



密 别：内部公开
分类号：()

阶段
标记 

Name: Stage automation equipment
operation manual.

Code : _____.

Writing : _____.

Proofreading : _____.

Audit : _____.

Signature : _____.

inspect : _____.

Approval : _____.

total : 18leaf

catalogs

1	Control System Introduction_____	3
1.1	System Components_____	3
1.2	control interface_____	5
1.3	Control Principle_____	13
1.4	Layout of electric control cabinet_____	13
1.5	External Component Arrangement_____	14
1.6	Input/Output List_____	15
2	power-on operation_____	16
3	emergency stop_____	16
	Enable Operation_____	16
5	manual operation_____	16
5.1	point-to-point (computing)_____	16
5.2	automation_____	16
5.3	single-step operation_____	16
6	automatic operation_____	16
7	Fault Alarm and Handling_____	17

1.Control System Introduction

1.1.System Components

The control system consists of motion controller AC801/802/810, touch screen IT7150E/7100E, switching power distributor, servo controller, remote module communication mode and so on. Figure 1 Electronic control of the main system circuit diagram diagram

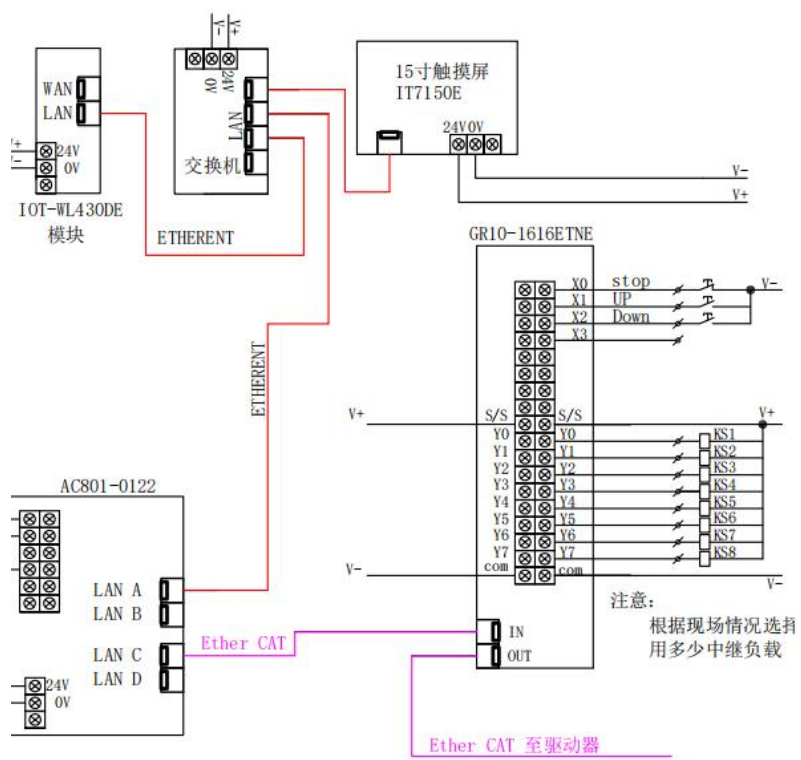


Fig. 1 Electrical control main system circuit diagram

1.控制系统简介

1.1.系统组成

控制系统由运动控制器AC801/802/810，触摸屏IT7150E/7100E、开关电源分配器、伺服控制器、远程模块通讯方式等组成。图 1 电控主系统电路图图

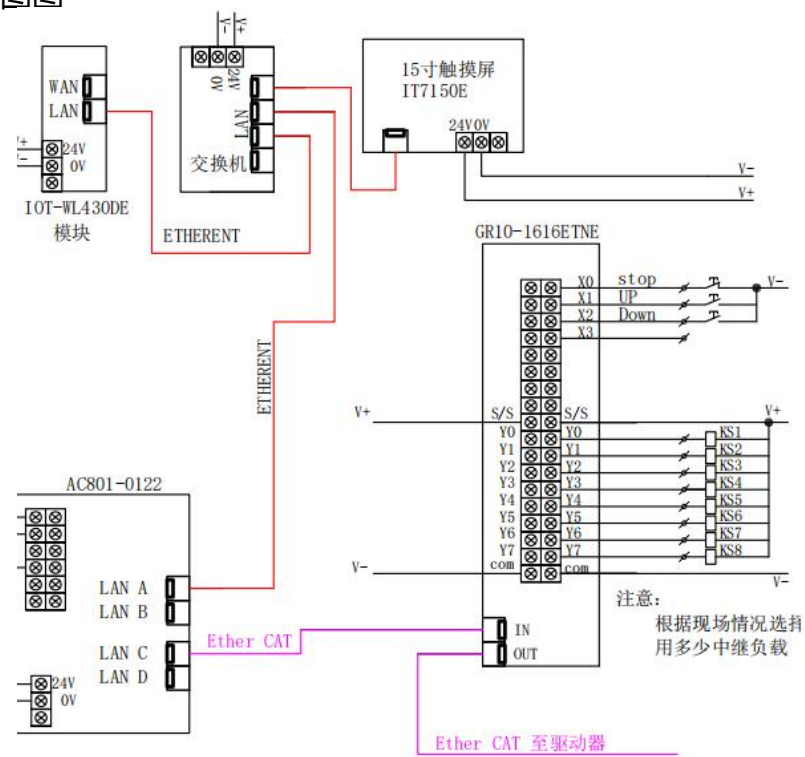


图 1 电控主系统电路图图

The configuration of the main control box will vary according to the site project, Figure 1 shows the system topology, the specific drawing information will be changed according to the project needs.

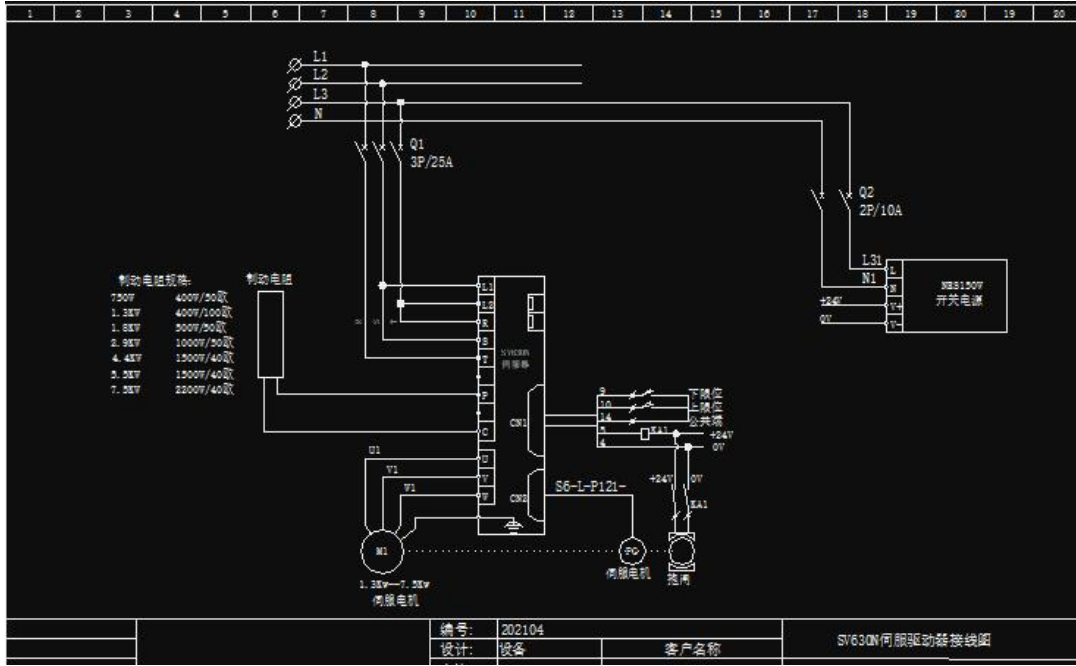


Figure 2 Electronic control servo circuit diagram

The number of drives in the servo electric box is determined according to the site conditions. The box includes drives, switching power supplies, braking resistors, relays and other electrical parts. -----

