

# 操作维护说明书

**Operation and maintenance instructions**



南通力威机械有限公司

Nantong Liwei Machinery Co., Ltd.

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## 1、概述 Overview

卷扬机电气控制系统由变频控制柜、PLC 控制柜等部分组成。整体符合标准：符合 GBT16895.6-2014 低压电气装置及其他相关标准与技术条件，本控制柜适用于下列工作条件：

- (1) 环境温度：-20~40℃；
- (2) 有潮湿空气；
- (3) 有机械正常营运情况下所产生的冲击和振动；
- (4) 有盐雾，油雾和霉雾；
- (5) 周期性倾斜不大于 22.5°；
- (6) 电源：AC380V 50HZ 控制电源：AC220V/DC24V。

The electrical control system of the winch consists of a frequency conversion control cabinet, a PLC control cabinet and other parts. Overall compliance with standards: It complies with GBT16895.6-2014 low-voltage electrical equipment and other relevant standards and technical conditions. This control cabinet is suitable for the following working conditions:

- (1) Ambient temperature: -20~40℃；
- (2) There is humid air;
- (3) There are shocks and vibrations generated by normal mechanical operation;
- (4) There is salt mist, oil mist and mold mist;
- (5) The periodic tilt is not more than 22.5° ；
- (6) Power supply: AC380V 50HZ Control power supply: AC220V/DC24V。

## 2、控制原理 Control principle

### 2.1 控制系统的概述 Overview of the control system

卷扬机控制方式:集中四合一无线遥控器控制，每组卷扬机可单动可任意台数联动，联动控制时，可以选择组内任意卷扬机参与联动控制，采用多电机主从同步闭环控制，确保参与联动控制的牵引卷扬机速度同步。遥控器行走控制为自复位拨钮开关，高低速选择为两档自定位开关，卷扬机运行模式选择开关为三档自定位选择开关；

卷扬机的机械排缆器两侧设置一个常闭限位开关，排缆器到极限位置，限位

开关动作，卷扬机停止运转；

卷扬机安装在移动平台上，可以根据作业需要由人工平行移动，卷扬机的机身电缆通过电缆卷盘和卷筒扁平电缆连接，需要移动卷扬机时，打开卷扬机上旋钮开关，电缆卷筒张力使能，该开关由电缆卷筒提供；

Winch control mode: centralized (four-in-one, five-in-one) wireless remote control, each group of winches can be single-acting or any number of winches can be linked. During linkage control, any winch in the group can be selected to participate in the linkage control. Multi-motor master-slave synchronous closed-loop control is adopted to ensure the speed synchronization of the traction winches participating in the linkage control. The remote control walking control is a self-reset dial switch, the high and low speed selection is a two-speed self-positioning switch, and the winch operation mode selection switch is a three-speed self-positioning selection switch;

A normally closed limit switch is set on both sides of the mechanical cable arranger of the winch. When the cable arranger reaches the limit position, the limit switch is activated and the winch stops running;

The winch is installed on a mobile platform and can be manually moved in parallel according to the needs of the operation. The body cable of the winch is connected through the cable reel and the flat cable of the reel. When the winch needs to be moved, turn on the knob switch on the winch to enable the cable reel tension. The switch is provided by the cable reel;

## **2.2 控制线路具有下列保护 The control line has the following protection**

变频控制柜保护功能如下

- QF1（空气开关）：用于变频柜进线电源短路过流保护；
- QF2、QF4（电机保护器）：用于变频风机及力矩电机电机保护；
- QF3（断路器）：用于电磁制动保护；
- QF5、QF6（断路器）：用于控制回路隔离变压器保护；
- F1、F2（熔断器）：用于电源显示及变频柜散热风机短路过流保护；
- VFD（变频器）：过流、过压、过载、缺相等完善的保护。

PLC 控制柜保护功能如下

- QF0（断路器）：用于 PLC 控制柜进线电源短路保护；
- QF1（断路器）：用于控制回路隔离变压器保护；
- FU1（熔断器）：用于调试插座短路过流保护；

The protection functions of the frequency conversion control cabinet are as follows

- QF1 (air switch): used for short-circuit overcurrent protection of the incoming power supply of the frequency conversion cabinet;
- QF2, QF4 (motor protector): used for frequency conversion fan and torque motor protection;
- QF3 (circuit breaker): used for electromagnetic brake protection;
- QF5, QF6 (circuit breaker): used for control circuit isolation transformer protection;
- F1, F2 (fuse): used for power display and frequency conversion cabinet cooling fan short-circuit overcurrent protection;
- VFD (frequency converter): perfect protection for overcurrent, overvoltage, overload, lack of phase, etc.

