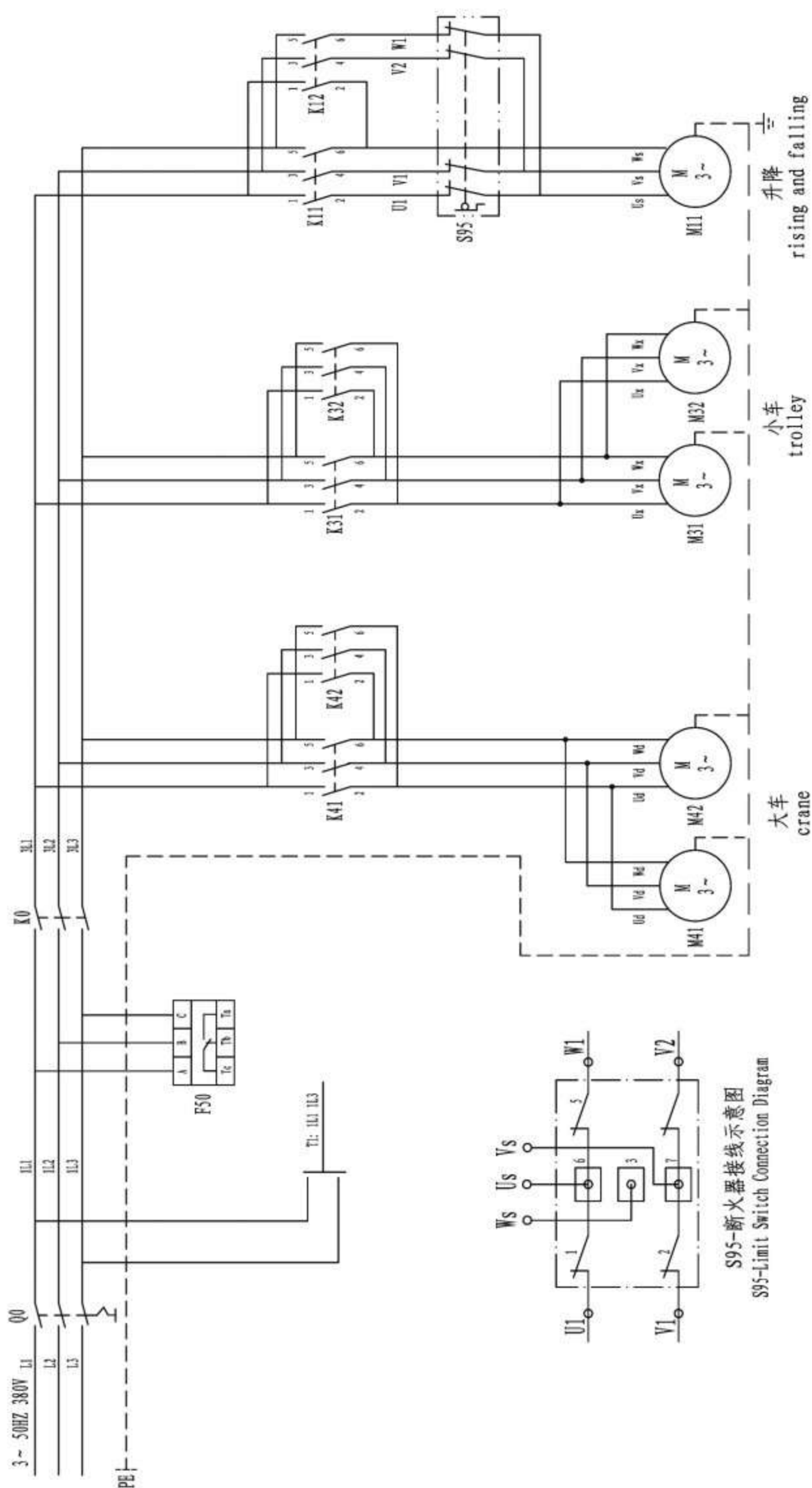
电气原理图2-10 (Electric Principle Diagram 2-10)



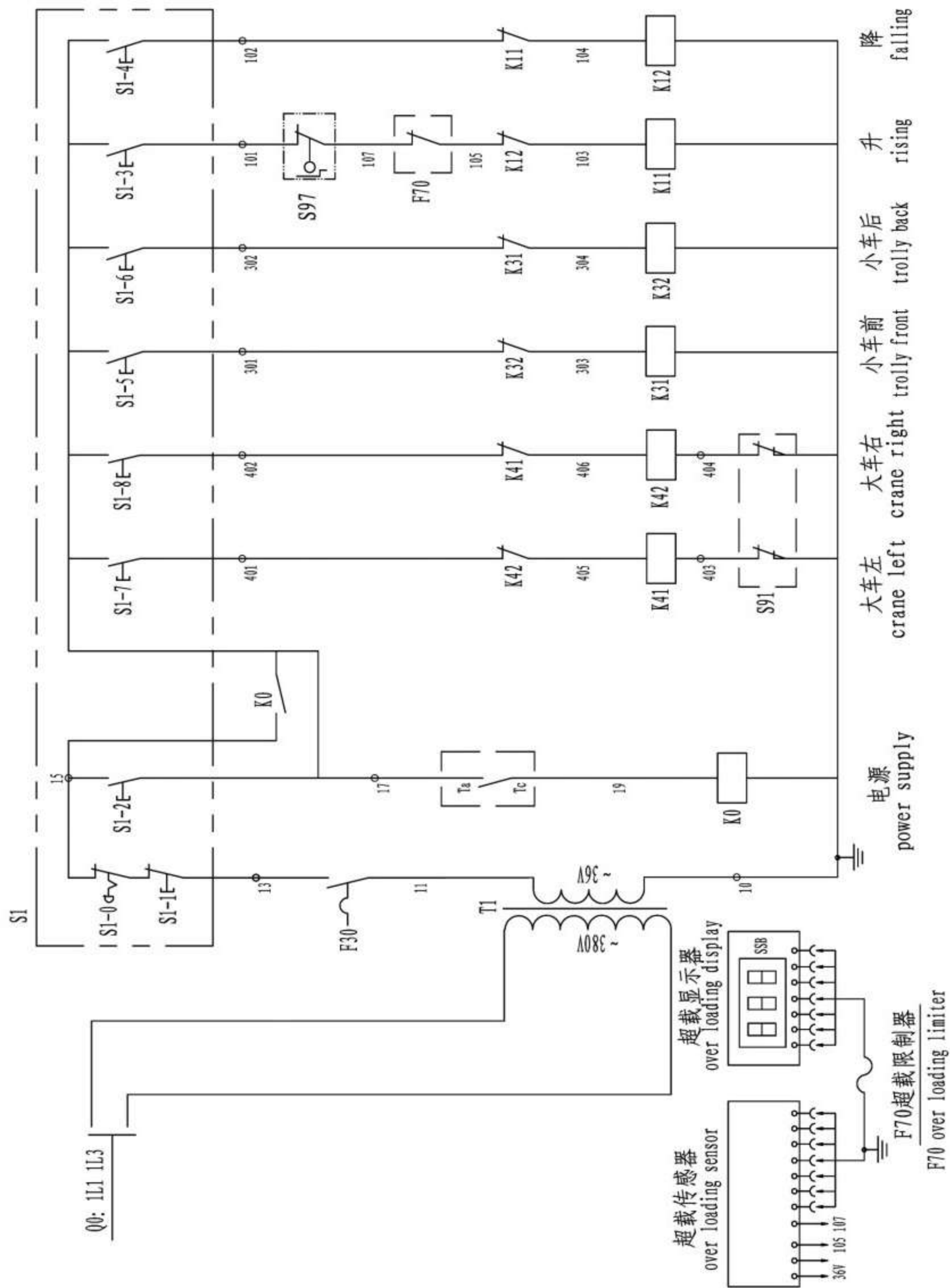
电气原理图3-1（Electric Principle Diagram3-1）



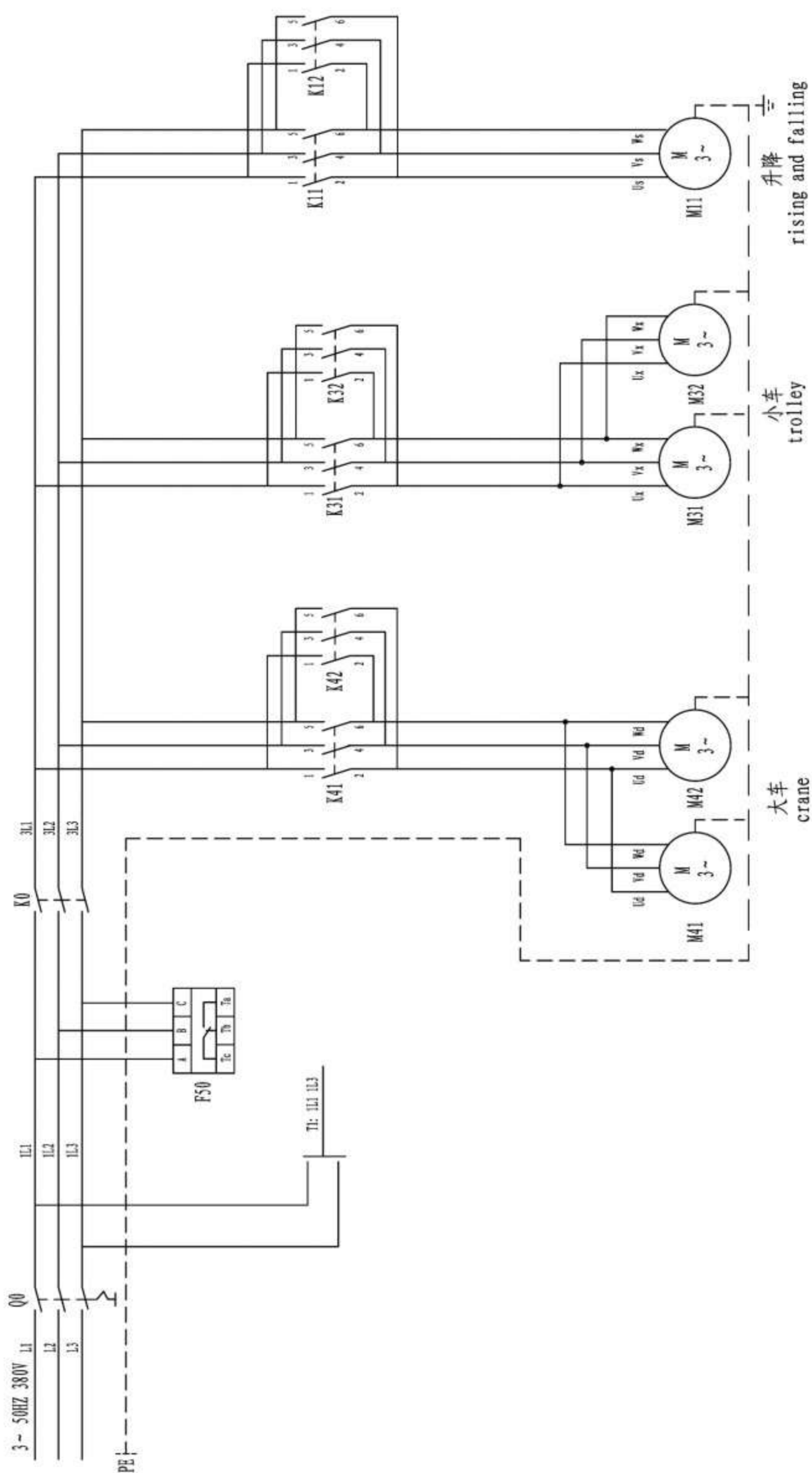
电气原理图3-2 (Electric Principle Diagram3-2)



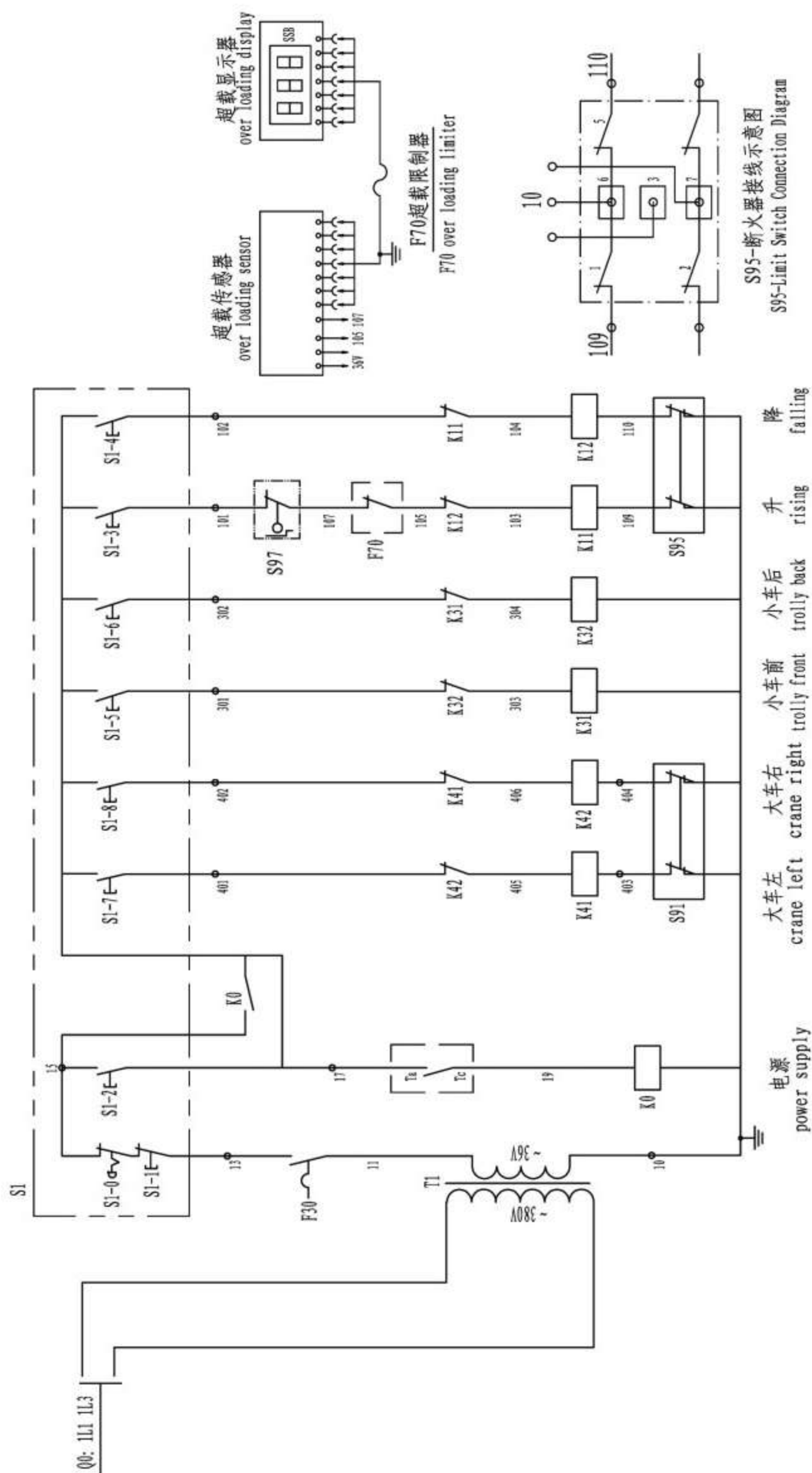
电气原理图4-1 (Electric Principle Diagram4-1)



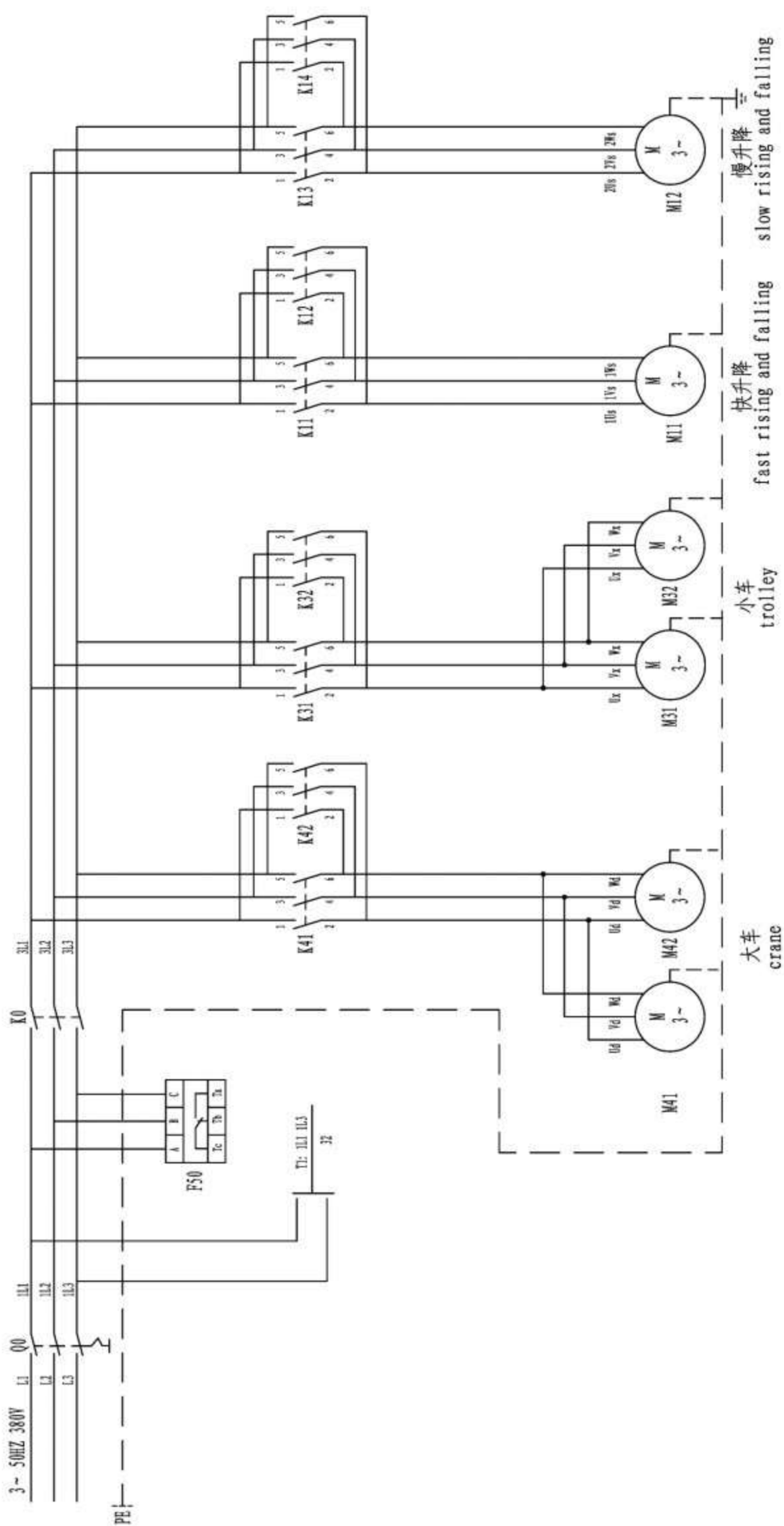
电气原理图4-2 (Electric Principle Diagram4-2)



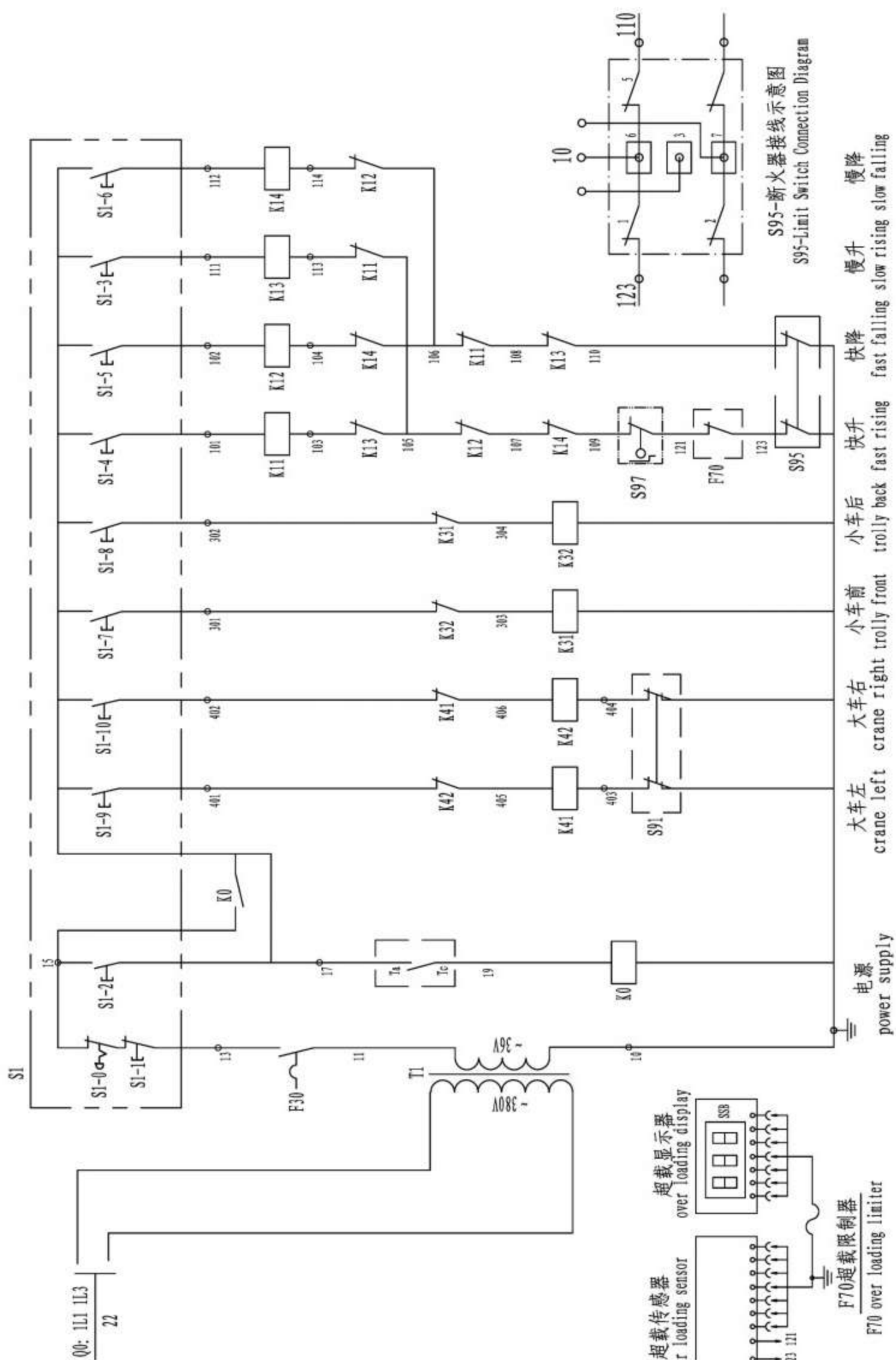
电气原理图4-3 (Electric Principle Diagram4-3)



电气原理图4-4 (Electric Principle Diagram 4-4)



电气原理图4-5 (Electric Principle Diagram4-5)



（六）电气安装 Electrical equipment installation

1. 电气设备的安装和电线的敷设应按随机所带的电气原理图、配线图、电气设备总图进行。

All installation and wiring should be done according to the drawing.