主控电箱的配置会根据现场项目存在差异，图1为系统拓扑图，具体图纸资料会根据项目需要变更。

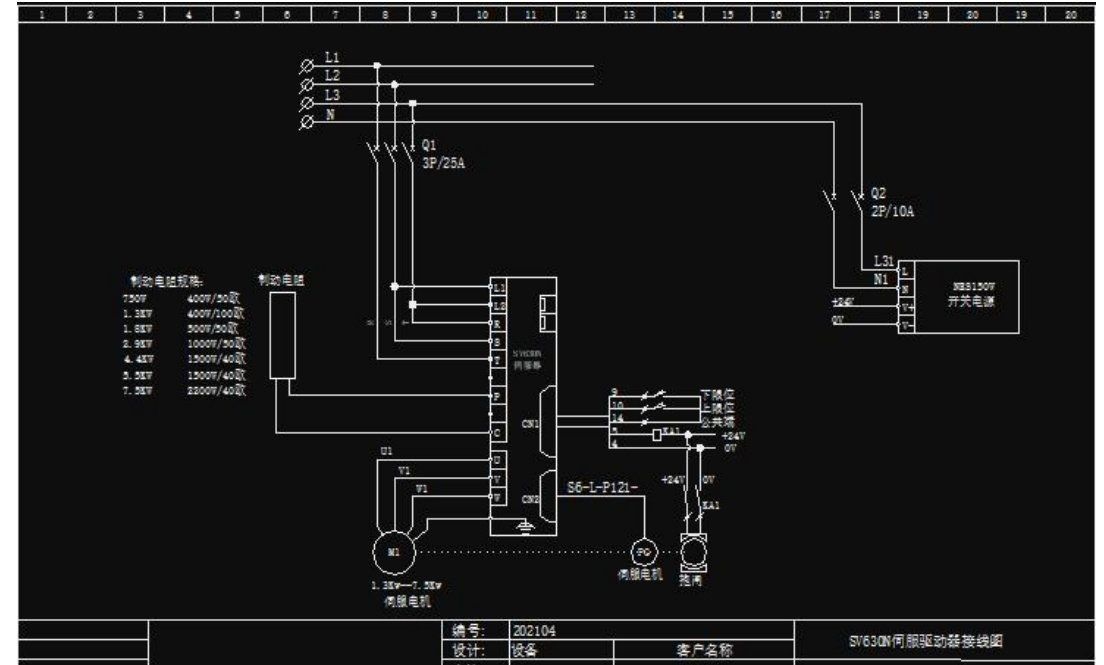


图 2 电控伺服电路图

伺服电箱的驱动器数量根据现场情况决定，箱内包括驱动器，开关电源，制动电阻，继电器等电气件。

1.2.control interface

After powering up, log in and use it according to the password of the operating user.



landing screen

After the machinery power on to enter the operating interface, check whether the interface is normal, network connection, whether the motor is alarmed, to confirm that all normal before manipulating machinery and equipment.

1.2.操控界面

上电后，根据操作使用者的密码登陆使用。



登陆界面

机械开电后进入操作界面，检查界面是否正常，网络连接，电机是否报警，确认全部正常后方可操控机械设备。



Main Interface The main interface allows access to: mode operation, manual control, stage lifting, parameter setting, monitoring alarm information and other sub-interfaces.

Running Interface Running Mode Interface, operate and monitor all movement modes. The modes are as follows: Fixed-point mode, the movement stops when it reaches the fixed-point position. Programming mode, the action cycles according to the set fixed-point pattern in the order of 1 to 10 (Note: Programming mode can only be programmed into fixed-point). Dynamic Mode, the motion moves continuously in the set static and dynamic positions. (Note: the lamp holder must be in the high position before the dynamic mode is activated. (Machinery must be paused when switching modes)

主界面

主界面可以进入：模式运行、手动控制、舞台升降、参数设置、监控报警信息等其他子界面。

运行界面

运行模式界面，操作和监控所有动作模式。模式设有：定点模式，动作到达定点位置后停止运动。编排模式，动作按1--10的顺序根据的设定的定点模式循环运动（注意：编排模式只能编入定点）。动态模式，动作在设定静态和动态位置连续动作。（注意：动态模式启动前灯架必须位于高位。切换模式时必须暂停机械）