The protection functions of the PLC control cabinet are as follows

- QF0 (circuit breaker): used for short-circuit protection of the incoming power supply of the PLC control cabinet;
- QF1 (circuit breaker): used for control circuit isolation transformer protection;
- FU1 (fuse): used for short-circuit overcurrent protection of the debugging socket;

## 2.3 柜体缩略图 Cabinet thumbnail

- 四合一 PLC 控制柜 Four-in-one PLC control cabinet



● 变频控制柜      Frequency conversion control cabinet



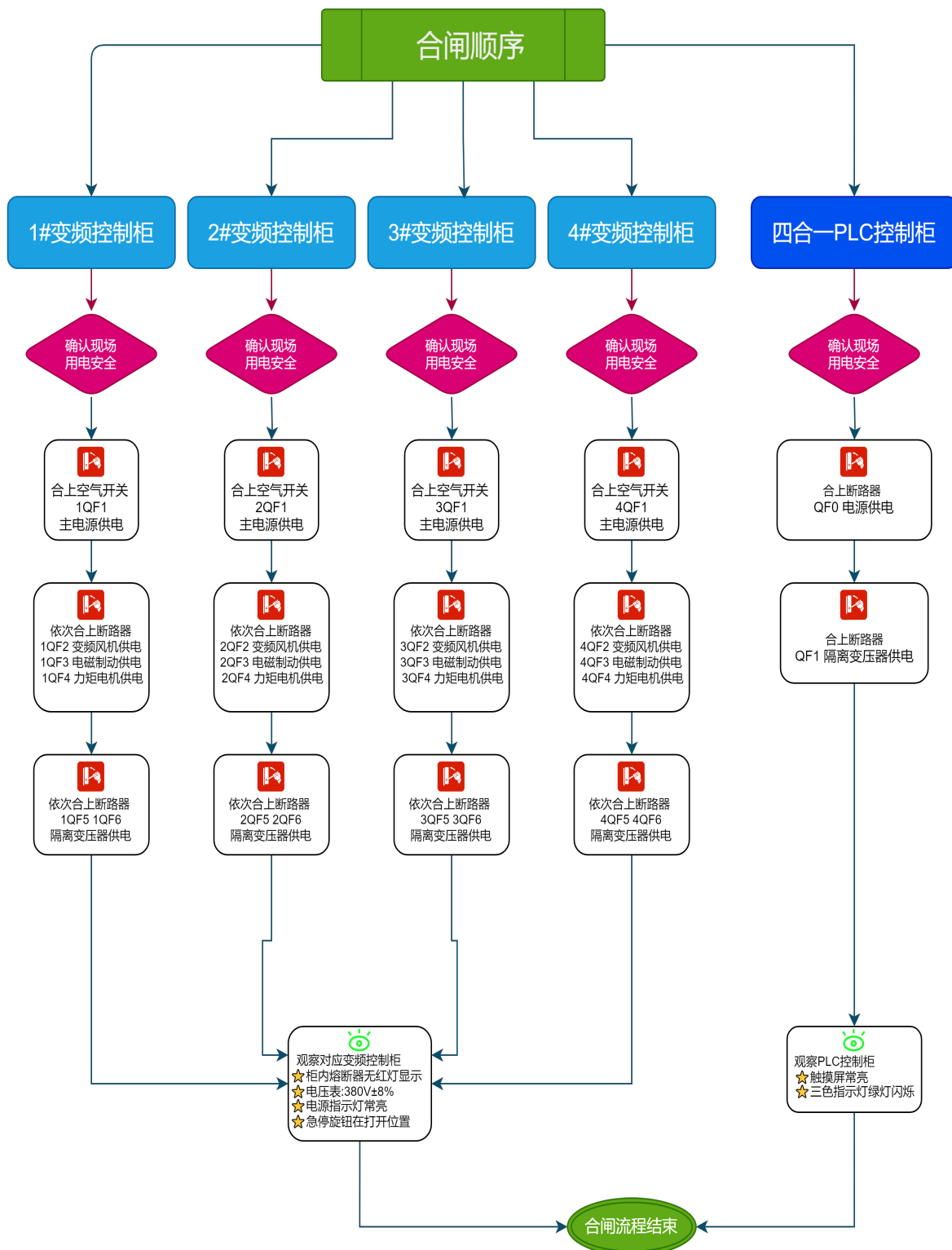