（1）安装前应详细地熟悉上述电气图与技术条件，了解各元件的相互作用和操纵原理，以求能迅速地处理安装及试车中所发生的问题。

Before installation, study carefully the above-mentioned drawings and technical conditions, get familiar with the reciprocity of elements and operational principles in order to quickly solve the problems which may caused in the installation and commission.

（2）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，运转应灵活，不允许有卡住和松动现象。电气设备和元件的型号、规格、触头的闭合次序等必须符合图纸规定要求。需要调整的应按图纸规定调整好。

All the electrical equipments and elements should be cleared up and checked before installation. All of them should be flawless, running well, no lock and loosen. They must conform to the drawings such as types, specifications, close and open order of contactor, etc. Some of them need to adjust according to the drawings.

（3）检查电动机、液压制动器、炭刷、接触器、继电器、电阻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1兆欧，应进行干燥处理，经检验合格后，才能安装使用。

Check the insulating properties of electrical elements such as motor, hydraulic brake, carbon, contactor, relay and resistance, etc. Measure their insulation resistance with Meg ohm meter. If any value is less than 1 megohm, drying treatment must be done. It must be installed until passing the check.

（4）检查电动机炭刷与滑环间的压力，一台电动机的所有炭刷压力必须一致。炭刷应与滑环全面接触，磨炭刷时不应磨圆其边缘。

Check the pressure between carbon brush of motor and slip ring, the pressure for all carbon brushes in one motor must be same. The carbon brush should contact with slip ring completely. When grinding the carbon brush, the edge of the brush should not be ground to round.

（5）检查控制器、接触器、继电器触头间的压力，是否符合各自的规定，如压力过大或过小，应予以调整。

Check the pressure among contact points of controller, contactor and relay. Adjust it if each one is higher or lower than that regulated.

（6）电阻器的接线必须按提供的技术资料正确连接。如果发现电动机出力不足，控制手柄在规定位置不能起吊额定负载或开动大、小车，应首先检查电阻器的接线是否有错。一般情况下可根据电阻

元件的规格数量作简单判断，必要时可用电桥进行测量（此时应拆除所有与电机相连的导线）。

The lead and the resistors should be correctly connected according to the instruction. If it is found that motor contributes less power such as the joystick in the right place and the crane cannot lift the rating load, or the crane and trolley cannot move, check the connection of the resistors first. Usually it can be judged according to the specifications and quantity of the resistors. If necessary, it can be measured with electro-bridge (all the leads to the motor should be disconnected at this time.)

(7) 控制器操纵手柄应灵活，档位应明显。

The joystick should be flexible and shift places should be clear.

(8) 引到电阻器的电线或电缆，其垂直部分可布置在电阻器的左侧或右侧，但不得影响电阻器的装卸。水平方向的连线，靠电阻元件近，绝缘层容易老化，可以包以石棉绳。

For the wires and cables of the resistors, the vertical part can be arranged on the right or left of the resistors but it should not affect assembling or disassembling of the resistors; and the horizontal part can be wound with asbestos rope.

(9) 检查操纵室内部接线情况，如有松动或脱落等现象，应予以消除，确保接触良好。

Check all the connections in the cabin. Eliminate loosening or falling connections if there is any and ensure all the connections are in good condition.

(10) 电控柜安装前，应对电控柜内的电气元件和电气线路做详细检查。元件不得有损坏，特别是接触器息弧罩和辅助触头等。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。

Before installing control cabinet, electrical elements and wires must be checked carefully. There are not any damage for elements, especially the extinguisher cover of the contactor and the assistant head etc. Oil dirty (rustproof oil painted before left factory) on the contacting gag bit must be cleared away.

(11) 柜面的倾斜度不大于 5° ，以保证屏上元件正常工作。

The gradient of control panel is not allowed larger than 5° in order to ensure the panel working in order.

(12) 限位开关安装前应仔细检查开关是否灵活可靠，安装后应检查其接线是否正确并逐个进行调整。以保证吊钩上升到极限位置时断电。

Before installing limit switches, carefully check if they are flexible and reliable. After installed, check if their wiring is right and is adjusted in turn, in order to ensure power off when hook lift to limit position.

(13) 小车电缆导电装置安装时，应首先把电缆理顺，消除应力，按图纸要求顺次排列在终点

夹、电缆滑车和拖动滑车上。将小车推到离开操纵室一端的极限位置上，使电缆放开，调整拖动滑车的位置，使每段电缆的长度基本一致并保持一定的弛度，当牵引钢丝拉直刚好受力状态下，电缆下垂夹角保持 120° 左右（首、末滑车之间的运行拖缆长度应等于跨度的1.15倍，裕量不得超过跨度的2%），调整好后。用电缆夹板将电缆牢固地固定在终点夹和拖动滑车上。再把小车推到靠操纵室一端的极限位置上，调整电缆，使每段电缆的悬长基本相同，用电缆夹板将电缆牢固的固定在电缆滑车上。电缆每隔500~700mm用铁皮编织并夹紧，针对多根运行电缆时，要用扎带或用铁皮编织等方法对电缆进行捆扎，确保电缆不交叉、不凌乱，整齐美观。应保证每根电缆都夹紧，为此，需在电缆夹板上垫以胶皮。然后装上牵引钢绳，调整钢绳长度，保证运行时由牵引钢绳受力，最后将电缆的两端分别接到桥架上和小车的接线盒中。

When installing the trolley conducting device, first straighten the electric cables to eliminate the torsion, then put the cables orderly on end point clamp, the pulleys and festoon pulley according to the drawings. Drive the trolley to the limited position opposite the driver's cab, then unlash cables, adjust the position of festoon pulley to keep the length of every period basically consistent and maintain certain relaxation, the sagging angle maintains about 120° (the traveling towrope length between first pulley and final pulley is equal to 1.15 times of span, but margin should not exceed 2% of span.). After adjustment, fix cables firmly in the end point clamps and festoon pulleys with cable cleats. The drive the trolley to the limited position near the driver's cab again, adjust cables to keep the suspending length of every period basically consistent, fix cables firmly onto the pulleys with cable cleats. Bind the cables tightly with band every 500~700mm. In order to guarantee every cable tightly bound, rubber sheet should be under laid on the pulleys. Then install towing steel-rope, adjust its length to guarantee steel-ropes bear force during running, finally connect the two ends of cables to the junction boxes on the bridge and trolley separately.

(14) 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、接电保护率等因素，合理选择载流量。

Design, installation and replacement of crane cable should be in accordance with working ambient temperature, power-on protection rate and other factors to reasonable select the carrying capacity.

(15) 起重机的主滑线应由专用馈电线供电。对于380V电源，应备有一根专用零线或接地线。

The main slide wire of crane should be powered by the special supply line. There should be a special zero line or ground wire for 380V power source.

(16) 户外起重机一律采用管配线，一根管内只能穿同一电动机导线，无腐蚀损害的作业环境可采用明敷设绝缘线。

The outdoor crane should adopt the tube wiring, wire for the same motor can only through

a tube, no corrosive operating environment should adopt the open-lay insulated wire.

(17) 起重机照明和信号电源线路应接在动力总开关前，当动力部分断电时，仍能保证正常供电。

Lighting and signal power lines of crane should be connected in front of the main power switch, which can ensure normal power supply under the interruption of main power supply.

(18) 按图纸规定在电线和电线管末端的接线盒上标以相应的号码以便于安装维修。

Corresponding numbers should be marked on the junction boxes of wires and the end of wire tubes according to drawings, in order to easy to install and maintain.

(19) 起重机金属结构及其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，可靠的接地或接零。通过轨道接地的起重机轨道两端，应采取接零或接地保护。轨道的接地电阻以及起重机上任何一点的接地电阻均不得大于 4Ω 。

Metal structures of crane, metal enclosures of all electrical equipments, pipe chase and metal sheath of cable must be connected to continuous conductor, the connection of zero wires or grounding should be reliable. The both ends of crane track should take measures of the neutral and earthing protection. Grounding resistance of track and any point on the crane should not be more than 4Ω .

2. 电气线路的调整 Adjustment of electrical line

(1) 电气元件按要求整定完毕后，进行电气线路的检查与调整。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与调整。

After all the electrical equipment and wires installed and fixed according to the regulations, check and adjust the whole electrical line. First check all the connecting points of the line, make sure that they are all right and tighten all the connecting bolts, then switch on the power for the crane in order to check and adjust the electrical line.

(2) 电控柜各元件动作顺序的检查与调整。

Check and adjust the action order of the components in the controlling panel.

检查时，主回路断路器应拉下，合上控制回路开关，然后逐档转动主零控制器手柄，观察各接触器、继电器的动作顺序及各种电气联锁是否与电气原理图的要求相符，否则应找出原因并调整。

When checking, the main circuit breaker should be off. Turn on the controlling circuit switch, turn the main controller joystick shift by shift and observe if the action order of each contactor, relay and electric linkage is in accordance with the requirements in schematic drawing. If not, find the reason and adjust it.

(3) 检查并调整各时间继电器的动作整定值是否符合出厂技术文件所要求的整定值。

Check and adjust the action setting value of time relay to meet the setting value regulated.

（4）安全保护线路的检查与调整 Check and adjust the safety devices

用手扳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排除。大、小车限位开关与撞尺间的距离应调整合适，过紧将损坏开关，过松不起保护作用。必须调整触头的角度以保证吊钩上升到极限位置时断电。

Turn the limiters and safety switches with hand and observe if they are flexible, if they can cut off the power protect the system when the system protected comes to the limit position. If there is any trouble, find the reason and eliminate it. The limit position both for crane and trolley should be properly adjust. The angle of the contactor must be adjusted in order to guarantee cutting off power when the hook goes up to the limit position.

（5）电动机运转方向的调整 Adjustment of motor rotation direction

合上所有开关，操纵控制器，分别使各机构电动机点动一下（即短时送电立即断电），观察电动机的转向是否与控制器的操纵方向一致。分别驱动的两台电动机是否同方向运行，是否与限位开关所保护的方向一致。如果不一致，应将任意两相的定子线调整一下，使其转动方向符合要求。

Turn on all the switches, operate the controller, shortly start every system separately(that is, turn on for a short time and turn off immediately) and observe if the turning direction of the motor is in accordance with that of controller's operation, if the two motors in system driven by double motor drive the system in the same direction and if the direction is in accordance with the direction protected by limiter. If not, overturn the wires of any two stators and make the turning direction is in accordance with the regulation.

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。首先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。只有在空载运行正常的情况下，才允许负载运行。负载运行时须逐步加载，直至满载为止。不允许直接满载运行。

After overall check and adjustment to the electric circuits, turn on all the breakers and provide power for the main circuits and controlling circuits of every system. Start systems one by one on condition of empty load to run the crane on a trial and observe if all the systems work well. Only after the trial running with empty is all right, the operation with load is allowed. The load should be added gradually, directly full load operation is not allowed.

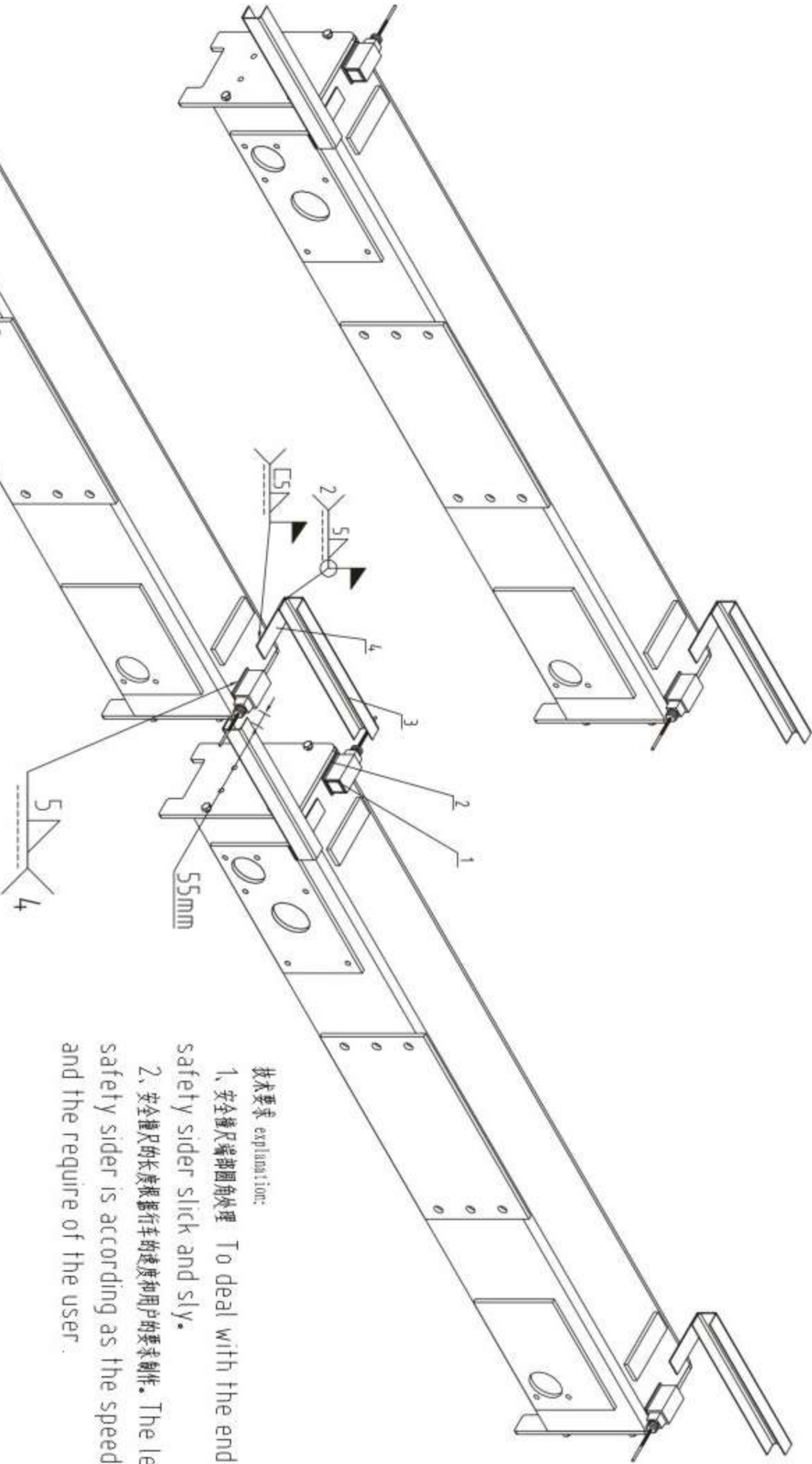
试运行全部正常后，起重机电气设备可以投入正常使用。

If the trial running is all right, the electrical equipment of the crane can be started normal operation.

单梁大车限位开关及撞尺安装

Installation diagram of the single girder crane limit switch and safety sider

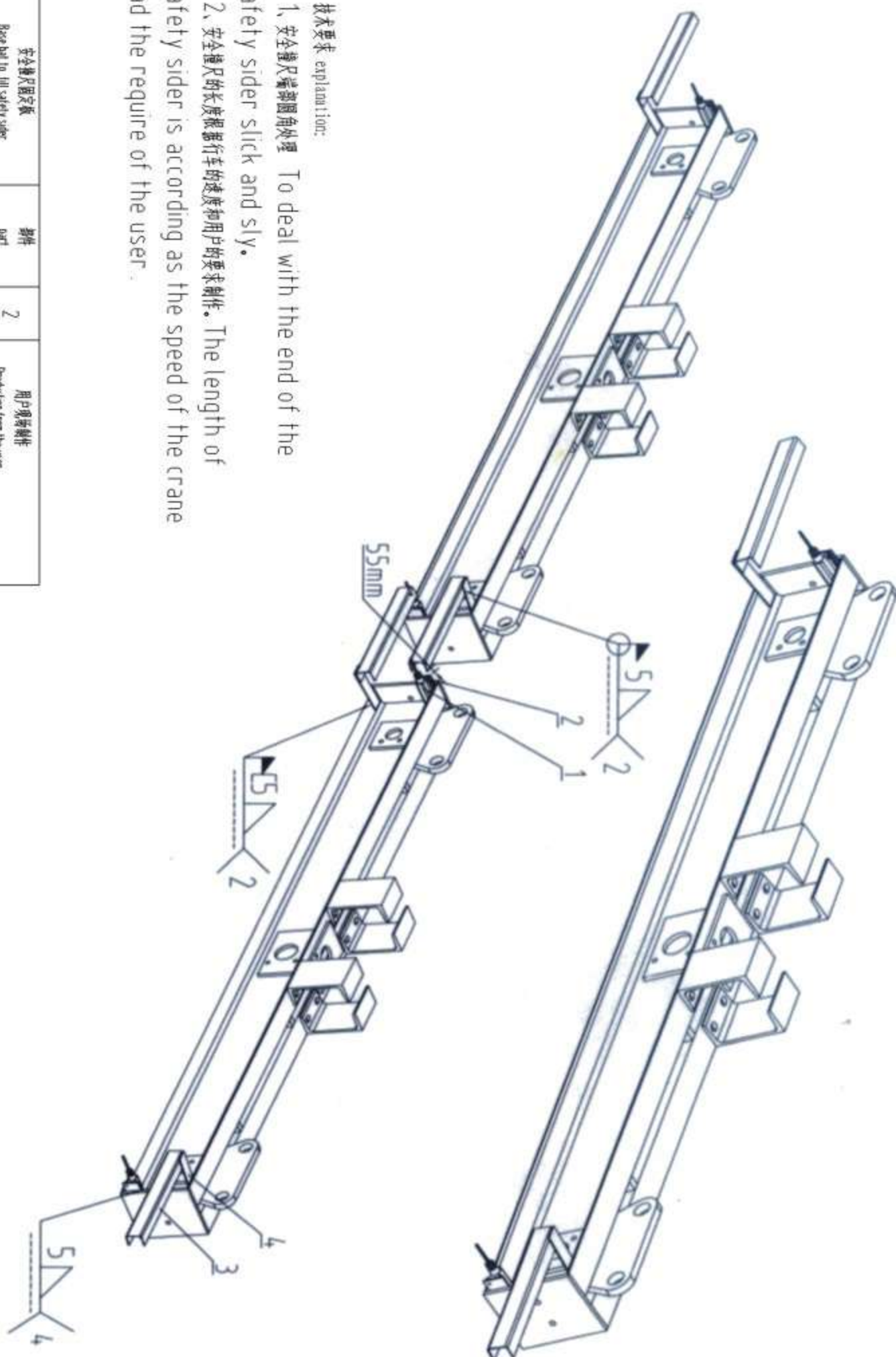
序号 No.	代号及名称 Code	名称 Name code	材料 Material	件数 PCS	备注 Remarks
4	50×150×5mm	安全撞尺固定板 Base bar to fill safety sider	零件 part	2	用户现场制作 Production from the user
3	35	安全撞尺 Safety sider	零件 part	2	用户现场制作 Production from the user
2		限位固定平板 To fill limiter	钢板 steel	2	
1		限位开关 limiter	成品 finished product	2	外购 To buy from outside



4	50×150×5mm	安全限位固定板 Base bolt to limit safety sider	部件 part	2	用户现场制作 Production from the user
3	J5	安全限位尺 Safety sider	部件 part	2	用户现场制作 Production from the user
2		限位固定平板 To fit limiter	钢 steel	2	
1		限位开关 limiter	成品 finished product	2	外购 To buy from outside
序号 No.	代号及规格 Code	名称 Name code	材料 Material code	件数 Pcs	备注 Remarks

技术要求 explanation:

- 1、安全限位尺端部圆角处理 To deal with the end of the safety sider slick and sly.
- 2、安全限位尺的长度根据行车的速度和用户的要求制作。The length of safety sider is according as the speed of the crane and the require of the user.