Fig. 2 Control Panel Diagram



图 2 操控面板图

Example 1



Operation interface operation: (Note: switching between modes must first pause the machinery) fixed-point mode: selected fixed-point mode, the selected mode point green. Press the “Start” button, the machine runs according to the selected mode and stops after reaching the set position. Motion Mode: Before running the motion mode, the light stand must be in the high position. Select the motion mode, after the selected mode is green. Press the “Start” key, the machine will move continuously according to the selected mode. Arrangement mode: Check the “Arrange mode” key and wait for the green light. Press the “Start” key, the machine will cycle according to the programmed mode. (Note: the programmed mode can only be programmed into the fixed point) Start key: start running the selected mode (no mechanical failure, in order to start normally). Pause key: Pause the running machine. (Mechanical faults will also pause the mechanical operation) Fault Clear: Mechanical alarm or error to remove the fault, so that the machinery is normal. Enable key: before the machinery is used, the enable key needs to be lit green before the machinery can be used normally (the sound of holding brake opening can be heard at the moment of enabling).

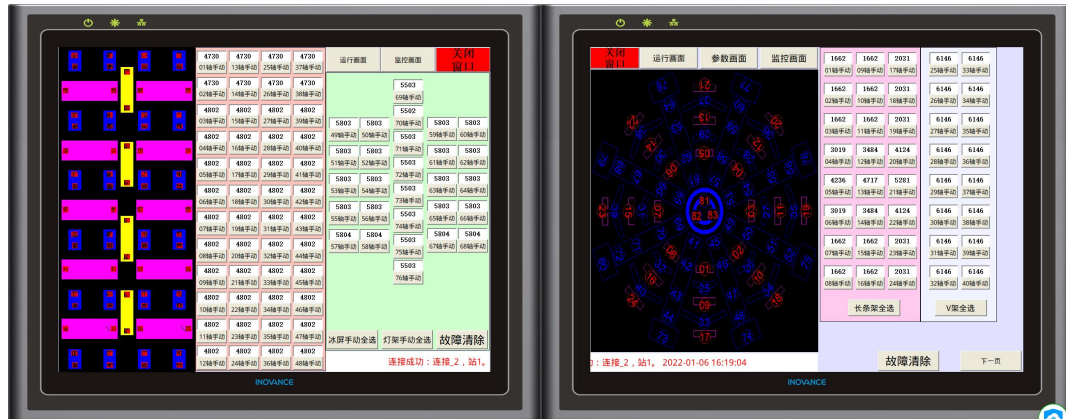
示例1



运行界面操作：（注意：模式之间切换必须先暂停机械）
 定点模式：选中定点模式，被选中的模式点绿后。按“启动”键，机械按选中的模式运行到达设定位置后停止。
 运动模式：运行动态模式前，灯架必须位于高位。选中运动模式，被选中模式点绿后。按“启动”键，机械根据选中的模式连续运动。
 编排模式：选中“模式编排”键，待点绿后。按“启动”键，机械根据编排的模式循环运动。（注意：编排模式只能编入定点）
 启动键：启动运行选中的模式（机械没有故障，才能正常启动）。
 暂停键：暂停运行中机械。（机械有故障时也会暂停机械运行）
 故障清除：机械报警或出错时去除故障，使机械正常。
 使能键：机械使用前，使能键需要点绿后，机械才能正常使用（使能的瞬间能听到抱闸打开的声音）。

manual interface

The manual interface should be used in manual mode to check the number of the light stand that needs to be manually operated according to the mechanical layout of the venue. After the light stand number is selected and green dotted, manually push the joystick up and down to run the light stand. The light stand moves up and down according to the rocker in a set range of heights. The value above the numbered buttons indicates the current height value of the light stand. (It is important to note that some light stands are interlinked with each other to limit the height protection)