- 四合一遥控器 Four-in-one remote control



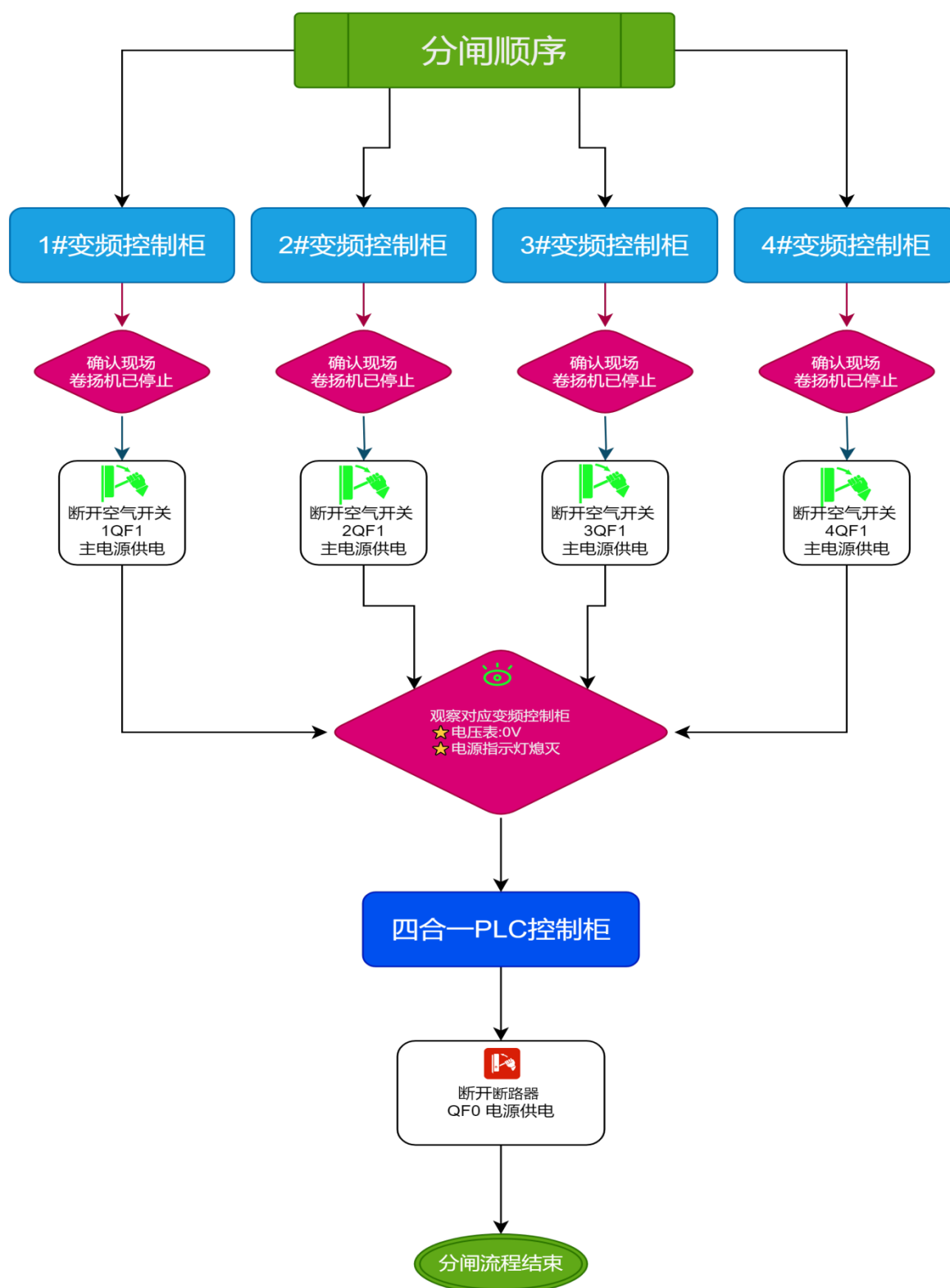


## 2.4 操作流程图 Operation flow chart

### 2.4.1 合闸流程 Closing process

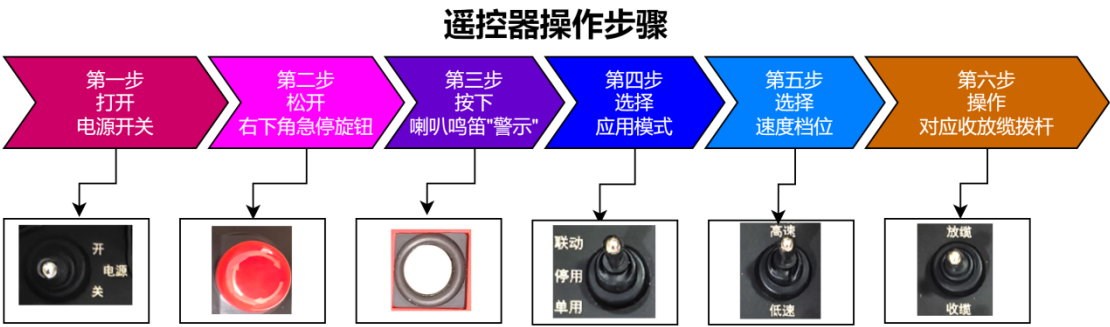


## 2.4.2 分闸流程 Disconnection process



2.4.3 四合一遥控器操作流程 Four-in-one remote control operation flow chart

遥控器接收器指示灯定义	遥控器使用注意事项
<p>★电源(绿色)</p> <p>1.常亮:供电正常。</p> <p>2.常灭: 接收器未供电/供电保险丝损坏/接收器其他故障。</p> <p>★信号(红色)</p> <p>1.常亮:无线信号正常连接。</p> <p>2.常灭:无线信号断开连接。</p> <p>★报警(红色)</p> <p>1.常亮:系统出现故障。</p> <p>2.常灭:系统未出现故障。</p>	<p>★遥控器使用前必须使用自带的充电器将电池充满。</p> <p>★遥控器连续工作时间大约为8-10小时,请及时充电。</p> <p>★使用前应检查遥控器锂电是否安装到位。</p> <p>★使用前应检查PLC控制柜天线是否安装正常。</p> <p>★应用模式选择在"单用"时;操作各自对应的区域。</p> <p>★应用模式选择在"联动"时;注意统一联动的速度档位。</p>



3、触摸屏应用 Touch screen application

3.1 触摸屏画面示意图 Touch screen diagram

3.1.1 系统画面 Main screen

主

1

2

3

4

2024 12 18  
10:15:06

数据	机号	JM10-1#	JM10-2#	JM10-3#	JM10-4#
直流母线		0V	0V	0V	0V
变频电源		0V	0V	0V	0V
输出频率		0Hz	0Hz	0Hz	0Hz
输出电流		0.0A	0.0A	0.0A	0.0A
电机转矩		0.0%	0.0%	0.0%	0.0%
电磁制动		关闭 打开	关闭 打开	关闭 打开	关闭 打开
运行模式		低速 高速	低速 高速	低速 高速	低速 高速
状态机		单机 准备	单机 准备	单机 准备	单机 准备