四、起重机的使用、操作 Use and operation for crane

（一）现场作业人员的必备条件：

Basic requirement of the on-site personnel

现场起重机作业人员包括起重机司机、起重机司索人员和起重机指挥人员等。上述人员持上岗证的必备条件如下。

On-site crane operating personnel, including crane drivers, department cable crane and crane command personnel, etc. the above personnel are prerequisite for working certificate are as follows.

1.基本条件 Basic requirement

必须能保证作业人员（包括自身）的财产的安全。

Must guarantee the security (including oneself) of the personnel.

2.年龄条件 Age conditions

年龄十八周岁以上。

Age above 18 years old.

3.身体条件 Physical qualifications.

身体健康，双目视力（含矫正视力）达1.0以上等无妨碍从事起重机作业的疾病和生理缺陷，高空作业时眩暈感等。

Healthy body, the binocular vision (including vision correction) is more than 1.0, no obstruction diseases and physical defects, high-altitude vertigo in crane operations

4.素质条件 Quality condition.

（1）心理素质：在紧张情况下反应良好；情绪稳定；具有责任感；

Psychological quality: react well under the stress condition; emotional stability; responsibility.

（2）文化素质：应具有初中以上文化程度

Cultural quality: above junior middle school.

（3）技术理论素质：基本熟悉所服务起重机的作业特性，工作原理；基本熟悉所服务起重机的组成、安全装置及系统；基本熟悉所服务起重机的基本性能参数等基础技术理论知识。

Technical theory quality: familiar with crane operation characteristics, and working principle; familiar with the crane composition、safety equipment and system; familiar with the basic performance parameter of the crane.

（4）操作技能素质：能较熟练与稳准地操作、吊装和指挥等。

operation skill quality: familiar with the operation, lifting and command.

（二）葫芦式起重机操作Hoist crane operation

1.葫芦式起重机操作要领 Main point of hoist crane operation.

（1）操作技能 Operation skill

起重机司机的操作技能体现在以下两个字-稳和准。稳——起重机起动，运转和停车要稳。准——吊载停放位置要准。稳、准、狠中的狠要不得，狠为野蛮操作，太危险。

Two words for the operator: Stable and accurate. Stable: crane starting, running and stopping to stability. Accurate: crane shall grant a parking position. Ruthless is disabled, ruthless is cruel operating, it's too dangerous.

（2）操作安全意识 Operation safety consciousness

安全意识体现在责任心上，没有安全责任心就不会有安全意识，否则就会造成事故灾害——人身伤亡或财产损失。

The safety consciousness lies in responsibility, no security responsibility, there will be no security, or it will cause accidents disasters---life or personal injury or property damage.

（3）不安全操作的表现形式 Unsafe operation forms

① 误操作：错误操作往往是由于缺乏安全意识、精神不集中、技术不熟练等原因造成。

Disoperation: caused by lacking of safety consciousness, lack of concentration, or the unskilled technology.

② 违章操作：违反操作规程的不安全操作，由于不熟悉起重机操作要领和安全规程等造成。

Illegal operation: Unsafe operation of violating the operating rules, because not familiar with the crane operating essentials and safety rules and other causes.

③ 野蛮操作：随意性、不负责任、不顾人身安全或财产损失的操作，是十分危险的。

Rough operation: It is dangerous that crane is operated irresponsibly, regardless of personnel safety or property.

2.葫芦式起重机操作形式 Hoist crane operation form

（1）地面操作 Ground operation

地面操作的葫芦式起重机是通过手动按钮开关，又称为手电门操纵控制的。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与切断，来控制电动机的正反转，已达到吊载的起升、下降、左右横行和前后运行的目的。手电门上有六个按钮，常称为“六豆”手电门，可以控制操纵吊载上下升降，左右横行和前后运行。手电门上设有机械联锁保护装置，还设有电源开关，还有低压（36V或42V）手电门和双速手电门。手电门按钮标记常为“上”“下”“左”“右”“前”“后”或↑、↓、→、←、⊙、×两种标记形式，其标记与起重机动作相一致。

The ground operation of the hoist crane is by manual push button switch, also called the

flashlight door control. The flashlight door use the soft rubber line and the reinforced steel wire to hang under the crane, and 1 ~ 1.2m from the ground is preferred. The flashlight door through the turn on and off of the electromagnetic switch to control motor and reversing so as to reach the lifting of the lifting load, down, left and right sides operation. There are six buttons on the flashlight door, which can manipulate crane load lifting up and down, around and before and after operation. Flashlight door is equipped with mechanical interlock protection device, power switch, as well as the low voltage (36V or 42V) flashlight door and double speed flashlight door. The flashlight door button labeled as "up" "down" "left" "right" "before" "after" or ↑、↓、→、←、⊙、× these two markers forms.

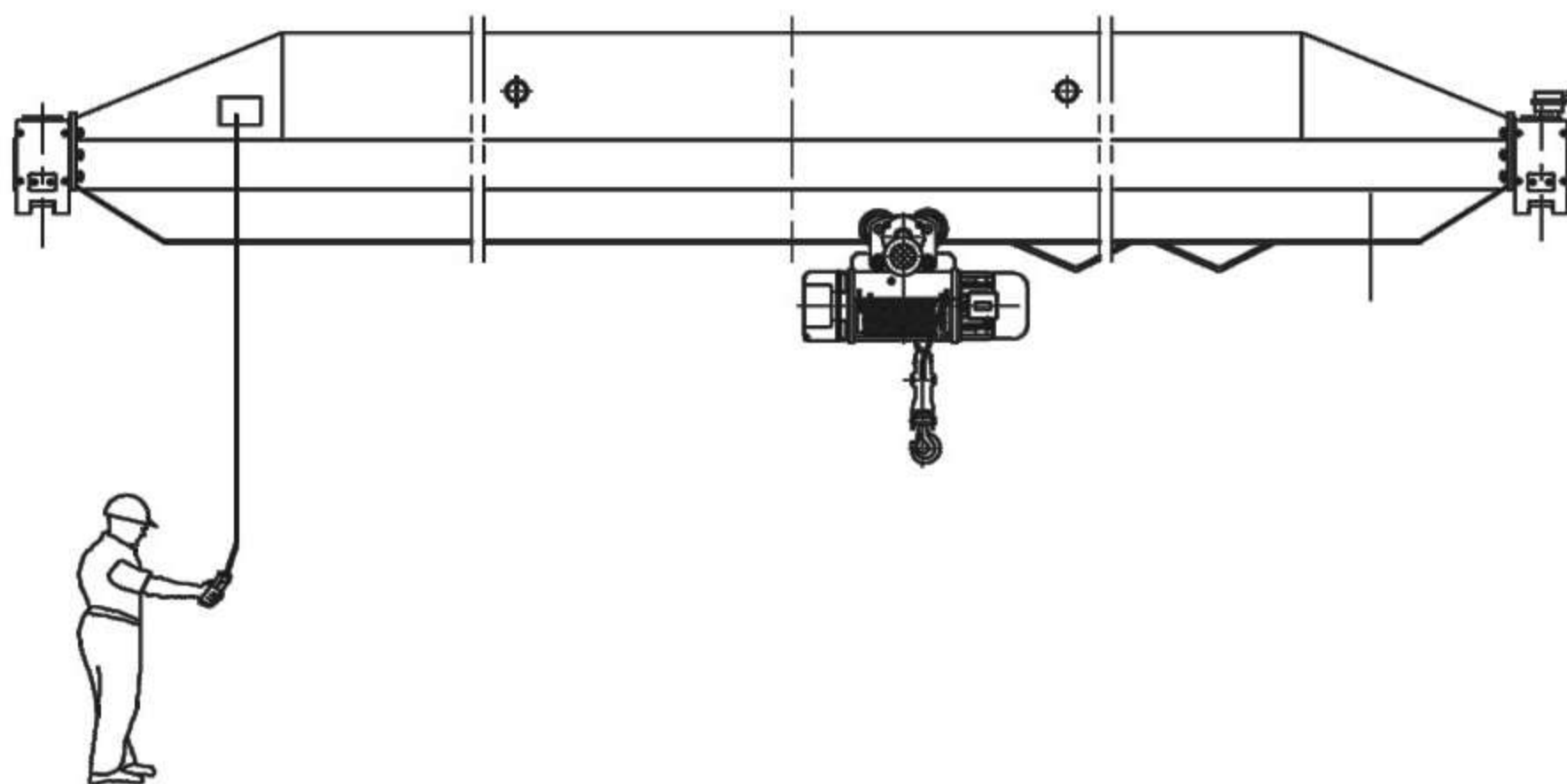
按手电门安装部位和安装方式的不同，常见的地面操纵形式有如下几种。

For different installation place and different installation way, the common ground controlling pattern has the following few kinds:

① 固定式手电门操作 Fixed type flashlight operation

悬吊手电门的橡胶软缆被固定在起重机主梁某一固定位置上，或固定在定悬臂上。适用于跨度小，地面上有长期固定的障碍物，操作人员的横向位移被限定在某一范围时，才采取这种操作形式

The suspended flashlight door's soft rubber line is in a fixed position on the crane, or fixed on the fixed cantilever. This type is applicable to with small span, and long-term fixed obstacles, the operator will take this kind of operation when the horizontal displacement are limited to a certain extent.

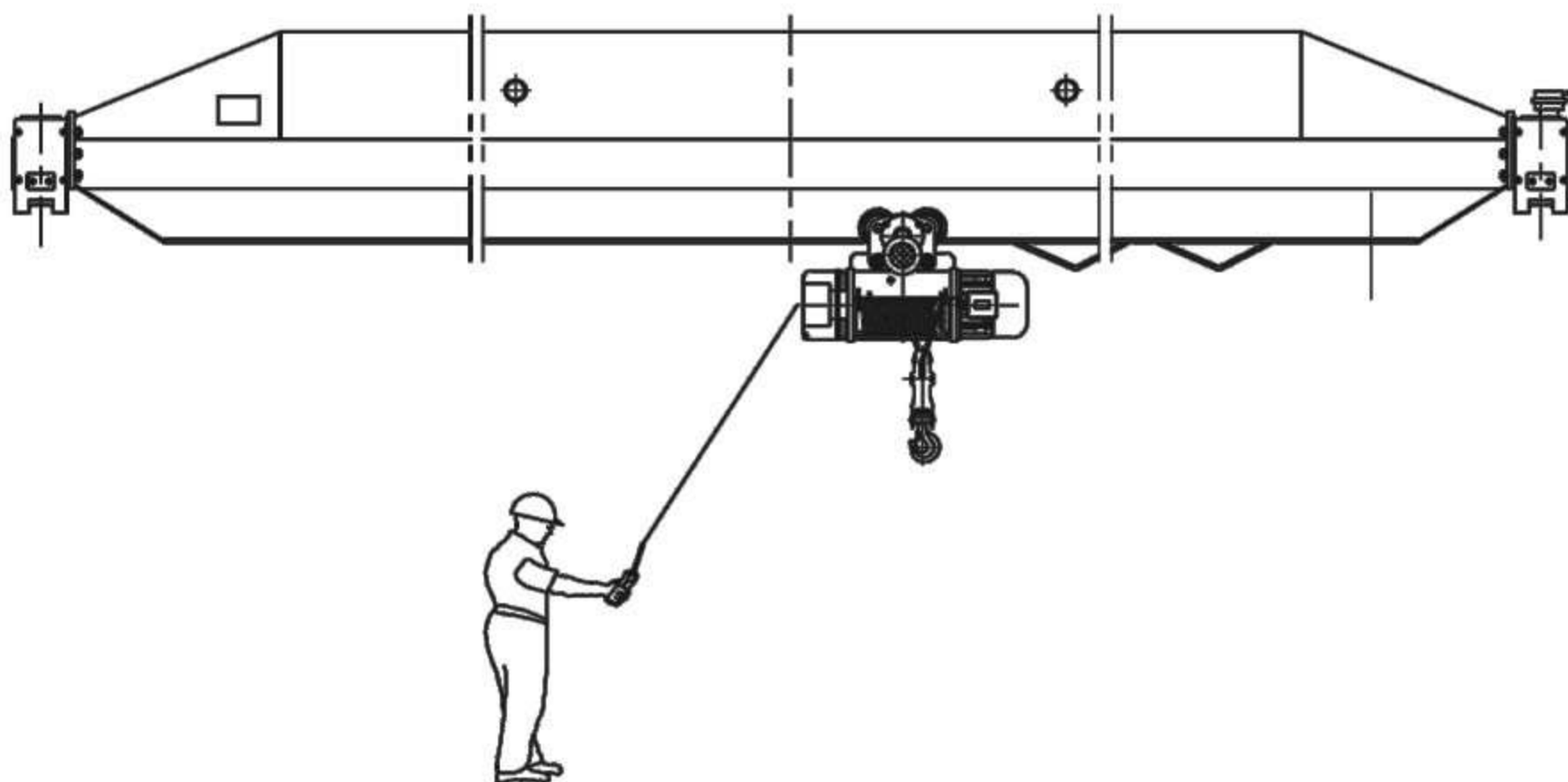


固定式手电门操作 Fixed flashlight door operation

② 跟随式手电门操作 Following flashlight door operation.

手电门通过橡胶软缆悬吊在电动葫芦的控制箱之下。操作人员操纵时必须跟随吊载横向或纵向移动，这种操纵形式是目前地面操纵普遍采用的形式，其优点是操作人员距离吊载近，观看清楚，排除故障和干扰快。

Flashlight door is through the soft rubber spring suspension under electric hoist control box. Operator must follows when manipulate the hoist load laterally or vertically, this manipulation form is commonly used to form ground controlling, its advantage is operator is close to the hanging load, and can see that trouble clear and repair quickly.

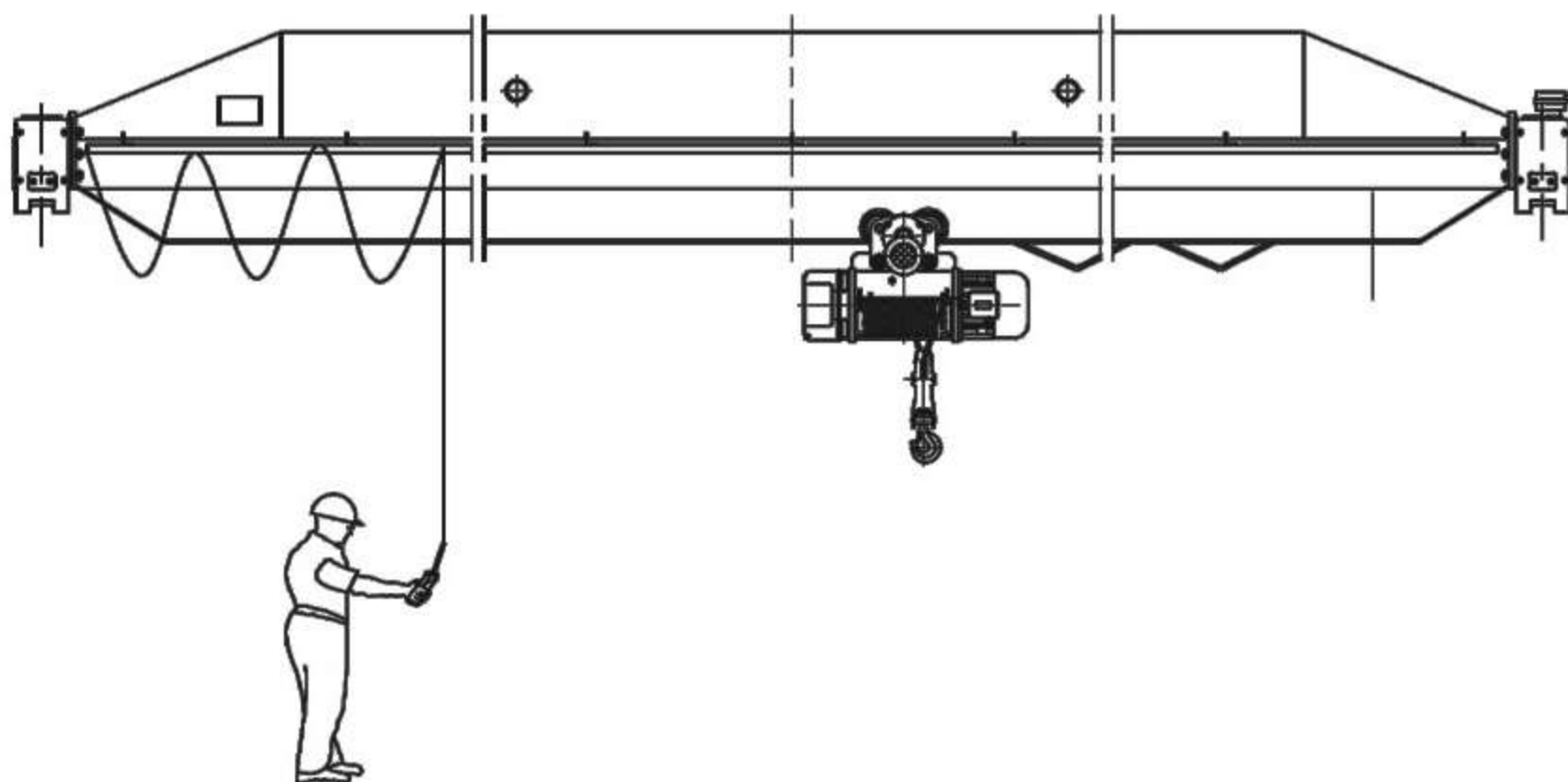


跟随式手电门操作 Following flashlight door operation.

③ 非跟随式手电门操作 Non-following flashlight door operation.

由起重机桥架固定支撑着滑道，滑道由异型轧制开口槽钢构成，槽内装有数个滚动小跑车，小跑车下悬挂有扁电缆或圆电缆，电缆一端和控制箱相连，另一端悬垂下挂手电门。操作人员手牵手电门，通过小滑车在槽内横向移动，就像拉窗帘一样能自由横向移动，操作起来十分灵活方便，这种操纵方式可以根据操作人员的实际需要随心所欲的掌握与吊载的远近，即安全又方便。

Supported by crane bridge fixed slide, the slide consists of different rolling open channel steel, roll groove is equipped with a number of small sports car suspension with flat cable or round cable, the cable end connected to a control box, the other end hang a flashlight under the trailer door. Operator hand flashlight, through a small pulley lateral movement within the groove, like the curtains to move freely, the manipulation is flexible. This kind of manipulation mode can be according to actual needs of the operators and the crane load distance, which is safe and convenient.

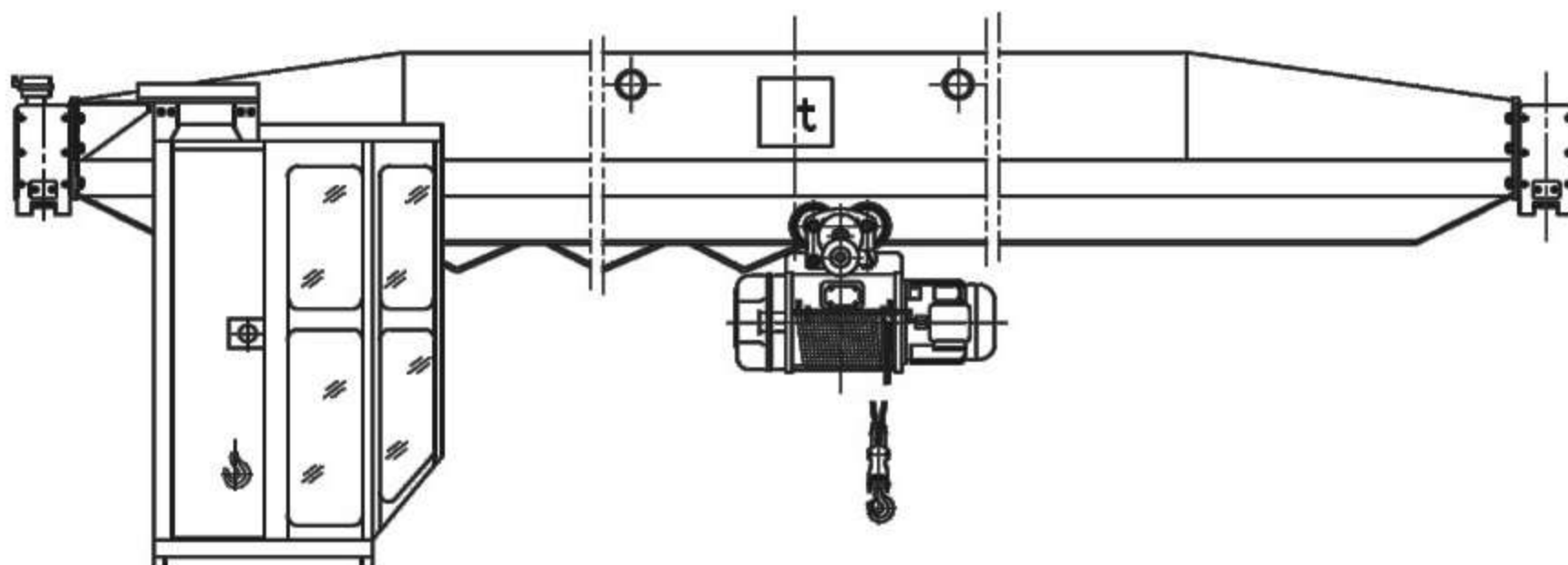


非跟随式手电门操作non-following flashlight door operation.