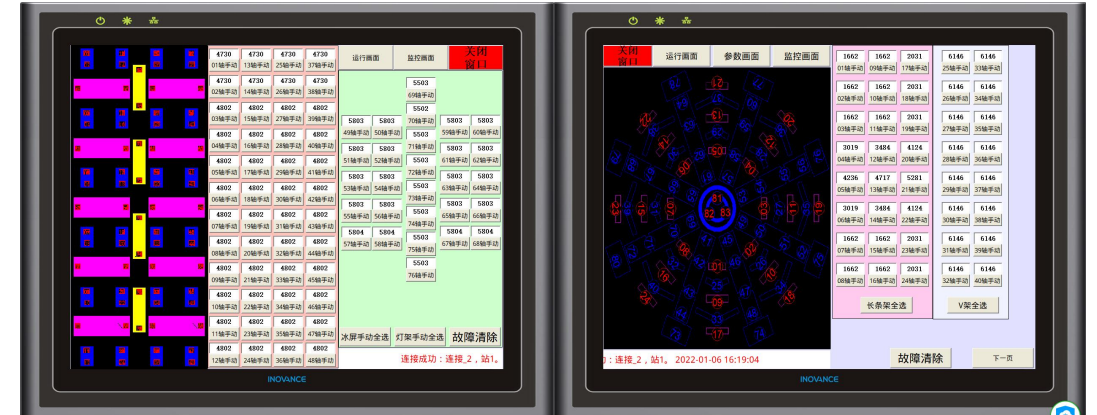


Manual Example 1

Manual Example 2

手动界面

手动界面应用于手动模式，根据场地机械布局，选中需要手动的灯架编号。灯架编号选中点绿后，手动上下推动摇杆运行灯架。灯架根据摇杆的上下运动在设定的范围高度。编号按键上方的数值表示灯架的当前高度值。（必须注意一些灯架的互相联动限制高低保护）



手动示例1

手动示例2



Lamp holder action parameters

Light Stand Mode Parameters

Mode parameters include static parameters and dynamic parameters, as shown in the following figure: static parameters, “static position” box to enter the definition of the operating data, the static operating height of the light stand data in the corresponding static position input. The static running height data of the light stand is input in the corresponding static position. You can also write the action position of the pendulum. Note: Data entry must be completed by pressing the “Save Parameters” or write to take effect. Dynamic parameter, “Dynamic Position” box, input the defined running data, the dynamic running height data of the light stand is input in the corresponding dynamic position. It is also possible to write the position of the action that has been set up. Note: Data input must be completed by pressing “Save Parameter” or write to take effect.



灯架动作参数

灯架模式参数

模式参数包括静态参数和动态参数，如下图所示：
 静态参数，“静态位置”框输入定义的运行数据，灯架静态运行高度数据在对应的静态位置输入。也可以把摆好的动作位置写入。
 注意：数据输入完成必须按“保存参数”或写入后才生效。
 动态参数，“动态位置”框输入定义的运行数据，灯架动态运行高度数据在对应的动态位置输入。也可以把摆好的动作位置写入。
 注意：数据输入完成必须按“保存参数”或写入后才生效。



monitoring interface

Monitoring interface

monitoring interface can be viewed in real time the operating status of machinery and equipment, the speed of machinery operation, mechanical loads, the fault code when a fault occurs. Operators or maintenance personnel can also be based on the monitoring interface of the fault code instructions to eliminate the various fault conditions.



监控界面

监控界面

监控界面可以实时查看机械设备的运行状态，机械运行的速度，机械的负载载荷，发生故障时的故障代码。操作或检修人员也可以根据监控界面的故障代码说明排除各故障情况。



Stage Control Interface

Stage interface operation

Select the stage equipment that needs to be raised or lowered, and then press “Stage Up”/“Stage Down” to control the stage raising and lowering.



舞台控制界面

舞台界面操作

选中需要上升或下降的舞台设备，再按“舞台升”/“舞台降”来控制舞台升降

1.3.Control Principle

The system is controlled by the high-definition intelligent touch screen IT7150E/IT7100E to set the parameter mode of the running action, and the parameters are sent to the motion controllers AC801/AC802/AC810 through the Ethernet TCP/IP network, and the motion controllers AC801/AC802/AC810 control the axes of servo motors through the fieldbus EtherCAT to complete the action at the set position. The motion controller AC801/AC802/AC810 controls each servo motor axis via EtherCAT on the fieldbus to move to the set position to complete the action.