系统主页

数据查询

趋势图表

IO 状态

故障查询

用户登录

3.1.2 数据查询 Data Query

主

1

2

3

4

2024 12 18  
10:20:30

序号	时间	母线电压	电源电压	频率	电流	转矩
1	2024-12-18 10:20:27	0	0	0.00	0.0	0.0
2	2024-12-18 10:20:25	0	0	0.00	0.0	0.0
3	2024-12-18 10:20:23	0	0	0.00	0.0	0.0
4	2024-12-18 10:20:21	0	0	0.00	0.0	0.0
5	2024-12-18 10:20:19	0	0	0.00	0.0	0.0
6	2024-12-18 10:20:17	0	0	0.00	0.0	0.0
7	2024-12-18 10:20:15	0	0	0.00	0.0	0.0
8	2024-12-18 10:20:13	0	0	0.00	0.0	0.0
9	2024-12-18 10:20:11	0	0	0.00	0.0	0.0
10	2024-12-18 10:20:09	0	0	0.00	0.0	0.0
11	2024-12-18 10:20:07	0	0	0.00	0.0	0.0
12	2024-12-18 10:20:05	0	0	0.00	0.0	0.0

系统主页

数据查询

趋势图表

IO 状态

故障查询

用户登录

1号卷扬机

2号卷扬机

3号卷扬机

4号卷扬机

3.1.3 趋势图表 Trend Charts

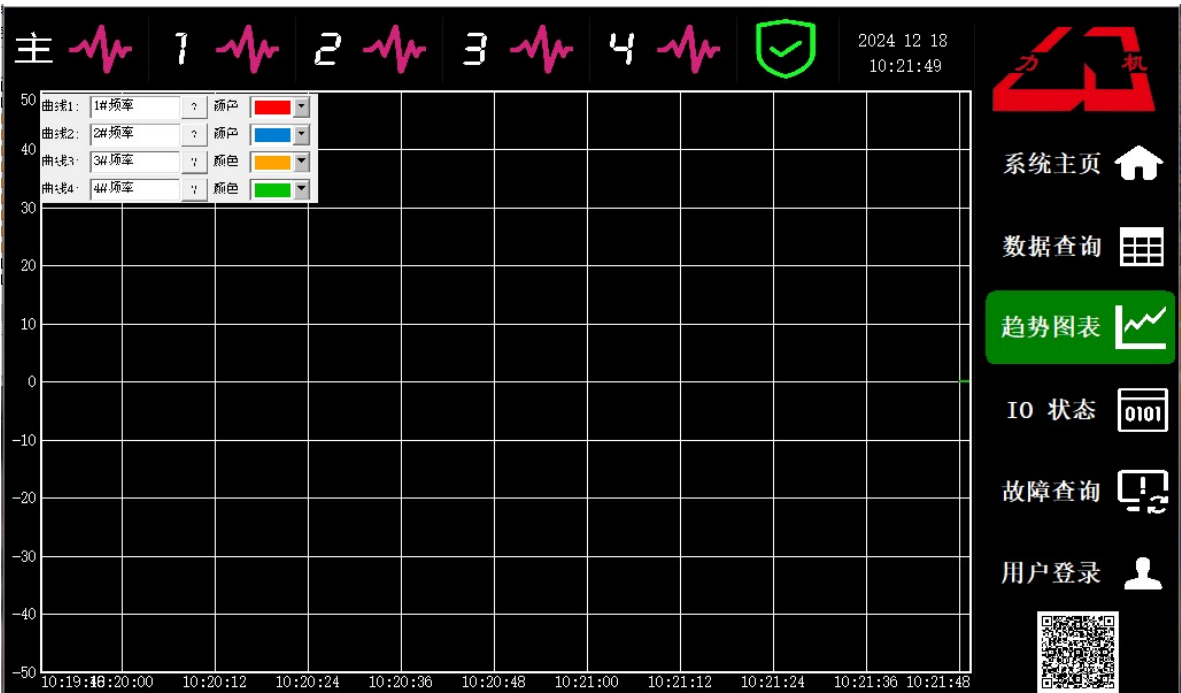
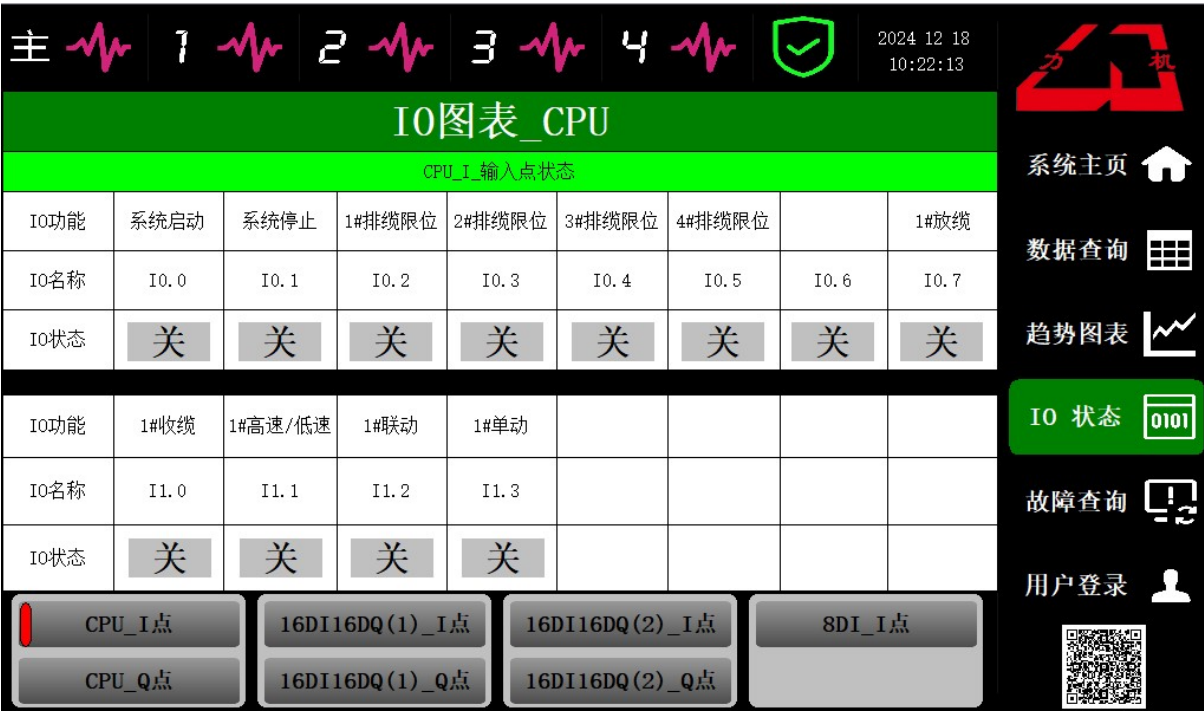