(2) 司机室操作 Cab control

司机室操作也是电动单梁起重机的操纵方式之一，考虑预防触电危险，司机室应安装在非电源滑线侧，当起重机运行速度要求不大于45m/min时应安装司机室进行操作，根据需要司机室有开式和闭式之分，开门方式有侧开和端开之分。

The cab control is one of the operation mode of the electric single girder crane, to prevent electric shock danger, the driver's room should be installed in the power supply side of slide wire. When the crane lifting speed is no more than 45m/min, the cab room is needed, and according to need , the driver room is divided into: open and close, the open way is divided into: side and end open.

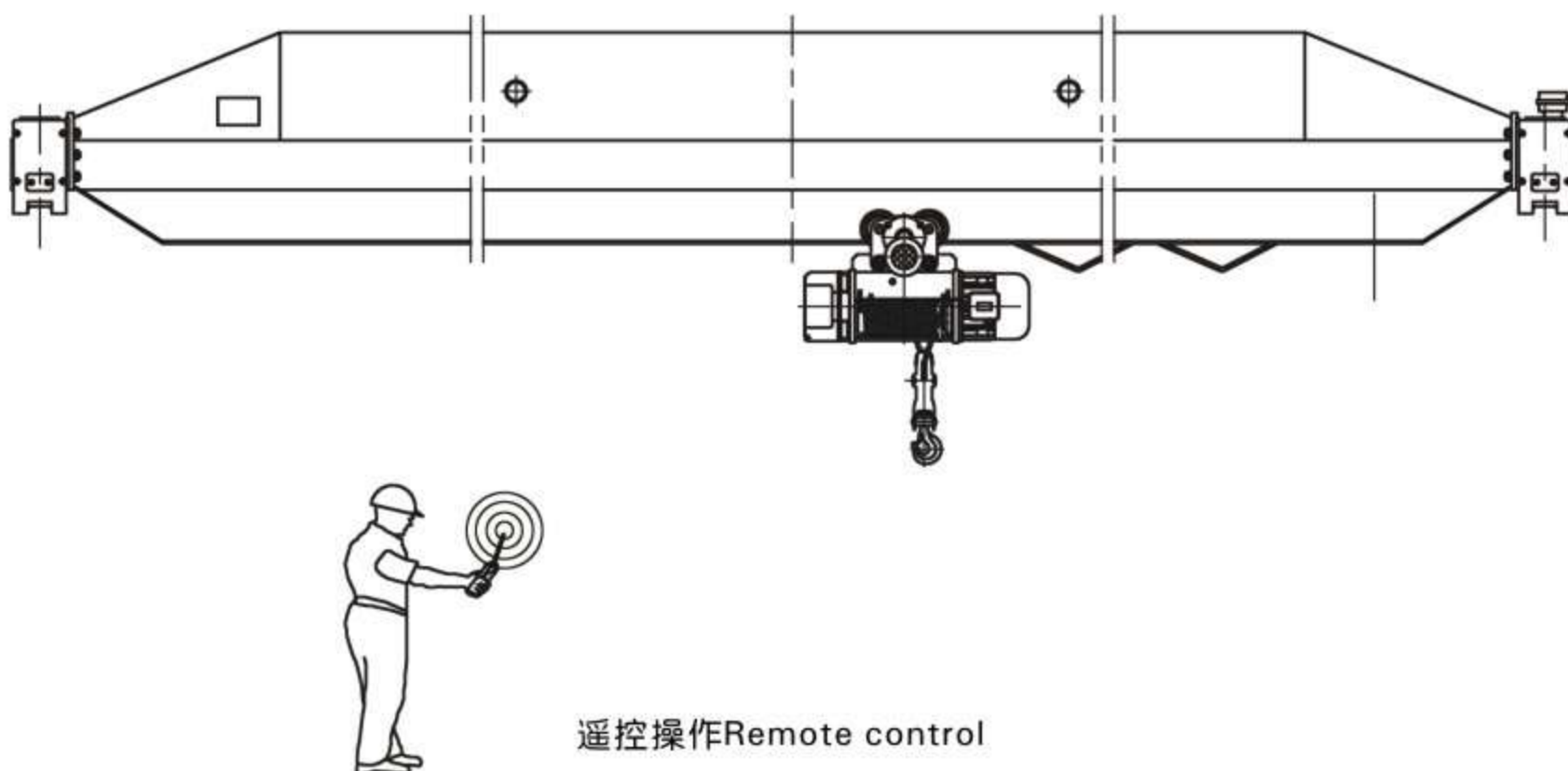


司机室操作Cab control

（3）遥控操作 Remote control

当操作现场环境条件不允许操作者直接按动由起重机悬吊的手电门按钮，或不允许随吊载纵横移动而移动时，而采取操作者同葫芦式起重机分别按特定场所一边监视起重机的动作，一边操纵按钮或操纵控制台的按钮使起重机作业。

When the operation environmental condition doesn't allow the operator to push the suspension flashlight door button, or doesn't allow mobile from the horizontal movement, the operator as well as the hoist crane should respectively according to the specific place watching crane movement, while the control button or control console button to make the crane operate.



遥控操作Remote control

3.司机的日常检查及保养工作

Driver's daily inspection and maintenance work

（1）清除污物 Remove dirt

① 经常擦拭司机室玻璃，保证有良好的视野；

Wipe the cab glass to ensure good field of vision.

② 经常打扫司机室，保持良好的工作环境；

Clean the cab to keep a good working environment.

③ 经常清理走台、梯子等处的灰尘、油污、水污等；

Clean up the dust, oil pollution, water pollution in the walkway and ladders.

④ 经常查看轨道上是否有污物和障碍物；

Clean whether there is a dirt track and barriers regularly.

⑤ 经常清除机构，电器上的污物灰尘等。

Clean the dirt dust on the electrical appliances .etc.

(2) 做好防锈工作 Good rust prevention work

① 主动查看电器、电线、电缆上的腐蚀情况，以防漏电事故；

Active view on electrical appliances , wire and cable corrosion situation, in case of leakage accident.

② 主动查看裸露的有磨损处的磨损状况；

Active view bare wear at the wear condition.

③ 主动查看润滑点的润滑状况；

Active check at the lubrication point.

④ 主动查看机体各处的漏漆脱漆状况等。

Active view the paint leakage condition.

(3) 注意操作中的异常现象

Pay attention to the abnormal phenomenon in operation.

① 意异常响动——啃道声、撞击声、摩擦声和电磁声等；

Abnormal sound gnawing track sound, crash, friction noise and electromagnetic noise, etc.

The abnormal sound -- gnawing track

② 注意异常冲击、震动与摇摆；

Pay attention to unusual shock, vibration and swing.

③ 注意溜钩、溜车的程度；

Pay attention to slip the hook, the extent of the slide.

④ 注意异常的温升或火花等。

Pay attention to the abnormal temperature rise or sparks, etc.

4.现场指挥信号知识 On-site command signal

(1) 指挥信号的适用人员：起重机司机；起重作业指挥人员；起重作业司索人员。

Command signal applicable personnel: crane driver, lifting operation command personnel, lifting operation department personnel.

(2) 起重吊运指挥信号种类 Crane lifting command signal types

① 手势信号 Arm signal

用手心、手指和手臂的不同姿势进行指挥起重机运转信号。

Use palm, fingers and arms of different position to command crane operation.

② 手势信号的要点如下：前进信号——是指起重机向指挥人员开来；后退信号——是指起重机离开指挥人员；前、后、左、右 在指挥语言中，均以司机所在位置为基准。

The main points of arm signal: Forward signals-refers to the crane to the commander, Backward signals-refers to the crane leave controllers. The before, after, left and right, in

command language, are based on location of the driver.

③ 旗语信号 Semaphore signals

用红色和绿色两面小旗进行指挥，主要用于室外露天作业流动式起重机。

Command in red and green flags on both sides, is mainly used in the outdoor homework mobile crane.

④ 音响信号 Audible signal

配合手势信号或旗语信号指挥用哨、扩音器或铃声等。

Cooperate with hand signals or semaphore signals command with the whistle, microphone, or ring, etc.

5.对指挥人员的要求：Commander requirement:

指挥信号必须清晰、准确；指挥人员指挥时要注视司机；指挥人员站位要合理，司机能看得清，与吊载要保持一定的安全距离。

The command signal must be clear and accurate. The commander should look at the driver. the commander's position should be reasonable, the driver can see clearly, and also keep a safe distance with suspended load.

6.对司机要求：Driver's requirements.

指挥信号不明确，应发出重复请示信号，用铃声-两次短声明示；指挥人员发出错误指挥信号时，司机有权拒绝执行；司机对任何人发出紧急停止信号都应服从。

If command signal is not clear, referrals signal should be issued, the with Ringtones - two short statement shows; if commanding officers send the wrong command signal, the driver has the right to refuse to perform; drivers issued an emergency stop signal should obey anyone.

7.通用手势信号 Common hand signal.

如以下各图：Such as the following figures.

(1) 预备（注意）信号 Preparatory signal

手臂伸直置于头上方，五指自然伸开，手心朝前保持不动。如图7-1

Stretch arms straight on overhead, five fingers naturally outstretched, palms facing forward remain intact, as the Figure 7-1.

(2) 要主钩信号 The main hook signals.

单手自然提拳，置于头上，轻触头顶。如图7-2

Single hand punch natural, placed in the head, and touch your head, as the Figure 7-2.

(3) 要副钩信号 To the auxiliary hook signal

一只手握拳，小臂向上不动，另一只手伸出，手心轻触前只手的肘关节，如图7-3

Fist with one hand, forearm fixed upward, the other hands out, palms touch beforehand elbow, as the Figure 7-3.



图7-1



图7-2



图7-3

(4) 吊钩上升信号 Hook up signal

小臂向侧上方伸直，五指自然伸开，高于肩部，以腕部为轴转动，如图7-4

The forearm to the lateral unbend, five fingers naturally stretches above the shoulders, wrist as the axis of rotation, as the Figure 7-4.

(5) 吊钩下降信号 Hook down signal

手臂伸向下方，与身体夹角 30° ，五指自然伸开，以腕部为轴转动，如图7-5

Arm into lower low, with the body angle of 30° , five fingers stretch naturally, regard the wrist as the rotation, as shown in Figure 7-5.



图7-4



图7-5

(6) 吊钩水平移动信号 Hook horizontal movement signal

小臂向侧上方伸直，五指并拢手心朝外，朝负载应运行的方向，向下挥动到与肩相平的位置，如图7-6

The forearm to the the lateral unbend, five fingers together palm outwards, towards the direction of the load should run, waving down to the position of the shoulder , as shown in Figure7-6.

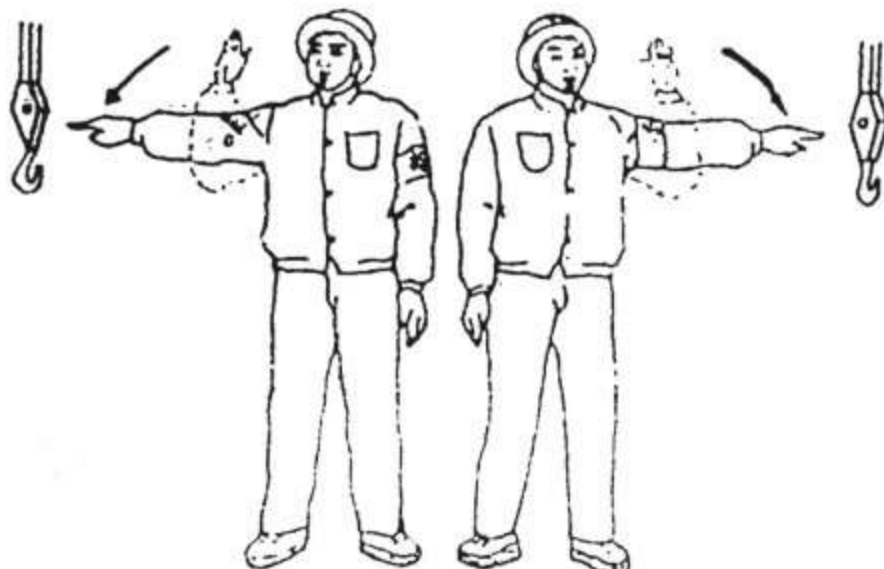


图7-6

(7) 吊钩微微上升信号 Hook slightly up signal

小臂向侧前上方，手心朝上高于肩部，以腕部为轴，重复向上摆动手掌，如图7-7

The forearm to the lateral upper part, palms up and higher than the shoulders, regard the wrist as the axis, repeat swing untoward palm, as shown in Figure 7-7.

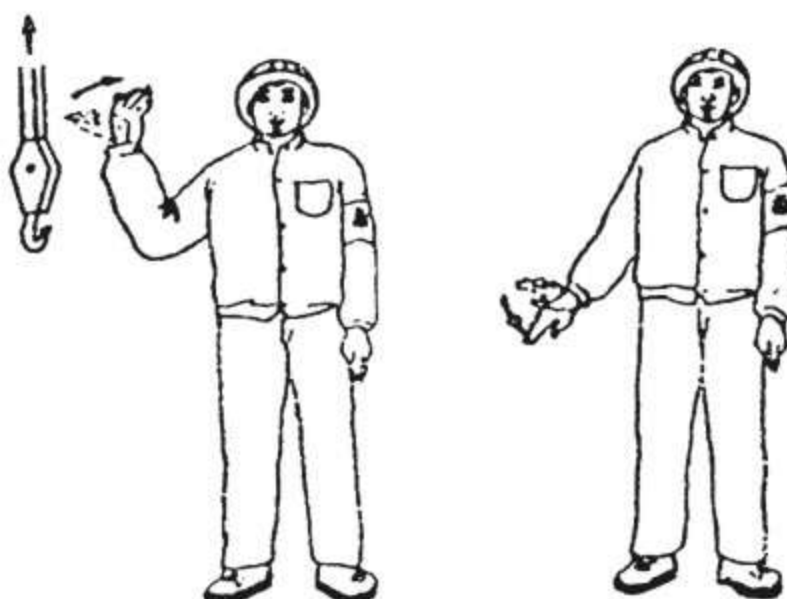


图7-7

(8) 吊钩微微下降信号 Hook slightly down signal

手臂伸向侧前下方，与身体夹角约为 30° ，手心向下，以腕部为轴，重复向下摆动手掌，如图7-7

Arm into below before side, with the body angle is about 30° , palms down, the wrist for axis, and repeat swing the palm down as shown in Figure 7-7.

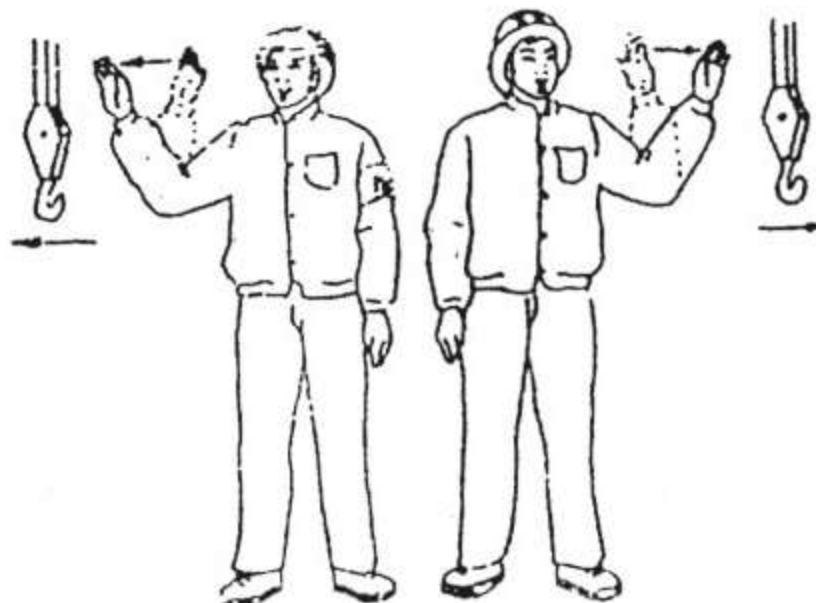


图7-8

(9) 吊钩水平微微移动信号 Hook slightly horizontal movement signal

小臂向侧上方自然伸出，五指并拢手心朝外，朝负载应运行的方向，重复做缓慢的水平运动，如图7-8

The forearm to the lateral upper part, five fingers together to the outwards to the direction of load running, do the horizontal movement slowly and repeat, as shown in Figure 7-8.

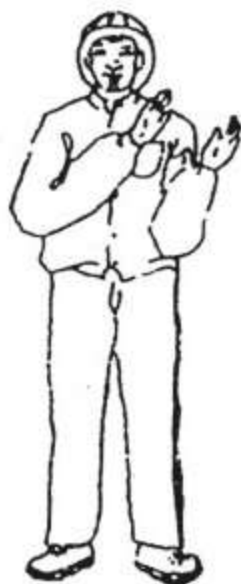


图7-9



图7-10

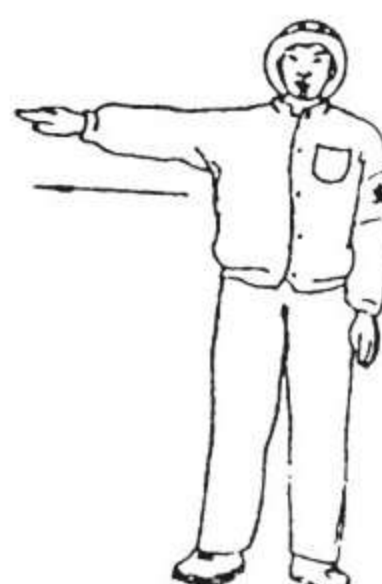


图7-11

(10) 微动范围信号 Slightly move scale signal

双小臂曲起，伸向一侧，五指伸直，手心相对，其间距与负载所要移动的距离接近，如图7-9

Both forearms tune to one side and five fingers stretch, palms relative, the spacing and the distance to move close to the load, as shown in Figure 7-9.

(11) 指示降落方位信号 Landing position signal

五指伸直，指出负载应降落的位置，如图7-10

Five fingers stretch, and point out the landing location, as shown in Figure 7-10.

(12) 停止信号 Stop signal

小臂水平置于胸前，五指伸开，手心朝下，水平挥向一侧，如图7-11

Lay the forearm in front of bosom levelly, and five fingers stretch, palms down, and sweep to one side, as shown in Figure 7-11.

(13) 紧急停止信号 Emergency stop signal

两小臂水平置于胸前，五指伸向朝下，手心朝下，同时水平挥向两侧，如图7-12

Lay the forearms in front of bosom levelly, and five fingers reach down, palms down, and the sweep both sides horizontally at the same time, as shown in Figure 7-12.

(14) 工作结束 End of the work

双手伸开，在额前交叉，如图7-13

Hands open and cross in front of the forehead, as shown in Figure 7-13.

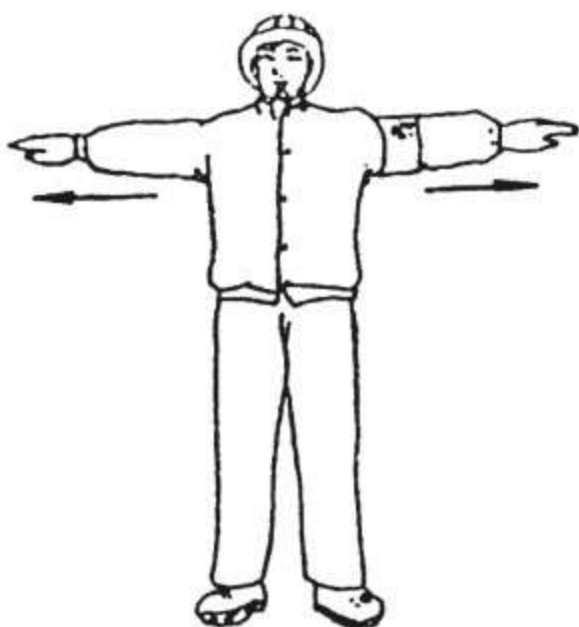


图7-12

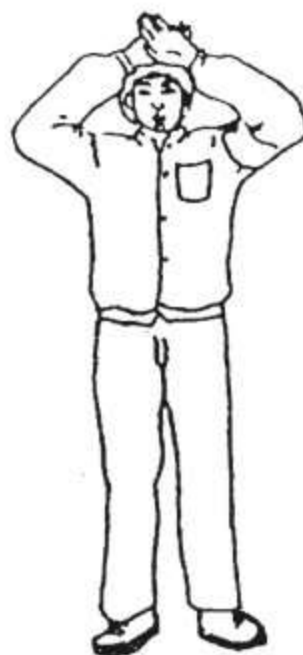


图7-13

8. 起重机安全操作规程 Crane safety operation procedures

(1) 作业前的安全准备工作 The preparation before operation safety

① 严格遵守交接班制度 Strictly abide by the system of succession.