1.4.Layout of electric control cabinet

The electrical boxes for the servo motor controllers are distributed on top of the ceiling frames of the site according to the actual situation on the site.



Fig. 4 Arrangement of electronic control cabinet



The internal arrangement of the electronic control cabinet is determined by the on-site project

1.3.控制原理

本系统控制通过高清智能触摸屏IT7150E/IT7100E设定运行动作的参数模式，参数通过以太网TCP/IP网络送到运动控制器AC801/AC802/AC810，由运动控制器AC801/AC802/AC810通过现场总线EtherCAT控制各伺服电机轴运动到设定的位置完成动作。

1.4.电控柜布置图

伺服电机的控制器电箱根据现场实际情况分布于场地的天花架上。



图 4 电控柜布置图



电控柜内部布置根据现场项目决定。

1.5.External Component Arrangement



Figure 6 External Component Arrangement

Explain the external component arrangement in conjunction with the mechanical mechanism diagram (line drawing).

1.5.外部元器件布置



图 6 外部元器件布置图

结合机械机构图（线图），说明外部元器件布置。

1.6.Input/Output List

Table 2 List of Input Points

serial number	functionality	address	connection point	note
1				
2				
3				
4				
5				

Table 3 List of Input Points

serial number	functionality	address	connection point	note
1				
2				
3				
4				
5				

1.6.输入输出清单

表 2 输入点列表

序号	功能	地址	连接点	备注
1				
2				
3				
4				
5				

表 3 输入点列表

序号	功能	地址	连接点	备注
1				
2				
3				
4				
5				

2.power-on operation

Power-on delay of about 20 seconds to enter the system, after power-on is strictly prohibited to touch all kinds of terminals to prevent electric shock! ----- The system can be used normally when the upper left corner of the operation interface is green with “normal bus status” and the number of connected machines is the same as the actual one.

3.emergency stop

Press the “red mushroom head” button or the “emergency stop switch” of the touch screen to stop the machine. Necessary mechanical inspection and maintenance can be carried out. (If the machine is tilted too much, it is necessary to press the emergency stop button to stop the machine in case of emergency.)

4.Enable Operation

Standby and no emergency stop, press the “enable” button, the machine enters the enable state. The lamp holder motor can be used for operation.

5.manual operation

5.1.point-to-point (computing)

The manual interface selects the machine that needs to be moved and uses the rocker to push up and down to run the light stand. The light stand moves up and down according to the rocker push in a set range of heights.

5.2.teach by demonstration

5.3.Single-step operation

6.automatic operation

There are three automatic motion modes in the motion interface: fixed point mode, dynamic mode, and programmed mode. Select the mode you want to run, and press the “Start” button to run the machine automatically according to the selection.

7.Fault Alarm and Handling

When there is a fault or warning in the system, the touch screen will pop up the alarm window and display relevant information. The operator can handle the alarm information and the corresponding prompts against the fault alarm table in order to eliminate the faults and warnings and make the equipment operate normally.