图 3.1.4 IO 状态 IO state



[illegible]

### 3.2 触摸屏画面功能说明 Touch screen function description

- 系统主页：直观的显示 1#~4#的运行数据以及运行状态
- 数据查询：记录卷扬机运行过程中的数据
- 趋势图表：实时显示运行频率曲线
- IO 图表：对应显示实际 PLC 输入输出点状态
- 故障查询：实时故障查询及历史故障查询功能
- 用户登录：登录后可修改设备权限功能 密码：241003
- System homepage: intuitively display the operation data and operation status of 1#~4#
- Data query: record the data during the operation of the winch
- Trend chart: real-time display of the operation frequency curve
- IO chart: corresponding display of the actual PLC input and output point status
- Fault query: real-time fault query and historical fault query function
- User login: after logging in, you can modify the device permission function  
Password: 241003

## 4、安装 Installation

控制柜安装以前首先清除控制柜内、外的灰尘，并检查控制柜各接线是否有松动现象，如有发现应立即修复。然后将控制柜固定于垂直的板壁上。安装时使控制箱与发热体与腐蚀性气体远离，控制柜的左侧、右侧和顶部与其物体至少相距 200 毫米，以免影响控制柜散热。

Before installing the control cabinet, first remove the dust inside and outside the control cabinet, and check whether the wiring of the control cabinet is loose. If found, it should be repaired immediately. Then fix the control cabinet on the vertical panel wall. When installing, keep the control box away from the heating body and corrosive gas, and the left side, right side and top of the control cabinet are at least 200 mm away from their objects, so as not to affect the heat dissipation of the control cabinet.

## 5、调整 Adjustment

控制柜安装完毕后再外部电气设备连接之前,应检查控制柜电器元件的整定数据是否有变动,是否满足原设计的需要。

检查和调整的主要内容如下:

- (1) 检查所有接触器、继电器触头的压力、超额行程、继开距离等。
- (2) 检查和调整电机保护器整定电流值。
- (3) 检查小型继电器安装是否良好,锁扣是否锁紧。

当控制柜与外部电器设备连线以后.应按控制柜的原理图认真检查各部分的联系是否正确,在证实无误后即可对本控制箱进行操作。

After the control cabinet is installed and before the external electrical equipment is connected, check whether the setting data of the electrical components of the control cabinet has changed and whether it meets the needs of the original design.