② 开车前必须安全检查； Must check the security before driving.

③ 检查轨道上是否有油污、水污、冰雪或障碍物；

Check whether there is oil pollution, water pollution, orbit or obstructions.

④ 检查吊载通道的通畅性； Check whether the crane load channel is smooth.

⑤ 认为正常方可合闸通电； Switch the power when everything is normal.

⑥ 空车试运行，检查各运转系统是否有异常现象，检查刹车等安全装置是否动作灵敏可靠。

Empty test run, check the system operation whether there is abnormal phenomenon, check the brakes and other devices safety.

(2) 操作安全注意事项 Operation security considerations.

① 不准超载起吊； No overload lifting.

② 不准在指挥信号不明或违章指挥下起吊；

No lifting under the command signal is unknown or violates the rules and regulations.

③ 不准斜拉斜吊； No suspension tilt hanging

④ 不准利用起升限位装置作起升停车用； Not allowed to use a device for lifting the parking

⑤ 不准在正常作业中经常使缓冲器与止档（阻进器）冲撞，或达到停车的目的；

No buffer and stop (resistance) in normal operation, or to achieve the purpose of parking.

⑥ 不准在作业中调整制动器或进行检修维护工作；

No adjustment of brake in operation or maintenance/repair work.

⑦ 不准在光线暗淡视线不清状态下吊运作业； No lifting operation in not clear condition.

⑧ 不准吊运捆绑不牢的吊载； No lifting bundled rickety suspended load.

⑨ 不准同时开动三个机构（三维动作）同时运转；

No running with the three institutions at the same time.

⑩ 不准吊运载荷从其他人员的头顶通过或滞留；

No hanging delivery charge from other researchers on the top of the head through or stranded.

⑪ 不准吊运棱角处无保护措施的物品等； No lifting edges in unprotected items.etc.

⑫ 不准在吊载有剧烈震动时进行起吊、横行和纵行作业；

No lifting when there is violent vibration, transverse and longitudinal.

⑬ 不准在吊载重量不清情况下，如吊拔埋置物和斜拉作业；

No lifting without knowing the lifting load, such as a hanging embedded objects and suspension.

- ⑭ 不准随意拆改葫芦式起重机上任何安全装置；

No random tearing down of any safety device on the hoist.

- ⑮ 不准在下列有影响安全缺陷和损伤下作业：制动失灵、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；

No operation in the safety defects and damage situation like: brake failure, limit device failure, hook nut lock device damage, and the damaged wire rope.

- ⑯ 不准在捆绑吊挂不牢、吊载不平衡易滑动倾翻状态下，重物棱角处与吊装钢丝绳之间未加衬垫下进行吊装作业；

No operation under the following situation: bundling hanging, hanging load imbalance and no pad between the weight edges and the wire rope.

- ⑰ 注意作业中吊载附近是否有其他作业者，以防止发生冲撞事故；

Note whether there are other operator near the hanging load to prevent the collision accident.

- ⑱ 注意吊载处在狭窄时的场所，易倾倒的位置时不易盲目操作；

Note that: hanging load in a narrow place, no blind operation in the easy to dump position.

- ⑲ 注意作业中随时观察前后左右方位的安全性；

Observe the front, back, left security when working.

- ⑳ 确认操作处于易见方位再进行操作； Confirm the operation is easy to see during operation.

- ㉑ 确认手电门按钮标记后再动作； Confirm the flashlight door button tag before running.

- ㉒ 确认吊具或吊装绳真正处于吊装没有挂扯其它物体时，再按动起升按钮；

Confirm the spreader or hoisting rope was not really in hoisting hanging without with other objects, and then press the starting button.

- ㉓ 发生故障时应及时与安全人员联系，及时排除故障与隐患；

Contact with the security personnel timely about the trouble shooting and hidden dangers.

- ㉔ 发生故障时应立即切断电源； Cutoff the power the moment failure occurs

- ㉕ 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与吊运；

Do the little height test when the load is close to or reach the rated load, do the hoisting and lifting after the short-distance lifting test is steady.

- ㉖ 重物下降至地面300mm处时，应停车观察是否安全再下降；

Stop and watch if it is safe when the heavy load is in 300mm high.

- ㉗ 无下降限位器的葫芦式起重机，在吊钩处于最低位置时，卷筒上的钢丝绳必须保证有不少于

两圈的安全圈；

Hoist crane without falling limiter, when the hook is in the lowest position, the wire rope on the drum must be more than twice the safety ring.

② 翻转吊载时，操作者必须站在翻转方向的反侧，确认翻转方向处无其他作业人员时再动作；

When flipping the suspension load, the operator must stand on the reverse side of the turning direction, confirm that there is no people at the flip directions.

③ 为减小吊载摆动与冲击，可以采取反向动作控制。

Adopt the reverse movement control to reduce load swing and hit.

9. 作业结束后的安全职责 After work safety responsibility.

① 将吊钩上升至接近上极限位置，不准吊载停歇；

Rise the hook up to the limit position without hanging load.

② 大车停在固定位置，小车停在远离电源滑触线非跨中位置；

Cart stops in a fixed position, the car stops at a position away from the power sliding contact line.

③ 吊具为抓斗或电磁吸盘时，吊具应落地不准悬空；

When the hook is grab bucket or magnetic chuck, the hook should fall to the ground.

④ 停车后将控制手柄调回零位，关闭紧急开关，拉闸关门下车；

Make the handle back to zero after parking, close the emergency switch before get off.

⑤ 做好交接班记录。Do the shift work record.

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

葫芦式起重机的检修维护工作通常可分为日常检查、修理、维护与保养工作，简称为日检；月份检查、修理、维护与保养工作，简称为月检；年度检查、修理、维护与保养工作，简称为年检。检修与维护工作不可截然分开，检查修理工作必然包括维护保养工作，维护保养工作中必然含有检查修理的工作内容。

The inspection of the hoist crane usually divides into: daily inspection, maintenance, and repair, shortly is called daily inspection. the monthly inspection, maintenance, and repair is called monthly inspection; the yearly inspection, maintenance and repair work is called yearly inspection. The repair and maintenance would never apart.

对于特殊使用要求的起重机，还可以分为安排周检和季检，对于一般式起重机只做日检、月检、年检即可。

For the special use crane, we can arrange the weekly inspection and seasonal inspection,

daily, monthly and yearly inspection are done for the common crane.

（一）葫芦式起重机的日检 Daily inspection of the hoist crane.

1.日检的概念 Daily inspection concept.

为日常安全检查，每天都必须进行检查，并做好应该做的维护保养工作。

To ensure the daily safety, inspect the machine everyday and do the corresponding maintenance work.

2.日检责任人 Daily inspection person

以起重机操作者司机为主，安全保全工为辅，司机不能修理的工作应及时转告保全修理工进行修理维护。

Depend on the operator as well as the maintenance man, if the driver can't repair should timely tell the security mechanic for repairs and maintenance.

3.日检的目的 Daily inspection purpose

是确保起重机能正常安全地进行运转作业。To ensure the crane run safely in normal operation.

4.日检的主要工作内容 Daily inspection's primary coverage.

（1）作业前的日常检查工作 Daily inspection before work

① 检查工作应由司机负责，修理工作应由专职人员和保全工负责。

The driver is responsible for inspection work, full-time staff and maintenance man should be responsible for the repair work.

② 观察作业范围内是否有障碍物，运输通道是否通畅；如有问题应及时处理方准开车；

Observe operation within the scope of obstacles, whether the transport channel is obstructed, if any problem should be handled in time square quasi diving.

③ 轨道上是否有油污、水污物、是否有障碍物，在室外时轨道上是否有泥水、冰雪等；将污物、障碍物等清除方准开车工作；

Check whether there is oil pollution, water contamination, on the track, whether

④ 三维空载动作是否正常；如不正常及时修理；

Check whether the three d racing action is normal, if not, repair timely.

⑤ 制动器等安全装置动作是否敏捷可靠；如有问题及时修理；

Whether the brakes and other safety devices motion is agile and reliable, if there is any problem, repair immediately.

⑥ 取物缠绕装置可控制系统是否正常等，如不正常应及时修理；

Whether the fetch winding device works normal, if not, repair timely.

5.作业中的日检 Daily inspection.

在运转作业中，司机应随时注意观察是否有以下不正常的故障现象，如有应立即停止作业，及时

通知专业检修人员进行抢修，正常后继续作业。

During operation, the driver should pay attention to see if there are abnormal failure phenomenon, stop to work, and timely notify the professional maintenance personnel for repair, and continue to work after normal.

① 运转中是否有异常震动、冲击、摆动和晃动等；

Whether there are abnormal vibration and impact during operation, shaking and swinging.

② 运转中是否有异响或噪声过大现象；

Whether there is a sound or noise during operation

③ 运转中是否有较严重的下滑溜钩现象；

Whether there is a more serious slippery under the hook during operation.

④ 运转中是否有较严重的打滑溜车现象；

Whether there is a more serious hit slippery car during operation.

⑤ 运转中是否有较严重的歪斜啃轨故障；

Whether there is serious skewed gnaw rail failure.

⑥ 运转中是否有其他异常现象等。

Whether there is other abnormal phenomenon in operation, etc.

6.作业结束后的日检 Daily inspection after work.

作业结束后司机有责任作以下常规的安全检查，做好口头记录或书面将问题向接班司机做交代，需要维修的让接班人通知专业检修人员进行及时修理，正常后方准开车作业。

The driver is responsible to do the regular safety inspection after work, do the oral or written records to the replaced driver, and inform the maintenance personnel for repair in time to ensure the normal driving.

① 检查各连接固定部位是否有松动；

Check if there is any loose in the fixed connections.

② 查看电机、电器、减速器等是否有过热现象；

Check if there is over heating of the motor, electric appliance, gear reducer, etc.

③ 查看减速器和其他有油封处是否有漏油现象；

Check if there is a leak phenomenon of the reducer and other oil seal.

④ 查看钢丝绳、车轮等裸露磨损件的磨损情况；

Check if there is the wear exposure conditions of the wire rope, wheel and other wear parts.

⑤ 查看电器控制系统是否有连电、漏电等隐患等；

Check if the electric appliance control system has leakage etc.

⑥ 查看起重机机体是否有锈蚀情况；

Check if the crane body has corrosion conditions.

① 对室外起重机要查看机体上是否有积水、积雪、结冰等状况。

Check if there is water , snow, ice on the outdoor crane body.

7.当日维护工作 Working day maintenance work

① 司机应做的维护保养工作 The driver should do the maintenance work.

A.经常擦拭司机室玻璃;

Clean the cab's room windows.

b.经常打扫司机室、走台、梯子、、等处污物灰尘;

Clean the dust in cab's room ,walkway, ladder.

c.经常清除电机、电器、减速器、和轴承座等处的灰尘污物;

Clean the dust in the motor, electrical equipment, reducer, and the bearing block.

d.经常清除轨道上的污物与冰雪等。

Clean the dirt with snow and ice on the tracks.

② 司机发现以下问题应及时通知专业检修人员进行检修

Driver should notify the professional maintenance personnel the moment he find the following problems.

a.裸露并有相对运动摩擦处，按时涂油和清除污物;

Bare and relative motion friction, oil and remove dirt on time.

b.有漏漆、脱漆处及时补漆;

Paint timely when there are missing paint, paint touch-up.

c.在相关部位增加防雨罩; Increase cover in the related area.

d.电气电路部分要注意防止电线电缆老化、龟裂，以防漏电、连电等触电事故。

As for the electric circuit part, more attention should be paid to prevent the wire and cable, chapping, in case of leakage, even the electric shock accident.

（二）葫芦式起重机的月检 Monthly inspection of the hoist crane.

1.项目分类 Project classification

葫芦式起重机的月检，希望能够根据安全方面的重要性，保证安全方面的难易，使用频繁程度的大小，零部件是否损耗，来规定出各部分的检查周期，如下表1示对检查内容做如下分类：

Monthly inspection of the hoist crane, it is hoped that according to the importance of the security, the using frequency, the wastage of the parts to rule out the inspection period of each part.

表1 检查分类 Table 6 inspection classification.

分类 Classification	分类标准 Classification principle	应用 Application
A	维护方面的重点检查内容 The focus of the maintenance check	每周检查一次 Once a week
B	安全方面的重点检查内容 The focus of the security check	每三个月检查一次 Once for three months
C	磨损破坏程度较小的部分 Small portions of wear and damage	每六个月检查一次 Once for half a year

对葫芦式起重机具有专门技术知识的工程技术人员或专职负责安全技术人员，根据使用者提供的情况进行的检查，检查记录必须留档保存三年以上。

The specialized technical knowledge engineering or technical personnel of the hoist crane, according to the situation of users to provide inspection, inspection records must be kept stored more than three years.

在月检中主要是依据目测、听觉或依靠手感等直观办法，因此在检查时必须取下外罩进行检查，随时确定安全程度、磨损状况和运转状态，同时进行必要的维护保养。

In the monthly inspection, we usually use the visual, auditory, or rely on intuitive method such as touch, so when in inspection, take off the cover and determine the safety degree, the condition of wear and running condition at any time, and at the same time to make the necessary maintenance.

（三）月检项目与内容 Monthly inspection items and contents

项目与内容如表2的规定，对各种类型的葫芦式起重机不一定表2所列的项目都适用，可以按各自的具体结构形式、性能特征、适用范围有所取舍和增减，按照适合于各自特点有关的项目主动地进行检查、维护与修理。

Monthly inspection items and contents such as the provision of table 2 for various types of hoist crane may not suit all, we can use the specific structures, performance characteristics and applicable scope to choose, inspect ,maintain and repair.