2.上电操作

上电延时20秒左右进入系统，上电后严禁触摸各类端子以防触电!-----当运行界面左上角“总线状态正常”绿色，且连接的机器数量与实际一致，系统才可正常使用。

3.急停操作

按下“红色蘑菇头”按钮或触摸屏的“急停开关”，机器停止不动。可以进行必要的机械检查保养。（机械遇到倾斜角度过大时，紧急情况下需要按下急停键停机）

4.使能操作

待机且机器没有急停状态，按下“使能”键，机器进入使能状态。灯架电机可以使用操作。

5.手动操作

5.1.点动

手动界面选中需要动作的机械，利用摇杆上下推动运行灯架。灯架根据摇杆推动上下运动在设定的范围高度。

5.2.示教

5.3.单步运行

6.自动操作

运动界面有三种自动运动模式：定点模式、动态模式、编排模式。根据需要选中运行的模式，按“启动”键机械根据选中自动运行。

7.故障报警及处理

当系统出现故障或警告时，触摸屏会弹出报警窗口，显示相关信息。操作人员可根据报警信息和相应的提示，对照故障报警表进行处理，以便排除故障和警告，使设备正常运行。

Table 9 List of System

serial number	Alarm content	cure
1	E136 – Encoder error	① Encoder connecting wire broken, replace the wire ② motor encoder damage, replace the motor
2	E201 – Overcurrent	① power off and back on, normal fault removal ② drive damage, replace the drive
3	E400 – Overvoltage	① main circuit voltage is too high, check the input voltage ② braking resistor is abnormal, replace the resistor to check the parameters of the resistor ③ drive damage, replace the drive
4	E420 – Out of phase	① three-phase input is bad, check the RST three-phase voltage ② drive damage, replace the drive
5	E620 – Motor overload	① the holding brake is not open, check the intermediate relay and switching power ② the load is too heavy, check the operation of the mechanical transmission mechanism ③ drive damage, replace the drive
6	E630 – motor blocking overload	① Holding brake is not open, check the intermediate relay and switching power ② Mechanical mechanism is stuck, exclude the mechanical mechanism ③ UVW output disconnected or connected to the wrong, check the UVW output line
7	E640 – IGBT over temperature	① Turn off the power to wait for the temperature to drop and then power on, normal operation ② drive fan damage, replace the fan or drive ③ drive damage, replace the drive
8	E650 – Drive overheating	① Turn off the power to wait for the temperature to drop and then power on, normal operation ② drive fan damage, replace the fan or drive ③ drive damage, replace the drive
9	E731 – Battery failure	① poor contact of encoder battery, tighten the battery connector ② low voltage of encoder, replace the battery (HOD-20=1)
10	E740 – Encoder failure	① Replace the encoder wire and reset the fault (HOD-20=2) ② Replace the motor and reset the fault (HOD20=2)
11	E730 – Low battery voltage	① Encoder battery voltage is low ② Encoder voltage is low, replace battery (HOD-20=1)
12	EB00 – Position deviation	① motor lack of phase or broken wire, check the motor and wire ② holding brake open bad, check the holding brake further replacement of the motor ③ load inertia gain setting mismatch, adjust the parameter
13	E950 – Positive switch in place	① Check the mechanical travel switch and adjust the travel switch.
14	E952 – Reverse switch in place	① Check the mechanical travel switch and adjust the travel switch.

表 9 系统故障及警告列表

序号	报警内容	处理办法
1	E136--编码器出错	①编码器连接线断线，更换线材 ②电机编码器损坏，更换电机
2	E201--过电流	①关电重新上电，正常故障去除 ②驱动器损坏，更换驱动器
3	E400--过电压	①主回路电压过高，检查输入电压 ②制动电阻异常，更换电阻检查电阻参数 ③驱动器损坏，更换驱动器
4	E420--缺相	①三相输入不良，检查RST三相电压 ②驱动器损坏，更换驱动器
5	E620--电机过载	①抱闸没有打开，检查中间继电器和开关电源 ②负载太重，检查机械传动机构运行 ③驱动器损坏，更换驱动器
6	E630--电机堵转过载	①抱闸没有打开，检查中间继电器和开关电源 ②机械机构卡住，排除机械机构 ③UVW输出断线或接错，检查UVW输出线
7	E640--IGBT过温	①关电待温度下降后上电，正常运行 ②驱动器风扇损坏，更换风扇或驱动器 ③驱动器损坏，更换驱动器
8	E650--驱动器过热	①关电待温度下降后上电，正常运行 ②驱动器风扇损坏，更换风扇或驱动器 ③驱动器损坏，更换驱动器
9	E731--电池故障	①编码器电池接触不良，电池接头紧固 ②编码器电压低，更换电池（H0D-20=1）
10	E740--编码器故障	①更换编码器线材，复位故障（H0D-20=2） ②更换电机，复位故障（H0D20=2）
11	E730--电池电压低	①编码器电池电压低 ②编码器电压低，更换电池（H0D-20=1）
12	EB00--位置偏差	①电机缺相或断线，检查电机和线材 ②抱闸打开不良，检查抱闸进一步更换电机 ③负载惯量增益设置不匹配，调整参数
13	E950--正向开关到位	①检查机械行程开关，调整行程开关。
14	E952--反向开关到位	①检查机械行程开关，调整行程开关。