The main contents of inspection and adjustment are as follows:

- (1) 1. Check the pressure, overtravel, and relay opening distance of all contactors and relay contacts.
- (2) 2. Check and adjust the set current value of the motor protector.
- (3) 3. Check whether the small relay is installed well and whether the lock is locked.

When the control cabinet is connected to the external electrical equipment. The connection of each part should be carefully checked according to the schematic diagram of the control cabinet, and the control box can be operated after it is verified.

## 6、维护 Maintenance

为了保证控制柜能正常工作,必须对设备实行定期检修,检修期是按其工作的平凡程度及设备所处的环境和位置(重要与次要,环境的良好与恶劣)等情况来确定的。但至少不低于下列规定的检修次数。

控制柜的维护分一般检查和大检查二种,一般检查每半个月一次,大检修每三个月至少一次。

In order to ensure that the control cabinet can work normally, it is necessary to carry out regular maintenance of the equipment, and the maintenance period is determined according to the ordinary degree of its work and the environment and location of the equipment (important and minor, good and bad environment). But at least not less than the number of maintenance



specified below.

The maintenance of the control cabinet is divided into general inspection and general inspection, general inspection every half a month, and major overhaul at least once every three months.

## 6.1 一般检查 General Inspection

- (1) 变频控制柜、PLC 控制柜在检查前必须首先切断其供电电源，**严禁带电检修**。（切断电源步骤：按“系统停止”按钮切断变频器电源及 PLC 控制柜电源，使控制柜脱离电网）。
- (2) 清除柜、控制台内外一切灰尘和脏物。
- (3) 检查各电器元件的紧固件是否有松动现象，活动机构是否灵活，带电部分与外壳有否短路情况，若有发现则应给以修复。
- (4) 检查零部件有否锈蚀现象，若有发现，则应予修复。在检查电器元件的触头时，如在其接触表面上发现有氧化物或细小熔化物时，需用油光锉将其清除，力求其接触表面保持原型，并有较高的光洁度。以保证触头的可靠接触。对于有银镀层的触头，如发现有烧焦或熏黑现象，则不能用细挫清除，而应用沾有汽油的抹布仔细揩净。揩完后，应将触头上的汽油揩净。
- (5) 检查接触器和继电器触头的超额行程，继开距离和接触压力，不符合要求时应给予检修和调整。
- (6) 检查接触器和继电器的触头弹簧和非磁性垫片是否完好，如有损坏应给予修理和调换。但在修理和调整时，必须对该元件进行技术数据测定和校对（如接触压力、开继距离、超额行程、吸收和释放电压或电流、延时继电器的延时时间等）。
- (7) 检查控制柜的绝缘电阻是否符合技术条件中的规定数据（如不符合的应给予修复）。
- (8) 检查接地装置是否完好，接地螺钉是否有松动，如有发现应立即修复。

(1) Before checking the inverter control cabinet and PLC control cabinet, the power supply must be disconnected first. It is strictly forbidden to perform maintenance with power on. (Power off procedure: Press the "system stop" button to disconnect the inverter power supply and PLC control cabinet power supply, so that the control cabinet is disconnected from the power grid).

(2) Remove all dust and dirt inside and outside the cabinet and console.

(3) Check whether the fasteners of each electrical component are loose, whether the moving mechanism is flexible, whether the live part and the shell have short circuit, if found,

it should be repaired.

(4) Check whether the parts are corroded, if found, it should be repaired. When checking the contacts of electrical components, if oxides or fine melts are found on the contact surface, it is necessary to remove them with a smooth file, and strive to maintain the prototype of the contact surface and have a high finish. To ensure reliable contact of the contacts. For the contact with silver coating, if it is found that there is burning or blackening, it can not be removed with a fine file, and it should be carefully wiped with a rag stained with gasoline. After wiping, the gasoline should be wiped off the contact.

(5) Check the excess travel of the contactor and relay contacts, following the opening distance and contact pressure, and should be repaired and adjusted when it does not meet the requirements.