表2 月检项目及内容Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project	月检内容及要求 Monthly inspection content and requirement
1	B	整机噪声检测 Machine noise testingt	用声级计（分贝仪）检测起升，下降，运行时的噪声，声级计相当于听诊器，可以通过测量噪声的大小来察看和分析机构是否有异常 Use the sound level meter to test the lifting and falling operation noise, the sound level meter equal to the stethophone, which can tell whether there is abnormality through the noise.
2	B	整机性能 The whole crane performance	满载起升异常 检查 Lifting abnormity inspection with full load 在满载起升时目测主梁或吊载是否有异常震动，倾听各机构是否有异常声响，在可能的条件下手触各齿轮箱、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 See if the girder or hoist has abnormal vibration when in full load lifting, and listen if all structures has abnormal sound, and if possible, touch the gear box and motor, to see if there is abnormal fever, then analyses the reasons and exclude the anomalies.
3	B	满载下降下滑 检查 Full load drop in check	满载下降中停车，观察下滑量是否太大，如有下滑量太大，应及时调整起升制动器间隙，直到刹车正常为止 Suspend during the full load, to see if the decline in volume is too big, if so, adjust the hoisting brake until the brake is normal.
4	A	整机性能 The whole crane performance	葫芦小车运行检查 Check for the hoist trolley running 观察葫芦运行小车在横行中是否有爬坡吃力、运行打滑、车轮悬空、啃轨、甚至有轮缘爬轨等现象。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 if the gourd run car has any difficulty in climbing, running in the transverse skid, dangling, gnaw rail wheel, even the flange climb. If there has check whether the girder rigidity is poor, the rail surface oil is dirty, or the running precision manufacturing and the assembly car is poor and so on.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project	月检内容及要求 Monthly inspection content and requirement
5	A	起重机 (大车)、 制动检查 Crane air brake test	检查起重机在运行和制动时，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器间隙，最好由同一个人调整分别驱动的两个制动器，因手感一样 Check whether there is obvious sync phenomenon during running and braking, if there is , adjust the cart running brake clearance, it's better done by the same person, for the same feel.
6	A	起重机运行 中的检查 Check in crane operation	察看起重机在运行中是否有异常蛇行、扭动、侧向滑移、歪斜跑偏、啃轨道、异常声响等现象，做好记录，查找原因 Check whether there is abnormal in the operation of the crane in sinusoidal, twist, lateral sliding, skewed, wandering, gnaw rail, make records and look for reason.
7	B	整机性能 The whole crane performance	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 brake acts flexible, and sliding distance is too large due to brake failure
8	B	检查起重机 车轮的着力点差 (三条腿现象) Wheel under pressure inspection	观察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 wether there is only three legs.
9	B	渗漏检查 Leakage check	观看起升减速器，大小车运行减速器是否有渗、漏现象 Check whether there are leakage or seepage in the running of the trolley traveling.
10	A	整机绝缘性能 检查 Insulation performance of complete machine inspection	用500V兆欧表分别测量各机构的主回路，控制回路（低压控制除外）常温绝缘电阻应 $\geq 1.0M\Omega$ Check main circuit and control circuit separately with 500V megohmmeter. Insulated resistor at room temperature should be more than $1.0M\Omega$ in control circuit.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
11	C	整机性能 The whole crane performance	表面外观质 量检查 Inspection of the surface appearance quality.	察看起重机各部分表面是否有锈蚀、脱漆、 损伤等缺陷 Check whether there are rust ,painting removal and other damages on the surface of the crane.
12	A	起重机运 行轨道 Crane traveling track	运行范围内 的检查 Inspection of the operation scope.	检查起重机整个运行范围是否有障碍物，起 重机与土建侧面和顶面的间隙是否太小，与 电灯、配线管及其他土建上物品是否有接触 的危险，起重机与带电电源裸铜滑线是否靠 近的太近 Check whether there is any obstacles during the whole traveling range of crane, whether clearance among crane and side and top of civil construction is too small, whether there is any dangerous that contact with lights, wiring tubes and other things, whether crane is too close to bare copper.
13	A		运行止档 （阻进器）检查 Inspection of the resistance	阻进器是否有变形、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 固定式时，焊缝是否有龟裂 Check whether travel stop-gear has deformation or damage, whether joint bolt is tight and whether the welding line has slight crackle.
14	C		轨道变形检查 Rail deformation inspection	从上下、左右方向检查整根轨道是否有异常 弯曲变形已超过轨道安装技术要求 Check whether there is abnormal deformation for the whole rail, which exceed the requirements of installation technology.
15	C		轨道安装检查 Track installation inspection	检查轨道接缝处是否有变形，固定螺栓是否松 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.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
16	C	起重机运行轨道 Crane traveling track	轨道磨损检查 Rail wear inspection	检查轨道踏面和侧面，工字钢轨道翼缘踏面和翼缘端部是否有局部严重磨损部分或出现剥落和变形等现象 Check whether thread and end of flange of I-steel rail has severe wear and tear, flaking or deformation.
17	C	主梁与端梁 Main girder and end carriage	主端梁焊缝检查 Main beam weld inspection	查看主梁、端梁上的焊缝是否有裂纹 Check whether there are crackles of welding line of main girder and end carriage.
18	C		主梁，磨损与变形检查 wear and tear and deformation of main girder	检查主梁工字钢轨道翼缘踏面和侧段是否有严重磨损部分，翼缘是否有塑性变形（翼缘下塌现象） Check whether thread and end of flange of I-steel rail has severe wear and tear and whether flange has plastic deformation.
19	C		主、端梁连接检查 Main and beam connection 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 girder and end carriage adopt bolts to connect.
20	C		主梁上轨道检查 Rail on the main girder inspection	对于主梁采用支撑型轨道时，要检查轨道是否有异常弯曲变形；检查轨道压板连接螺栓是否有松动；检查焊缝是否有裂纹 Check whether there is abnormal deformation, whether joint bolts have been loosened and sealing has crackles.
21	B		检查主梁上的运行止档 Check the operation of the main beam stopper	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 cars on the main girder running stop occur deformation, damage, loss risk, if there' s any loose for connection bolts; if there is a crack of weld.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
22	C	主梁与端梁 Main girder and end carriage	检查主、端梁上的缓冲器 Check the buffer on the main and side beam	安装在主梁止档上和端梁端部上的抗撞击缓冲器及连接螺栓不得有松动，缓冲器不得有龟裂、破损、裂纹等缺陷 Joint bolts of knocking protection buffer that installs on stop-gear of main girder and end of end carriage should not has been loosened and crackles of buffer are not allowed.
23	B	电动机 Motor	电动机发热检查 Motor heat checking	检查起升、运行电机是否有过热现象，如果有应分析原因是超载过多还是电压波动（压降）太大，或者是起制动过于频繁，制动器间隙太小，制动轮与制动环（片或块）之间有异常摩擦等 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.
24	B		电动机异常检查 Motor abnormality inspection	检查起升、运行电机是否起动勉强、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接线等有虚接、断裂等原因 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.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
25	C	制动器 Brake	磨损状态检查 Worn condition inspection	对于锥形制动电动机，应打开电机罩观察，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太大，窜动量大证明，磨损严重，窜动量不得大于4mm，应调整窜动量为1.5mm，否则应报废更换制动环；对于平面制动器、瓦块制动器材料，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 or tile brake, the worn proportions amounting to 50% of original thickness should be replaced.
26	C		刹车性能检查 Brake performance inspection	检查起升机构中制动器在重物下降时是否刹不住车下滑太大；有上述现象时，应及时调整制动器的制动性能 Check lifting brake whether there is unreliable brake or sliding distance is too large, if exists above phenomena, adjust the performance of brake.
27	C		异常检查 Exceptional checking	检查各制动器锁紧螺母（锥形制动器）是否有松动；电磁瓦块制动器连杆机构各铰接部分磨损状态，弹簧是否有松动；是否有制动时发出尖叫声，如有尖叫声应检查制动轮与制动环（片或块）之间是否有相对摩擦或接触不良等缺陷，弹簧是否有塑性变形 Check each cone type brake whether the nuts has been loosened, each hinge part of linkage mechanism of electromagnetic brake whether there are severe worn, whether spring is loose. When brake, there is scream, check whether there are defects like relative friction between brake ring and brake piece or bad contact, whether spring is deformation.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
28	C	减速器 Reducer	检查齿轮传动的 声响 Gear drive sound inspection	检查各机构传动齿轮的声响是否有异常，是否异常声响是有缺油润滑不良、齿轮轴承磨损严重、齿面有磕碰外伤、齿轮加工和装配精度造成的 Check whether gear drive sound is abnormal and analyze the reasons that lie in bad lubrication or severe wear and so on.
29	C		异常检查 Exceptional checking	检查各减速器连接或固定螺栓是否有松动，是否有漏油现象；起升减速器箱体是否有被吊钩偏摆砸裂现象（起升限位器失灵造成） Check whether each reducer connection and fixed bolts has been loosened and whether there is a phenomenon. Check whether lifting reducer box has crackles caused by hook deflection. (or by lifting limiter failure)
30	C	卷筒装置 Drum device	磨损状态检查 Worn condition inspection	查看卷筒绳槽磨损状态，是否有异常磨损 Check whether there is wear and tear of rope groove for drum
31	C		卷筒外壳 检查 Shell of drum inspection	查看卷筒外壳是否有外伤（当起升限位器失灵最容易造成吊钩滑轮顶伤外壳） Check shell of drum whether there is damage. (due to lifting limiter failure to cause the off-pulley of hook.)
32	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.
33	C		异常检查 Exceptional checking	检查卷筒上压绳板是否有松动，卷筒连接螺栓是否有松动，导绳器连接螺栓是否有松动，导绳器的导向滑块移动是否顺利 Check whether the plywood and joint bolts of drum and joint bolts of rope guide have been loosened and whether the slipper of rope guide moves successfully.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project	月检内容及要求 Monthly inspection content and requirement
34	A	钢丝绳 Wire rope	断丝检查 Broken wires inspection 观察钢丝绳是否有断丝现象，当断丝在一个 导程之内断丝数超过钢丝绳10%应报废 Check steel wire rope whether there is phenomenon like broken wires. When the number of broken wires are more than 10% of total numbers of steel wires, the steel wire rope should be rejected.
35	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 reduction after wire rope worn should not exceed 7% of nominal diameter, or the wire rope should be rejected.
36	A		变形检查 Deformation inspection 因斜吊造成的挤伤变形或出现扭结的钢丝绳 应报废 Steel wire rope distorted or twisted because of lifting slant should be rejected.
37	B		腐蚀检查 Corrosion inspection 检查钢丝绳外表不得有腐蚀现象，外表应持 有一定量的润滑油，但不应有过多的污物 Surface of steel wire rope should not have tarnishing phenomenon and should be covered with lubricant oil but not too much dirt.
38	B		导绳器检查 Rope guider inspection 查看钢丝绳在空中（特别是四绳以上者）是 否有打花扭转现象，这是由于钢丝绳未能在 放松状态进行缠绕造成的 Observe whether wire rope has been twisted(especially more than four wire rope), because the steel wire-rope has not been slackened when binding the rope.
39	A	钢丝绳 Wire rope	异常检查 Exceptional checking 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、平滑轮接触部位不 得有缺油、啃绳现象 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.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
40	A	吊钩与滑轮 Hook and pulley	裂纹检查 Crack checking	吊钩、滑轮和滑轮槽均不得有异常的磨损 There should be no harmful crackles of hook, block or shell of block.
41	A		磨损状态检查	吊钩、滑轮和滑轮槽均不得有异常的磨损 There should be no harmful crackles of hook, block or shell of block.
42	A		异常检查 Exceptional checking	查看滑轮是否有破损，吊钩螺母是否有未锁紧的危险，外壳连接螺栓和挡板和挡轴板固定螺栓是否有松动危险，均衡滑轮固定螺栓是否有松动等 Check whether the block has damage, bolts of hook are tight and the joint bolts are loosened, fixing bolts of balanced pulley are loosened.
43	A		变形检查 Deformation inspection	吊钩钩口不得有异常变形 Hook mouth can not have abnormal deformation
44	C		回转检查 Rotation inspection	检查吊钩、滑轮能否灵活回转 Check whether the hook, the pulley rotate flexible.
45	C	车轮 Wheel	磨损检查 Worn condition inspection	车轮踏面及轮缘内侧表面均不得有异常磨损 Wheel tread and the wheel rim on the inside surface shall not have abnormal wear and tear.
46	C		裂纹检查 Crackles inspection	车轮表面不得出现异常裂纹及破损 wheel surface shall not be abnormal cracks and breakage.
47	C	传动轴 与联轴器 Drive shaft and coupling	变形检查 Deformation inspection	检查传动轴是否有变形、震动等现象 Check for deformation and vibration transmission shaft.
48	C		支撑检查 Supporting inspection	检查传动轴支座螺栓是否有松动、供油情况等 Check if there is any loose for the shaft bearing bolt, oil supply situation, etc.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
49	C	传动轴 与联轴器 Drive shaft and coupling	检查联轴器的 工作状态 Coupling inspection	查看联轴器的磨损状态，固定状态，运转状态是否有异常 Check whether there is any abnormal phenomenon of worn condition, fixed condition and running condition of coupling
50	C	司机室 Cab	固定状态 检查 Fixed condition inspection	检查司机室固定连接螺栓是否有松动，采用焊接连接时焊缝是否有裂纹 Check whether the joint bolts of Cab have been loosened and welding line have crackles.
51	C		工作状态检查 Working condition inspection	通风取暖照明等是否正常合理，司机室是否摇晃严重 Check whether aeration, illumination or warming is reasonable and Cab shakes severely.
52	C	标牌 Sign plate	检查醒目度 Conspicuity inspection	观察吨位牌位置是否合理、清晰醒目 Check whether the location of tonnage plate is reasonable and obvious.
53	C		检查固定状态 Fixed condition inspection	吨位牌、铭牌固定螺栓或铆钉是否有松动 Check whether bolts or rivets of tonnage plate and nameplate are loose.
54	B	电源引入 装置 Power source device	馈电裸滑线安全 检查 Bare slide-wire safety inspection	检查起重机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 in accordance with the relevant regulation requirement and whether there is relevant safety protection measure.
55	B		滑触面检查 Surface of slide-wire inspection	查看滑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.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
56	B	电源引入装置 Power source device	绝缘装置 检查 Insulation device	检查滑线的支撑绝缘子不得有破损，连接不得有松动 Damage of supporting insulator of slide wire is not allowed and connection part should not be loosened.
57	C		软缆引入装置 检查 Cable introducing device inspection	当电源引入采用软缆引入时，应检查支撑软缆的拉紧钢丝（或钢丝绳）的磨损状态和紧张状态 Check the worn state and tight state of strained steel wire rope supporting cable when adopts cable introducing device.
58	C		滑触线安全标志检查 Slide wire safety mark inspection	检查供电主滑线（电源滑线）在非导电接触间是否涂有红色油漆安全标记，在适当位置是否有安全标志，或是否有表示带电的指示灯 Check whether there is safety mark on non-conductor side connection surface of slide-wire and whether there is indicator light with electricity.
59	C	集电器 Current collector	磨损状态 检查 Worn condition inspection	检查集电器滑轮、销轴或吊线环的磨损状态，不得有异常磨损 The unusual wear and tear of block of current collector, pins or bridle ring is forbidden.
60	C		固定状态 检查 Fixed state inspection	集电器与电缆的连接螺栓不得有松动，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.
61	B		集电滑轮回转 状态检查 Block turning state inspection of current collector	集电器滑轮应灵活而平稳的回转，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 difficulty.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
62	C	集电器 Current collector	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.
63	B	机内接线 Wiring	机内接线外表检查 Wiring surface inspection	从集电器至电动机和各电器的配线称为机内接线。机内连线包括橡胶软缆配线，所有的配线不得有外伤 Built-in wiring is wired from collector to motor and each electrics. wiring includes rubber cable and electrical wire, outer damage is forbidden.
64	C		固定连接检查 Fixed connection inspection	所有的电器固定连接螺栓不得有松动，所有的机内配线固定连接螺栓不得有松动，配线管在机体上的固定要牢固 All joint bolts of electric and wiring should be tight. Wiring tube fixed on the body should be strong.
65	B		软缆移动检查 Cable remove inspection	检查作为电源引入的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.
66	C		扁电缆伸缩性能检查 Extend-retract performance of flat cable inspection	检查扁电缆是否因材质或老化伸张收缩困难 柔软性是否变坏 Check whether extend-retract performance of flat cable is low, flexibility is bad.
67	B	电磁接触器 Electromagnetic contactor	触点及铁芯检查 Contact points and slug inspection	打开电磁开关箱，查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.
68	C		配线固定检查 Wiring fixed state inspection	检查各配线固定螺钉是否有松动 Check whether each wiring fixed bolt is loosened.

表2 月检项目及内容 Table2 Monthly inspection content and requirement

序号No.	分类 Classification	月检项目 Monthly inspection project		月检内容及要求 Monthly inspection content and requirement
69	A	电磁接触器 Electromagnetic contactor	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.
70	A	手电门 Pendant control	外观检查 Appearance inspection	按钮标志应明显，手电门开关盒无损伤 Button mark should be obvious and there is no damage out of the pendant switch.
71	A		故障异常检查 Troubles abnormity inspection	手电门悬挂软缆上下端连接部位附近不得出现破损，联锁应无故障，内部绝缘要安全可靠，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.
72	A	起升限位开关 Lifting limiter switch	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.
73	B		触点检查 Contact point inspection	检查开关的触点是否有损伤和破损状况。损伤严重、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.
74	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.
75	A		限位位置检查 Spacing position inspection	吊钩滑轮组起升至上限位置，起升限位开关应能立即动作，此时吊钩滑轮组最高点距离卷筒最低点距离应保证有150mm以上的距离 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 150mm.

（四）葫芦式起重机的年检 Hoist crane yearly inspection

葫芦式起重机的年检是由专业维护人员起重机保全工以年为周期的定期检查与维护，在日检月检维护的基础上，根据葫芦式起重机故障多少与轻重，可以量情自行确定年检周期为一年或两年。年检是一次性的全面检查、试车，对主要机械部分要进行拆检，对出现有较严重的磨损、疲劳变形的部分要做具体尺寸检测，对于达到了使用极限（报废标准）或预计到下一次年检日期内有可能达到磨损报废使用极限危险的部分必须及时更换修理，同时做好必要的维护。

Hoist crane yearly inspection is done on the basis of the daily and monthly inspection by the professional person, according to the hoist crane and how much weight, you can feel to determine annual inspection period for a year or two. The yearly inspection will check the wastage and deformation size. If the scrap is to the limit dangerous parts, must repaired timely and do the necessary maintenance.

年检是针对葫芦式起重机设备本身，虽然在以下的年检项目中为具体列出土建检查项目，但架设葫芦式起重机轨道的承轨梁、屋面梁和支腿立柱等土建设施，因地基下沉、台风、地震等造成土建设施变形、松动等，势必将直接影响运行轨道的几何精度，以至于影响起重机的运行性能，所以年检中应同时检查承轨梁、屋面梁和立柱等土建设施是否有异常现象。

Annual inspection for the hoist crane equipment itself, the Order of the rail beams, roof beams and outrigger column civil facilities, specific civil engineering inspection items are listed in the following annual inspection project, but the erection of the hoist crane rails because of the foundation, typhoons, earthquakes and other civil facilities deformation, loose, bound to directly influence the geometric accuracy of the orbit that affect the operating performance of the crane, so the annual inspection should also check the order of the rail beams, roof beams and columns and other civil facilities whether there are anomalies.

年检的具体项目如下表所示：

The annual inspection of specific projects are as shown.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items			检修标准 Requirements
运行 轨道 Rail	起重机运 行轨道状态 Rail running state	1	轨道踏面清洁状态 Clearance state of rail thread 不得有灰尘，铁屑，也不得有油污和污水 No attached greasy dirt or amount of dirt
		2	轨道跨度检测 Rail span inspection 支撑型轨道 Bearing type rail $S \leq 10\text{m}; \Delta S = \pm 3\text{mm}$ $S > 10\text{m}; \Delta S = \pm [3 + 0.25(S-10)]\text{mm}$ 悬挂型轨道: suspension type rail $\Delta S = \pm 5\text{mm}$ 注: S—跨度 (m) ; ΔS —跨度偏差 Note: S--span(m), ΔS --tolerance of span
		3	轨道踏面斜度 Inclination of rail tread $\leq 1/1000$
		4	同一截面两轨道标高差 Difference of two rails elevation of same section $\leq s/1000$
		5	同一侧轨道支撑点标高差 Difference of same side rail bearing elevation $\leq L/1000$
		6	轨道接缝间距 Rail juncture distance 接缝间距 $\leq 2\text{mm}$ Joint spacing $\leq 2\text{mm}$
		7	轨道裂纹与变形检查 Crack and deformation of rail inspection 轨道不得有裂纹和变形（塑性） Crackles and plastic deformation are not allowed
		8	轨道接缝错位 Rail juncture displacement 踏面上下、左右相错 $\leq 1\text{mm}$ Tread down, left and right sides are wrong
		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 支撑型轨道: 磨损量 $\leq$ 原尺寸10% 悬挂型轨道: 踏面 $\leq 10\%$; 宽度 $\leq 5\%$ Worn proportions of bearing rail is no more than 10% And the suspension rail the tread $\leq 10\%$; width $\leq 5\%$
		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.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
起重机 桥架 Crane bridge	主梁 Main girder	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%；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-titled angle of main beam inspection	上拱度 $\Delta F = (1/1000 \sim 1.4/1000) s$ camber $\Delta F = (1/1000 \sim 1.4/1000) s$
		15	主梁旁弯检查 Bending of main beam inspection	旁弯值 $\Delta F_p \leq s/2000$ Bending $\Delta F_p \leq s/2000$
		16	主梁葫芦运行轨道的磨损 状态检查 Worn condition inspection of electric hoist traveling rail	对于主梁工字钢灯等轨道，踏面磨损量 ≤ 原尺寸10%；宽度磨损量 ≤ 原尺寸5%； Worn thread proportion should be no greater than 10%, and the worn width proportions should be greater than 5 % for I-steel rail.
		17	主梁工字钢轨道翼缘局部 弯曲变形 Deformation of I-steel flange	工字钢主梁其承载翼缘不得有明显的下塌 变形（塑性变形） Flange of I-steel should not have obvious plastic deformation.
		18	起重机运行轨道固定安装 检查 Installation rail inspection	采用螺栓固定连接轨道时，螺栓不得有松 动；采用焊接固定轨道时，焊缝不得有裂纹 The rails are connected by bolts, which should not be loose, fixed rail through welding, welding seam should not have crackles.
	端梁 End carriage	19	端梁外观质量检测 Appearance quality inspection of end carriage	不得有外伤和异常变形；锈蚀量 ≤ 原材料 厚度的10%；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

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
起重机 桥架 Crane bridge	端梁 End carriage	20	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.
		21	基距偏差 The deviation degree of wheel distance	$K \leq 3m; \Delta K = \pm 3mm$ $K > 3m; \Delta K = \pm K/1000mm$ （K—基距； ΔK —基距偏差） (K--base distance, ΔK —deflection of base distance)
	起重机 运行机构 Traveling mechanism	22	运行电动机异常检查 Traveling motor inspection	电动机不得有启动吃力勉强，噪声太大或有异常声响、异常发热等 The start of motor should not be too grudging, too noisy and abnormal sound are forbidden.
		23	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时应及时报废： Reject when any of the following has occurred: 裂纹，制动环或制动片等衬料磨损量达原厚度50%；弹簧出现塑性变形；小轴或轴孔直径磨损量达原直径的5% Wear of Crackles, brake ring or brake block reach the 50% of original thickness, spring deformation, wear of small shaft or diameter of axle hole reach the 5% of original diameter. 制动轮的制动摩擦面，不应有妨碍制动性能的缺陷或沾染油污 当制动轮轮缘厚度磨损达原尺寸厚度的50%时；轮缘凹凸不平达1.5mm时应报废 Brake friction surface of brake wheel should not have the faults or oil stains. When wear of brake wheel flange thickness reach 50% original thickness, and flange roughness reach 1.5mm ,they should be scrapped.
		24	运行减速器安装状态 Installation of traveling reducer	固定连接螺栓不得有松动 Joint bolt should be tight

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
起重机 桥架 Crane bridge	起重机 运行机构 Traveling mechanism	25	运行减速器外观检查 Appearance of traveling reducer	外壳不得有外伤、破损 The shell should be no damage
		26	运行传动齿轮质量检查 Gear quality inspection	齿轮出现下列情况之一应报废： 齿轮出现裂纹；齿轮出现断齿；齿面点蚀 损坏量达啮合面的50%；或深度达原齿厚 的15%，其他级啮合齿厚磨损达原齿厚的 25%，开式齿轮达30% Eject when any of the following has occurred; There have been crackles on the gear teeth; The corrosive-pitting surface amount to 30% of the mating surface and the depth amounts to 15% of the origin; 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%.
		27	运行减速器密封检查 Traveling reducer sealing inspection	不得有渗漏油现象 No leakage
		28	键连接检查 Key connection inspection	键及键槽不得有松动、变形 The key can not loose and deformation.
		29	轴的磨损状态 Worn condition of shaft	键磨损量 ≤ 原轴颈2% Diameter difference of wheel thread is no more than 2%
		30	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 grease, there should be no damage or crackle
		31	油封的检查 Oil seal inspection	不得有老化变质 There shall be no aging.
		32	齿轮联轴器检查 Gear coupling inspection	出现下列情况之一应报废： Reject when any of the following has occurred. 裂纹crackles 断齿broken gear tooth 齿厚的磨损达原齿厚的20% The worn of rim thickness amounts to 20% of original thickness.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
起重机 桥架 Crane bridge	起重机 运行机构 Traveling mechanism	33	车轮表面质量的检查 Surface of wheel quality inspection	出现下列情况之一的应报废： Reject when any of the following has occurred. 裂纹crackles 轮缘厚度磨损达原厚度50% The worn wheel rim thickness amounts to 50% of the original thickness. 轮缘厚度弯曲变形达原厚度20% Deflection of flange thickness reach 20% of original thickness. 踏面厚度磨损达原厚度15% Wheel thread thickness proportions amounts to 15% of original thickness. 当运行速度 $\leq 50\text{m/min}$ 时，圆度达1mm When traveling speed $\leq 50\text{m/min}$, roundness reach 1mm. 当运行速度 $> 50\text{m/min}$ 时，圆度达0.5mm When traveling speed $> 50\text{m/min}$, roundness reach 0.5mm.
		34	两侧车轮直径差 Difference of both sides wheels diameters	踏面直径 $\leq 1\%$ Diameter difference of wheel tread $\leq 1\%$
		35	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.
		36	轴承检查 Bearing inspection	不得有破损或裂纹 There should be no damage or crackle.
	桥架 bridge	37	跨度偏差 ΔS Deviation degree of span	$S \leq 10\text{m}; \Delta S = \pm 2\text{mm}$ $S > 10\text{m}; \Delta S = \pm [2 + 0.1(S-10)]\text{mm}$ 且 $\Delta S_{\text{max}} = 10\text{mm}$
		38	桥架对角线差 Diagonal difference of loading bridge	$K \leq 3\text{m}; S1-S2 \leq 5\text{mm}$ $K > 3\text{m}; S1-S2 \leq 6\text{mm}$
		39	车轮着力点高度差 Δh Height different of wheel forced on	$S \leq 10\text{m}; \Delta h = \pm 2.5\text{mm};$ $10 < S \leq 15\text{m}; \Delta h = \pm 3.5\text{mm};$ $15 < S \leq 20\text{m}; \Delta h = \pm 4.5\text{mm};$ $20 < S \leq 25\text{m}; \Delta h = \pm 5.5\text{mm};$ $25 < S \leq 30\text{m}; \Delta h = \pm 6.5\text{mm};$ $30 < S \leq 35\text{m}; \Delta h = \pm 7.5\text{mm}$