(6) Check whether the contactor and relay contact springs and non-magnetic gaskets are intact, if damaged, should be repaired and replaced. However, after repair and adjustment, the technical data of the component must be determined and proofread (such as contact pressure, opening distance, excess travel, absorption and release voltage or current, delay time of the delay relay, etc.).

(7) Check whether the insulation resistance of the control cabinet meets the specified data in the technical conditions (if it does not meet the requirements, it should be repaired).

(8) Check whether the grounding device is in good condition, whether the grounding screw is loose, and repair it immediately if found.

## 6.2 大检修 overhaul

6.2.1 在进行大检修之前，应做好如下的准备工作：

- (1) 切断控制柜的输入电源。（步骤同上）。
- (2) 拆掉与箱外连接的外部导线。

6.2.2 在控制箱大检查时，除做如前所述一般检查项目外，尚需要完成下列几项工作：

- (1) 检查接触器和继电器的吸引和释放电压或电流量，是否符合要求。
- (2) 检查和调整电机保护器的动作电流值。
- (3) 清楚灭弧罩（内部和外部）和线圈上的灰尘和脏物，并测定线圈电阻。检查其有否短路现象，如有发现。则应给予修复或调换。

- (4) 检查控制箱的接地气是否良好，如接触不良或接地断裂，则应给予修复。

6.2.1 should be prepared for the following preparations before the overhaul is carried out:

- (1) cut off the input power of the control cabinet. (the same).

- (2) remove external wires connected to the box.

6.2.2 in the case of large inspection of the control box, the following tasks are required to complete the following items except as mentioned above.

- (1) check for the suction and release voltage or current of the contactor and relay.

- (2) check and adjust the action current of the heat relay.

(3) clear the dust and dirt on the arc cover (internal and external) and the coil, and determine the coil resistance. Check whether it has a short circuit, if found. It should be repaired or replaced.

(4) to check if the ground gas of the control box is good, such as contact or ground fracture, should be repaired.

### 6.3 工作时的保护 Protection at work

- (1) 检查外柜上是否有妨碍其正常冷却的其他物体。

- (2) 外向的温度是否有过热现象

(3) 控制柜之应用是否符合其所规定的工作制度，并观察控制柜的配套电动机工作情况，如发现有不正常现象应立即进行检查。

(1) Check whether there are other objects on the outer cabinet that hinder its normal cooling.

- (2) Whether the outward temperature is overheating

(3) Whether the application of the control cabinet conforms to its prescribed working system, and observe the working condition of the supporting motor of the control cabinet. If any abnormal phenomenon is found, it should be checked immediately.

### 6.4 常见故障排除指南 Common Troubleshooting Guide

主机不转，检查要点：

- (1) 检查变频器是否正常启动。

- (2) 检查 KM1 接触器是否吸合。

Host does not turn, check the main points:

- (1) Check whether the frequency converter starts normally.

- (2) Check whether the KM1 contactor is sucked.

## 7、封存注意事项 **Precautions for sealing**

(1) 清除柜壳内外的灰尘和脏物。

(2) 为了避免堆积灰尘，控制箱应包上防水帆布。

(3) 存放控制柜的库房应保持清洁干燥，库房的温度应保持在 0-35℃之间相对湿度应保持在 55%-70%之间，且库房内无腐蚀气体。

(4) 在封存期间，必须定期地（不少于半年一次）对控制柜进行检查，无发现封存不良，引起腐蚀或其他毛病，则应立即清除，检查完毕后再进行一次新的油封。

(1) Remove dust and dirt inside and outside the cabinet shell.

(2) In order to avoid accumulating dust, the control box should be covered with waterproof canvas.

(3) The warehouse where the control cabinet is stored should be kept clean and dry, the temperature of the warehouse should be kept between 0-35 ° C and the relative humidity should be kept between 55%-70%, and there is no corrosive gas in the warehouse.

(4) During the sealing period, the control cabinet must be inspected regularly (not less than half a year), and no poor sealing is found, causing corrosion or other problems, it should be removed immediately, and a new oil seal should be carried out after the inspection.

## 8、电气图纸 **Electrical drawings**

电气图纸见附件