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电动葫芦 Electric hoist	电动机 Motor	40	电动机温升检查 The rising temperature of motor inspection	对于E级绝缘电机温升不得超过115℃ 对于F级绝缘电机温升不得超过155℃ The rising temperature for E grade insulation motor should be no more than 115℃ The rising temperature for F grade insulation motor should be no more than 155℃
		41	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 Brake	42	制动器检查 Brake performance inspection	制动器应安全可靠，刹车灵敏 Brake performance should be safe and reliable and act flexibly.
		43	制动器零件质量检查 Component of brake quality inspection	出现下列情况应报废： Reject when any of the following has occurred: 裂纹Crackles 制动衬料（平面制动环、锥形制动环或瓦块制动片）厚度磨损达原厚度50% Worn proportion of brake ring amounts to 50% of original thickness. 弹簧（螺旋式、蝶形弹簧等）出现塑性变形；销轴或轴孔直径磨损达圆直径的5% The spring has plastic deformation. Worn proportions of axis hole diameter amounts to 5% of original diameter.
		44	制动轮质量检查 Component of brake quality inspection	制动轮的制动摩擦面，不应有妨碍制动性能的缺陷或沾染油污 Brake friction surface of brake wheel should not have the faults or oil stains. 出现下列情况之一应报废： Reject when any of the following has occurred 裂纹crackles 起升制动轮轮缘厚度磨损达原厚度40%，运行制动轮达50% The brake ring worn thickness is 40% of original thickness, wear of the running brake wheel reach 50% of original thickness.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电动葫芦 Electric hoist	减速器 Reducer	45	安装状态检查 Installation state inspection	连接螺栓不得有松动 Joint bolt should not be loose.
		46	齿轮质量检查 Gear quality inspection	出现以下情况应报废： Reject when any of the following has occurred 裂纹crackles 断齿the gear teeth have broken. 齿面疲劳点蚀损坏达啮合面50%，或深度达原齿厚的10% The corrosive-pitting surface amount to 50% of the mating surface and the depth amounts to 10% of the origin. 齿轮齿厚磨损达原齿厚的： 第一级起升齿轮为10%，运行齿轮为15%，其他级齿轮起升为20%，运行为25%，开式齿轮为30% The permitted worn proportion of first-level gear amounts to 10% of the origin, and others amounts to 20%, traveling gear amounts to 25%. The exposed gear amounts to 30%.
		47	减速器外观检查 Exterior inspection of reducer	不得有破损缺陷 No defect like damage
		48	密封质量检查 Sealing quality inspection	不得有渗漏油现象 No leakage.
		49	异常检查 Anomaly inspection	不得有异常声响，异常发热 Abnormal sound and abnormal heating are forbidden.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电动葫芦 Electric hoist	制动器 Brake	50	减速器其他零件检查 Reducer inspection	键连接不得有松动，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 $\leq$ 原轴颈1% The worn proportion of gear shaft should be less than 1% the original shaft journal. 其他轴的磨损量 $\leq$ 原轴颈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 Aging and metamorphosis are forbidden. 油封不得有老化变质，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.
	卷筒装置 Drum device	51	钢丝绳尾端固定状态检查 Fixed condition at the end of steel wire rope inspection	卷筒上钢丝绳尾端压板螺栓不得有松动和异常 Pressing plate at the end of steel wire rope should not be loosened.
		52	导绳器工作状态检查 Rope guider working state inspection	当空钩下降时，钢丝绳应能自由地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.
		53	卷筒检查 Drum inspection	出现下列情况之一应报废： 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 Pulley	54	滑轮槽外观检查 Pulley groove appearance inspection.	滑轮槽应光洁平整，不得有损伤钢丝绳的缺陷 Block groove should be smooth and there should be no limitation.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电动葫芦 Electric hoist	滑轮 Pulley	55	铸造滑轮质量检查 Block rejection standards	出现下列情况之一应报废： 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. 其他损害钢丝绳的缺陷 Any defects damage the wire rope.
	钢丝绳 Wire rope	56	钢丝绳质量检查 Wire rope quality inspection	钢丝绳报废的具体要求可参考GB 5972《起重机械钢丝绳报废实用规范》，钢丝绳的安全程度检查与报废内容主要有以下几个方面 Wire scrap specific requirements can reference GB5972 < Scrap wire rope of hoisting machinery and practical specification > , the safety degree of the wire rope inspection with scrap content basically has the following several aspects. 断丝的性质与数量。绳端断丝；断丝的局部聚集；断丝的增加率；绳股断裂；绳股损坏引起的绳径减小；弹性减小；外部和内部磨损；外部和内部腐蚀；变形；由于热或电弧造成的损坏 The nature and number of the wire. The rope broken wires, Broken wires at the end of rope, Broken wires get together partly. The bounce is reduced. Exterior and interior wear and tear. Exterior and interior corrosion. Deformation. Damage because of heating and arc.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电动葫芦 Electric hoist	吊钩 Hook	57	吊钩质量检查 Hook quality inspection	出现下列情况之一的应报废： Rejected 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 15% of the original dimension. 扭转变形超过10% Twisted deformation is more than 10% the original dimension. 危险断面或吊钩顶部产生塑性变形 Dangerous section or neck of hook occurs plastic deformation.
	葫芦运行车轮 Traveling wheels of hoist	58	车轮质量检查 Wheel quality inspection	出现下列情况之一应报废： 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.
		59	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 tread width.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电器部分 Electrical equipments	电源引入装置 The power entry device	60	馈电裸滑线安全检查 Bare feed slide wire security check	电源引入装置年检要求与月检要求相同 The inspection requirements is the same to monthly inspection.
		61	滑线面检查 Sliding surface inspection	
		62	绝缘装置检查 Insulation device Inspection	
		63	软缆引入装置检查 Flexible cable entry device	
		64	滑触线安全标志检查 Safety sign of slide line inspection	
	集电器 Collector	65	磨损状态 Wear and tear state	与月检要求相同 The inspection requirements is the same to monthly inspection.
		66	固定状态 Steady state	
		67	集电滑轮回转状态 Rotation condition of collector pulley	
		68	集电器弹簧检查 Collector spring inspection	
	机内接线 Built-in wiring	69	接线外表检查 Wiring appearance inspection	与月检要求相同 The inspection requirements is the same to monthly inspection.
		70	固定状态 Steady condition	
		71	软缆移动检查 Flexible movement inspection	
		72	扁电缆伸缩性能检查 Stretch performance of flat cable inspection	

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
电器部分 Electrical equipments	电磁接触器 Electro-magnetic contactor	73	触点和铁芯检查 Contact point and iron core inspection	与月检要求相同 The inspection requirements is the same to monthly inspection.
		74	配线固定状态 Wiring fixed state	
		75	接触器动作检查 Contactor inspection	
	手电门 Pen dent	76	外观检查 Appearance inspection	与月检要求相同 The inspection requirements is the same to monthly inspection.
		77	故障异常检查 Abnormal failure inspection	
	起升限位开关 Lifting limiter switch	78	动作检查 Action inspection	与月检要求相同 The inspection requirements is the same to monthly inspection.
		79	触电检查 Electric shock inspection	
		80	配线固定状态 Wiring fixed state	
		81	限位位置检查 Limit location inspection	
试车 Commissioning	空载试车 No-load test	82	空载试运行 No-load test running	作大车前后运行，小车左右横行，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 Cart before and after operation, the car around, hoist lifting and falling action, check whether there is abnormal, the action is in line with the button.
		83	安全装置检查 Safety device check	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 up the ceiling position switch and travel switch run etc, safety devices action is quick, safe and reliable.
	负载试验 Load test	84	额定负载试验 Rated load test	主梁垂直下挠不得超过各种葫芦式起重机安全标准中的规定值 Girder under the vertical deflection shall not exceed the specified value in a variety of hoist crane safety standards.

葫芦式起重机年检项目及要求 Items, requirements for yearly examination

检查项目 Items				检修标准 Requirements
试车 Commis- sioning	负载试验 Load test	85	超载试验 Overload 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 After 25% overload lifting load, the girder can not have a permanent deformation, crack, peeling paint, loose, damage to wait for a phenomenon.
		86	动载试验 Dynamic test	起吊1.1倍额定载荷于跨中，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 Lifting 1.1 times the rated load in across, only take up a rise, fall, and cart, agencies within the given time action should be flexible, stable and reliable without exception

（五）葫芦式起重机的维护 Hoist crane maintenance

维护是为了使起重机保持或者恢复到能执行其所需功能的状态而进行的一系列的工作，包括监控、检测、更换、调整、修理管理等工作。

Maintenance is to keep the crane or restored to perform its required function of the state by a series of work: monitoring, detection, replace, adjust, and repair management.

1. 维护程序 Maintenance procure.

维护工作应该有一定的程序，维护程序应依据制造商的使用说明书来制定，如没有制造商的使用说明书，维护程序应由能胜任的人来制定，原始记录应存档。

Maintenance work should have some certain procure, and the procures should made according to the manufacture instruction, if no the manufacture instruction, the maintenance procure should be done be a qualified person, to record the original records.

2. 维护人员 Maintenance stuff

维护人员的最低要求：胜任职称；能了解和掌握所维护的起重机的结构和常见故障及事故等危险；经过一定的专门维护技术培训；熟悉相应起重机的安全使用要求等。

The lowest requirement of the maintenance stuff : qualified title, have a good master of the crane structure and the common obstacle and accidents, trained by special maintenance technical dep, familiar with the crane safety requirement.

3. 计划性维护 Planned maintenance

计划性维护为定期维护，为减少起重机故障或功能失灵发生的概率，根据制定的时间表进行维护，并依据指定的规范来执行。

The planned maintenance is regular maintenance, to reduce the crane fault or the probability of function fault reoccur, to maintain according to the specified standard.

4.非计划性维护 Unplanned maintenance

非计划性维护是属于故障检修或停工检修，是指在发生故障或进行故障检查后，为了将某台起重机修复到能执行其所需功能的状态进行维护。

Unplanned maintenance belongs to the maintenance or overhaul, refers to the malfunction or failure after inspection, in order to repair a crane to perform its required function state maintenance.

5.调整性维护 Adjustment maintenance.

按照维护程序中要求的例行检查，一旦发现有任何危险状况时，都应在起重机重新恢复运转前加以排除，应对所有危险隐患的零部件进行维修或调整更换，以确保其功能正常。

In accordance with the maintenance routine inspection requirements of the program, if there are any dangerous situation, should resume operation in the crane before be excluded, all the hidden dangers of parts for repair or adjustment change, to ensure its normal function.

(1) 葫芦式起重机如有以下危险隐患的零部件应进行维护或调整更换：

Hoist crane which has the following dangerous parts should maintain and adjust.

(2) 破裂的、折断的、被严重腐蚀的、弯曲变形的或过度磨损的起重机构的各零部件；

Cracked, broken, severe corrosion and bending deformation of the crane parts.

(3) 破裂的、折断的、被严重腐蚀的、弯曲变形的起重机钢结构件；

Cracked, broken, severe corrosion and bending deformation of the crane steel structures.

(4) 已损坏的或过度磨损的吊钩； Damaged or excessive wear of the hook.

(5) 对于凹陷或烧焦的插头或触头应采取单件或成套调整使更换；

For the depressing or burning plug should replace with a set of adjustment.

(6) 控制按钮和警示的标志应清晰可辨。 Control button and warning sign should be legible.

更换的零部件应与制造商提供的规格质量相一致，如果采用焊接方法维修钢结构件时，应按规定焊接规范焊接和鉴定维修部位的材质。

The quality of the replace parts should be the same with the manufacturers, if use the repair welding method, steelwork shall be in accordance with the provisions, welding specification, welding repair parts of the material and identification.

6.维护的安全性预防措施 Safety precautions before maintenance.

(1) 维护前的预防措施 Precautions before maintenance.

① 起重机应被迁移到一个对其他的起重机作业造成干扰最小的区域。

Crane should be removed to the minimum interference areas.

② 维护时应将被吊载卸下。

When maintaining, the suspended load should be shed.

③ 所有的控制装置应处于关闭状态。

All control equipment should be closed.

④ 应采用标志的锁定程序，应设有“正在维修”的指示标志，控制或操纵电器的开关应被锁定在“关闭”挡位。

Use the logo lock procedures, and the "maintenance" signal and the control and manipulate electrical switch gear must be locked in the "off".

⑤ 如果上方的维护作业会造成危险时，应在起重机的下方地面上使用警示标志和安放栅栏。

Use warning signs and fence on the ground when there are maintenance tasks on the top.

⑥ 维护时应将电源切断。

Turn down the power when maintaining.

⑦ 在拆卸液压装置时，应释放压力。

When removing the hydraulic device, release pressure.

(2) 维护后的预防措施 Preventive measures after maintenance.

① 应重新安装防护装置。

Reinstall the protective device.

② 应恢复安全装置的作用，若有必要应重新进行校准。

Restore the role of security device, and calibrate again if necessary.

③ 应移走替换下的零部件及散乱物件。

Remove the replaced spare parts and loose items.

④ 应撤走维护用的工具和设备。

Remove the maintenance tools and equipment.

7. 润滑保养 Lubricating maintenance.

起重机所有需要润滑的运动部件应定期进行润滑，应检查润滑系统中润滑剂的输送是否畅通。对于润滑的部位和润滑次数、润滑剂的类型，应遵循制造商的建议。在施加润滑剂时起重机应是静止的提供防护措施，除非配备了自动或远程润滑装置。

All need lubrication parts in crane should regularly check, and check whether the lubrication delivery is clear, as for the lubrication parts and numbers and types, all should abide by the manufacturer's suggestion. When applying lubricant crane should be still provide protective measures, unless it is equipped with automatic or remote lubrication device.

(1) 润滑的保养作用：控制摩擦；减少磨损；降低温度；防止锈蚀；有利密封。

Friction lubrication maintenance work: control, reduce wear and tear, reduce the temperature, to prevent corrosion, sealing.

(2) 润滑方法 Lubricating method.

① 分散润滑：油杯、油嘴、油枪等；Dispersion lubricating oil cup, nozzle, oil gun, etc.

② 集中润滑；Centralization lubrication.

③ 手动甘油润滑：油泵、给油器、滤油器；

Glycerin lubrication: manually lubrication oil pump, oil filter oil feeder

④ 电动甘油润滑：电动机、减速器、泵、储油器；

Electric glycerin: motor, reducer, pump, oil reservoir oil pool

⑤ 油池润滑点：减速机体；Lubrication points: slow down the body.

(3) 常见润滑点 Common lubrication points.

吊钩螺母处的轴承；动、定滑轮处的轴承；钢丝绳；卷筒端轴承；各轴承处轴承；减速器中齿轮；联轴器处齿轮；制动器交接点；电动机轴承；车轮轴承等。

Hook nut bearing, dynamic and fixed pulley bearings ; wire rope, roll end bearing, the bearing , gear reducer, coupling gear, brake intersection, motor bearings, wheel bearing.

8.日常维护中清除污物和防锈防腐 Remove the dirt and rust corrosion in daily maintenance.

① 经常擦拭司机室玻璃；

Clean the cab's room windows.

② 经常打扫司机室、走台、梯子等处污物与灰尘；

Clean the dust in cab's room ,walkway, ladder.

③ 经常清除电机、电器、减速器、制动器和轴承座等处的灰尘和污物；

Clean the dust in the motor, electrical equipment, reducer, and the bearing block.

④ 经常清除轨道上的污物与冰雪等；

Remove dirt with snow and ice on the tracks,etc.

⑤ 在裸露并有相对运动摩擦处，按时涂油和清除污物；

In the bare and there is relative motion friction, oil and remove dirt on time.

⑥ 有漏漆、脱漆处及时补漆；

Missing paint, paint touch-up in a timely manner.

⑦ 对相关部件增加防雨罩；Increase the cover on the parts.

⑧ 电器电路部分要注意防止电线电缆老化、龟裂以防连电、漏电和短路危险。

Electric circuit part should pay attention to prevent the electric wire and cable aging, cracking, leakage and short circuit.

六、起重机常见故障原因与排除

Common faults and failure recovery of crane

本节表格形式汇总了葫芦式起重机各机构主要零部件、部分钢结构承载件和电气控制等发生的故障，并对各种故障产生的原因和排除方法做了相应介绍：

This section summarizes fault of main components, load bearing steel structure and electrical control of crane with electric hoist, describe causes of all kinds of faults and the method for eliminating them:

起重机常见故障原因与排除 Common faults and elimination method

序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
1	吊具 Lifting tools	吊钩开口度过大 Hook opening is too large	(1) 磨损变形 Wear deformation (2) 疲劳变形 Fatigue deformation	(1) 危险断面磨损量达原始尺寸10%时应报废 Should be scrapped when dangerous section worn to 10% of original amount. (2) 开口度比原始尺寸增加15%应报废 Should be scrapped when opening increased by 15% (3) 扭转变形超过10度时应报废。报废时换新钩 Should be scrapped and replace with new hook when deformation is over 10 degrees
2		吊钩护钩装置 Hook protection device	(1) 碰撞损坏 Collision damage 斜拉斜吊 Inclined pulling or lifting (2) 弹簧断裂或弹性失效 Spring break or elastic break-down	(1) 注意保护护钩装置 Pay attention to hook protection device 不允许斜拉斜吊 Inclined pulling or lifting is not allowed (2) 注意检查护钩装置有效性，有问题应及时修理或更换 Check effectiveness of hook protection device, repair or replace when there's problem in time

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3	吊具 Lifting tools	抓斗刃口闭合 错位, 间隙过大, 空中漏料 Grab edge closed disloca- tion, gap is too large, the air leakage	(1) 刃口磨损严重 Cut-edge badly worn (2) 刃口疲劳变形 Cut-edge fatigue deformed (3) 落地冲击伤害等 Landing impact injury	磨损疲劳变形, 刃口接触间隙 超过5mm, 长度超过300mm 时应及时修理或报废更新 Worn, fatigue and deformed, repair and replace with new one if contact gap of edge is more than 5mm and length is over 300mm.
4	钢丝绳 Wire rope	断丝断股 Broken wire and strand	(1) 丝间、股间磨损 严重 Severe wear of wire & strand (2) 钢丝绳与滑轮、卷 筒间绳与槽直径配合不 当的严重磨损 Wire rope and pulley, severe wear for rope doesn't match with groove mismatch (3) 润滑不良、锈蚀 破坏 Lubrication not good, corrosion damage (4) 超载吊运 Overload (5) 斜拉斜吊 Inclined pulling and lifting (6) 已达到报废标准仍 继续使用 Continue to use though has to be scrapped (7) 钢丝绳与滑轮外壳 出入绳口摩擦啃绳等 Rope entrance to pulley friction and gnawing	(1) 保持钢丝绳的良好润滑 Keep good lubrication of wire rope (2) 绳与槽直径搭配合理 Diameter of rope and that of groove well matched (3) 安装超载限制器 Provide overload limiter (4) 安装导绳器, 不准斜拉 斜吊 Provide rope guide, inclined pulling or lifting are not allowed (5) 达到报废程度严禁继续 使用 It's prohibited to use if reach end-of-life (6) 滑轮钢丝绳出入口处加 护套等 Add protection cover for rope entrance to pulley

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5	钢丝绳 Wire rope	变形 Deformation	(1) 疲劳变形 Fatigue deformation (2) 超载拉伸变形 Overload deformation (3) 斜拉斜吊变形等 Inclined pulling deformation (4) 因无导绳器，乱绳时钢丝绳进入卷筒端面缝隙中挤伤变形等 Because no rope guide, disorderly rope into the drum surface gap and deformed	(1) 安装超载限制器 Equip overload limiter (2) 严禁斜拉斜吊 Inclined pulling and lifting is prohibited (3) 合理选择工作级别和安全系数等 Reasonable selection of work duty and the safety factor (4) 应安装导绳器 Equip rope guide (5) 按操作规程操作 Operate as per regulations
6		空中打麻花 Twist in the air	在地面缠绕钢丝绳时，未能将钢丝绳放松伸直 When winding wire rope on the ground, fail to straighten the wire rope	钢丝绳在放松状态下，重新缠在卷筒上 Re-wind the wire rope on the drum
7	滑轮 Pulley	滑轮轮槽壁裂纹或破损 Crack or damage of pulley groove	(1) 磨损严重 Severe wear (2) 撞击损害 Severe collision (3) 斜拉斜吊等 Inclined pulling & lifting	(1) 注意润滑保养 Lubricate and maintenance (2) 轮槽壁磨损量超过原始尺寸20%应报废更新 Replace with new one if pulley wall wears more than 20% of its original dimension. (3) 按操作规程操作 Operate as per regulation
8	卷筒装置 Drum device	卷筒外壳变形 Drum shell deforms	交流接触器线圈粘连，限位失效，吊钩滑轮组顶坏外壳 The coil of AC contactor adhesion, limit fails to work, hook block top bad housing	更换交流接触器，保证安全起升限位 Replace A.C. Contactor, ensure safe lifting limit

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9	卷筒装置 Drum device	乱绳 Rope disorder	(1) 没有安装导绳器 Not equip rope guide (2) 导绳器损坏 Rope guide damaged (3) 斜拉斜吊造成导绳器损坏 Rope guide damaged by inclined lift or pull	(1) 安装导绳器 Equip rope guide (2) 严禁斜拉斜吊 Inclined lifting and pulling are not allowed.
10	减速器 Reducer	齿轮传动噪声过大或有异常响动 Gear drive is too noisy or there is abnormal sound	(1) 缺油、润滑不良。 Lack of oil and poor lubricating (2) 齿轮齿面有磕碰伤痕、齿轮加工精度低，装配质量差。 Gear and tooth surface have collision traces, low accuracy of gear processing and poor assembly. (3) 齿轮、轴承等磨损严重、疲劳破坏程度大。 Gears and bearings are worn badly, and fatigue damaged severely. (4) 齿轮箱内清洁度差。 Cleanliness is poor in the gear box.	(1) 加足润滑油 Fill up with lubricant oil 修整齿面磕碰伤痕，提高齿轮加工和装配精度。 Repair the tooth surface, improve the gear processing and assembly accuracy. (2) 齿轮及轴承达到报废程度应及时更换。 It should be replaced in time when gears and bearings reach the standards for scrapping. (3) 定期清洗换油。 Clean and chang oil at regular intervals
11		起升减速器箱体碎裂 Cabinet of lifting reducer is broken	多因起升限位失灵，吊钩滑轮轮组外壳撞击卷筒外壳，造成吊钩偏摆击裂箱体（CD葫芦尤其突出） Lifting limit is out of order, pulley block for hook collide with drum shell , crack the box due to deflection of hook.	及时更换减速器箱体，更换或修理起升限位器，尽量使限位器少动作 Replace the reducer box in time, replace or repair lifting limiter, try to make limiter less action

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12	减速器 Reducer	减速器渗漏油 Oil leak	(1) 减速器箱体接合面之间密封纸垫破损 Sealing paper between joint faces of reducer box is broken. (2) 未涂密封胶或涂抹不匀或密封胶失效 Uncoated sealant, uneven paint or sealant lose efficacy (3) 油封密封件老化失效 Oil seal aging (4) 放油咀处密封垫失效 Sealing gasket loss efficacy at the nozzle (5) 透气孔太小或阻塞 Air hole is too small or is blocked. 减速器发热严重等 Reducer heating is serious.	更换密封纸垫 Replace sealing paper 重新均匀涂抹密封胶 Repaint sealant evenly 更换油封 Replace oil seal 更换密封垫 Replace sealing gasket 更换透气塞或将通气孔灰尘污物清除 Replace vent plug or dust the air hole. 提高润滑降温效果等 Improve the lubrication and cooling effect
13	制动器 Brake	下滑溜钩严重、运行刹车不灵溜车严重 Serious slide hook, brake doesn't work.	(1) 制动环、盘和制动轮磨损严重 Brake rings, discs and brake wheels are worn seriously. (2) 制动环、盘和制动轮已报废仍继续使用 Brake rings, discs and brake wheels continue to be used when they have been scrapped. (3) 制动间隙太大 Brake clearance is too large. (4) 制动器中制动面有油污 Braking surface has oil stains. (5) 制动弹簧疲劳变形失去弹性等 Brake spring loss elasticity due to fatigue deformation	(1) 及时调整制动间隙 Adjust the brake clearance in time (2) 及时清除制动面油污 Clean oil stains of braking surface in time (3) 制动环、盘等磨损量达原始尺寸50%时应报废更换 Brake rings and discs should be replaced when abrasion loss reach 50% of original size. (4) 制动轮磨损量达原始尺寸的40%应报废更换 Brake wheel should be replaced when abrasion loss reach 40% of original size. (5) 弹簧弹性失效应及时更换弹簧等 Replace springs timely if spring loss elasticity

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14	制动电动机 Brake motor	空载时电动机不能起动 Motor cannot start up at no load.	(1) 电源未接通 Power isn't connected (2) 按钮失灵, 接触不良 Button failure, bad contact (3) 电磁开关箱中的熔断器, 接触器等元件失效 Fuse, contactor and other components are failure in the electro magnetic switch box. (4) 限位器未复位 Limiter has not been reset. (5) 按钮接线折断 Button connection is broken	(1) 接通电源 Power on (2) 整修有关电器元件 Repair relevant electrical components (3) 调整或重新接按钮线 Adjust or reconnect button wire
15		空载时旋转, 有载时不转 Rotation at no load, no rotation when there is load.	(1) 转子断条, 转子铸铝铝条粗细不均匀 Rotor broken bar, thickness of rotor cast aluminium bar is uneven (2) 电动机单相运转 Single phase run motorue deformation	(1) 更换电动机 Replace motor (2) 重新接线 Rewiring
16		电动机起动吃力 Motor start difficulty	(1) 超载过多 Overload (2) 电源电压过低 Supply voltage is too low (3) 制动器未完全打开 Brake fail to fully open (4) 电动机锥形转子窜量太大 Movement of motor conical rotor is too big (5) 接线、电磁线圈等有断裂等 Wiring and electro magnetic coil may break	(1) 按规定吊载, 安装超载限制器 Hoisting and installing overload limiter according to regulations (2) 调整电源电压 Adjust voltage (3) 调整制动器间隙或锥形转子间隙及窜量 Adjust brake clearance or conical rotor clearance (3) 重新接线 Rewiring

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17	制动电动机 Brake motor	噪声大或有异常声响 Big noise or there is abnormal sound.	(1) 定子硅钢片未压紧 Insufficient compression of stator silicon steel sheet (2) 定转子间隙不均匀扫膛等 Clearance between stator and rotor is uneven (3) 制动轮偏摆 Brake wheel deflection (4) 电动机动平衡差 Dynamic balance of motor is bad. (5) 刹车尖叫，刹车面接触不良 Brake shriek, braking surface is bad contact	(1) 更换定子 Replace stator (2) 调整间隙及窜量 Adjust clearance and movement (3) 检查制动轮端跳并修复 Check brake wheel and repair it (4) 修复平衡 Repair the balance (5) 修理制动环或制动轮使二者锥角相符 Repair brake ring or brake wheel
18		烧包（定子组烧毁） Stator group burn down.	绝缘等级低，漆包线有外伤，扎间、相间或极间未垫绝缘或绝缘性能差 Low insulation class, enameled wire has collision traces.	更换电动机，注意保护漆包线的磕碰加强扎间、相间或极间绝缘措施 Replace motor, pay attention to the protection of enameled wire, increase the insulation measures

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19	制动电动机 Brake motor	过热 Overheating	超载过多，电压波动（压降）太大，起制动过于频繁，制动器间隙太小 Load too heavily, voltage fluctuation (pressure) is too large, too frequent starting and braking, the brake clearance is too small	按规定吊载，调整电源电压，应适当减少起制动次数，重新调整制动器间隙 Lift as per regulations, adjust the supply voltage, reduce the number of starting and braking appropriately, re-adjust the clearance of the brake
20	运行小车 Trolley	车轮打滑 Wheel slip	工字钢等轨道面或车轮踏面上有油、水等污物 Oil, water etc. on the rail surface or wheel tread	清除轨道面或车轮踏面上的污物 Clean the dirt on rail surface or wheel tread
21	运行小车 Trolley	车轮悬空 Wheel suspended	(1) 车轮磨损严重又不均匀 Wheel severe wear and uneven (2) 工字钢等支承车轮的翼缘面不规整 Flange surface of supporting wheel and I beam is irregular (3) 运行小车制造装配精度差，三条腿现象严重 Bad fabrication & assembly precision of trolley, three legs phenomenon is serious (4) 疲劳剥落严重 Fatigue chipping badly	(1) 车轮踏面磨损量达原始尺寸50%，轮缘磨损达原尺寸50%应报废更换 Replace with new one when wheel tread and flange wear up to 50% of its original size (2) 进行火焰修整 flame dressing 按制造装配精度要求进行检查并修整 Check and repair as per requirements of fabrication and assembly precision (3) 严重疲劳剥落应报废 Serious fatigue spalling should be scrapped.

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22	运行小车 Trolley	轮缘爬轨 Flange climb rails	(1) 轨道端部： 止档(阻进器)或缓冲 器不对称 End of rail: Stop (resistance device) or buffer are unsymmetric (2) 运行小车主 被动侧重量不平衡， 造成被动侧车轮翘 起而爬轨 Weight of driving and passive side of traveling trolley are imbalance, causing the passive wheel warp and climb on rail	(1) 重新调整（或修整）止 档或缓冲器为对称结构 Adjust (or repair) stop or buffer for symmetric structure (2) 在被动侧加配重 Add counterweight in the passive side
23	起重机 运行机构 Traveling mechanism of crane	起动时，主动 车轮打滑 When start, driving wheel slip	(1) 轨道面或车轮 踏面有油、水等污物 Track surface or wheel tread has oil, water and other dirt (2) 车轮装配精度差， 三条腿现象严重 Poor assembly accuracy of wheel, three legs phenomenon is serious	(1) 清除污物，必要时 在轨顶面上撒沙子以增 加摩擦 Remove the dirt, if necessary, if necessary, put sand on rail top to increase the friction (2) 改进车轮装配质量 或火焰 Improved wheel assembly quality or flame

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24	起重机 运行机构 traveling mechanism of crane	运行中出现歪斜 Skew occurs during the operation —跑偏 off-tracking —啃道 undercut —磨损 abrasion	(1) 轨道架设未能达到相应规范要求 Built of rail can not reach corresponding requirements (2) 起重机桥架几何精度超差较大 (如跨度偏差、跨度差、对角线差等) Crane bridge geometric accuracy differ greatly (such as span and diagonal deviation, etc.) (3) 车轮槽宽与轨顶面宽间隙配合不当 Wheel groove width and rail top width do not match (4) 车轮公称直径尺寸差较大 Wheel diameter differ greatly	(1) 检查轨道跨度偏差, 标高差, 倾斜度等, 如超差较大应重新修整 Check rail span deviation, elevation difference, inclination, it should be modified if differs considerably (2) 检查起重机桥架几何精度, 如超差过大, 要及时修整 Check the geometric accuracy of crane bridge, modify in time if difference is too large, should be modified promptly if differ (3) 调整、修复或更换车轮或轨道, 达到规范要求为准 Adjust, repair or replace the wheel or rail, specification requirement shall prevail (4) 检查车轮踏面直径, 如因磨损造成直径不一致, 应及时更换车轮 Check the wheel tread diameter, if worn wheels diameters are inconsistent, replace with new in time

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25	起重机 运行机构 Traveling mechanism of crane	制动时： 刹不住车， 扭摆 When brake： brake failure， torsion	(1) 制动间隙太大 Brake gap is too big (2) 制动环磨损 已达到报废标准仍 使用 Still use brake ring that shall be scrapped (3) 制动弹簧效能 降低 Low efficient of brake spring	(1) 调整制动间隙 Adjust brake gap (2) 更换制动环 Change brake ring (3) 更换制动弹簧、碟簧 Change brake spring， disc spring
26	起重机 运行机构 Traveling mechanism of crane	运行中： 出现卡轨、 爬轨、掉轨或 正常的蛇行、 扭摆、冲击、 震动等 During traveling： if block the rail，climb the rail，fall off or normal crawl， torsion， impact， shack，etc.	(1) 轨道与桥架跨度 配合不当 Rail doesn't match with span of bridge (2) 轮槽与轨顶面宽 配合不当 Wheel groove and width of rail top do not match (3) 起重机三条腿 现象严重 Three legs phenomenon is serious (4) 轨道接缝质量 Quality of rail joint	(1) 检查起重机桥架和轨 道几何精度，整修超差部分 Check the crane bridge and rail geometric accuracy， modify out-of-tolerance part (2) 调整。整修车轮与轨道 的侧隙，或更换车轮 Adjust. repair the side gap of wheel and rail，or replace the wheel (3) 必要时进行起重机大修 Overhaul when necessary (4) 修整轨道接缝达到 规范要求 Modify connections of rail until reach requirement

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27	起重机 运行机构 Traveling mechanism of crane	起制动时：有 明显的不同步、 扭转、侧向滑 动 When start or brake: obvious out of sync, torsion, side slid	(1) 因磨损造成 车轮踏面直径尺寸 相差较大 Wheel tread dimension differ considerably because of wear (2) 分别驱动的 两侧制动电机窜量、 制动的灵敏程度、 转速相差较大 Motor brake clearance, sensitivity, speed difference of respective drive are too big	(1) 更换车轮 Replace the wheel (2) 靠手感) 调整两 侧驱动电动机的制动间 隙 (即锥形制动电机的 轴向窜动量), 选配转 速接近的电机配对使用 Based on hand feel, adjust brake gap of driving motor on both side (Axial movement of taper braking motor), use pair motors with similar speed)
28	主梁 Main girder	主梁上拱度 减小至消失 甚至出现下拱 Main girder camber is reduced to disappear or even arch	(1) 超载起吊 Overload (2) 疲劳过度 Over-fatigue (3) 使用环境恶劣 (如高温烘烤) Severe environment (such as high temperature)	(1) 按规定起吊或加有超载 限制器加以限制 Lift as per regulation or add overload limiter (2) 利用火焰局部烘烤修复 Local repair by flame (3) 改善工作环境 Improve the working environment

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29	主梁 Main girder	振动或下挠过大，造成葫芦运行小车溜车 Camber of main girder reduced to disappear or even presence of arch, vibration or deflection is too large, resulting in hoist trolley slip	(1) 超载起吊 Overload (2) 主梁刚度差 Bad rigidity of main girder (3) 有共振因素影响 Affected by resonance	(1) 按规定起吊或加载荷限制器加以限制 Lift as per regulation or add overload limiter (2) 主梁补强（加大截面） Main beam reinforcement (increasing section) (3) 降低吨位使用 Lower weight (4) 排除共振干扰 Eliminate resonance interference
30		主梁工字钢等下翼缘下塌（出现塑性变形） Lower flange of I beam of main girder collapse (Plastic deformation)	(1) 超载过大 Too much overload (2) 葫芦轮压过大 Wheel load of hoist is too big (3) 工字钢翼缘太薄 I beam flange is too thin (4) 主梁下翼缘磨损严重而变薄，局部弯曲强度减弱 Severe wear of lower flange of main girder, local bending strength weaken	(1) 按规定起吊或加载荷限制器 Lift or add overload limiter as per regulation (2) 增加葫芦走轮个数 Increase the number of hoist wheel (3) 选用异形加厚工字钢或在工字钢下翼缘下表面贴补加强板 Select figured thicken I beam or add strengthening plate under flange of I beam (4) 下塌严重时，无法补强时主梁应报废 When collapse too serious, main girder shall be scrapped if can't be strengthened

起重机常见故障原因与排除common faults and elimination method

序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
31	门架 Gantry	运行中门架晃动、扭动 Gantry sway when traveling	(1) 跨度太大 Span is too long (2) 门架刚性不足 Insufficient rigidity of gantry (3) 悬臂过长 Jib is too long	(1) 安装防偏斜安全装置、防偏斜指示器 Install anti-inclination safety device, prevent deviation indicator (2) 设计保证刚性 Design ensures the rigidity (3) 设计时慎重对待悬臂长度、必须计算防倾覆稳定性 Cantilever length must be calculated carefully against overturning and keep stability
32	司机室 Cab	振动与摇晃 Vibration and swing	(1) 操纵室本身刚性差, 与主梁连接不牢 Bad rigidity of cabin, not firmly connected with main girder (2) 起重机主梁动刚度差 Dynamic rigidity of main girder is too bad (3) 起重机运行振动冲击大 Big impact during traveling of crane	(1) 加强操纵室的刚性 Strengthen rigidity of cabin (2) 增加减震装置 Add shock absorption device (3) 适当提高主梁刚性 Appropriately improve rigidity of main girder (4) 当电机为鼠笼电动机不能调速, 尽量采用双速鼠笼电动机, 以减小制动的冲击或变频调速 When the it is squirrel cage motor and can not regulate speed, double speed squirrel-cage motor is preferred to reduce the braking impact or frequency control (5) 对轨道缺陷进行修复 Modify defect of rail

起重机常见故障原因与排除 Common faults and elimination method

序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
33	操作 Operation	误操作 Wrong operation	(1) 操作者技术素质差 Poor technical quality (2) 操作者未经培训无证上岗 Operator not trained, work without certificate (3) 操作者精神不集中 Operator's spirit is not focused (4) 违犯操作规定 Violation of operating regulations	(1) 加强安全教育与培训 Strengthen the safety education and training (2) 防止野蛮操作 Prevent the uncivilized operation (3) 熟悉起重机设备的机构与性能、加强现场管理 Familiar with the mechanism and performance of crane, strengthen field management
34	手电门 Pendant	按钮动作失灵，按下时不能复位 Button fails to work, cannot be reset	(1) 按钮弹簧疲劳破坏 Button spring fatigue damage (2) 灰尘污物过多 Too much dust and dirt (3) 悬挂电缆短线或接线松落 Short suspension cable or loose wiring (4) 悬挂电缆无护绳 No protective rope for suspension cable	(1) 更换弹簧 Replace spring (2) 保持清洁 Keep clean (3) 更换电缆或重接线 Change cable or re-wiring (4) 增加一细钢丝绳承担悬吊手电门作用 Add one piece of wire rope to support pendant

起重机常见故障原因与排除common faults and elimination method

序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
35	手电门 Pendant	动作与按钮标志不符 Action isn't consistent with mark	电源相序接错 Wrong phase-sequence connection	倒换接线 Reverse wiring
36		触电 Electric shock	(1) 采用铁壳手电门 Use steel case pendant (2) 非低压手电门 Not low voltage pendant	(1) 采用硬塑外壳手电门 Use hard plastic shell pendant (2) 采用低压（36V或42V）手电门 Use low voltage (36V or 42V) pendant
37	操作控制器 Operational controller	无阻启动或不能启动 Start without resistance or can not start	(1) 控制器触头粘连 Controller contact adhesion (2) 触头接触不良、有松动 Poor & loose contacts	(1) 清除油污 Remove oil and dirt (2) 修理、固紧 Repair and fix firmly
38		卡阻动作困难 Blocking is difficult	(1) 出头有损伤 Damage on head (2) 发热严重 Severe overheat	(1) 及时修复，更换有伤触头 Repair in time, change damaged contact (2) 防止过于频繁启动 Prevent too frequent start

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序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
39	交流接触器 AC contactor	线圈断裂 Coil break	疲劳破坏 Fatigue break-down	更换线圈 Change the coil
40	交流接触器 AC contactor	触点粘连 Contact adhesive	未能清除磁铁接触面上的防锈油或凡士林，特别是冬天低温下易造成触点粘连 Not remove antirust oil or vaseline on the magnet contact surface, especially in low temperature winter, can easily cause adhesion	清除磁铁接触面上的防锈油或凡士林 Remove antirust oil or vaseline on the magnet contact surface
41		触点烧毁 Contact burn	触点接触面质量太差 Contact surface quality is poor	选择接触面质量好的接触器 Select the contact surface with good quality.
42	限位器 Limiter	负荷升至极限位置时不能限位 Limit doesn't work when load rise to the limit position	（1）电源相序接错，接线不牢 Power phase sequence is wrong, the connections not fixed （2）限位杆的停止挡块松动 Stop block of limit rod is loose	（1）重新接线、修整 Re-wiring and repair （2）紧固停止挡块于需要的位置上 Fasten stop block at the required position

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序号No.	项目 Item	常见故障 Common faults	故障产生原因 Reasons	故障排除方法 Elimination methods
43	行程开关 Stroke limit	限位失灵 Limit fails to work	(1) 短路 Short circuit (2) 接线不对 Wrong wiring	重新接线 Re-wiring
44	电源引入装置 Power lead-in device	电源引入装置 接触不良 Bad contact of power lead-in device	(1) 塑料滑轮磨损严重 Severe wear of plastic pulley (2) 滑道连接不牢 Slide connection is not firm (3) 引入支臂固定不牢 Lean in jib is not fixed (4) 滑轮脱落脱轨拖绳 Pulley fall off rail, dragrope (5) 内藏式滑触线滑槽塑料老化变形 Groove and plastic of concealed bus bar aging and deform	(1) 采用耐磨塑料 Use wear-resistant plastic (2) 检查滑道、修整固定牢固 Check slide, repair and fix firmly. (3) 检查引入支臂、固定牢固 Check lead in jib, fix firmly. (4) 修整滑线、滑槽或及时更换 Repair bus bar, slide groove and replace in time

（说明：本说明书为通用电动单梁（悬挂）起重机说明书，以上起重机图样仅供参考，具体机械电器安装图纸以随机资料为准。）

(Instruction: this is the manual of general purpose gantry crane, draft of the crane above is only for reference, detailed mechanical and electrical erection drawing, delivery attached documentation shall prevail).

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