# YLSK-560CNC Spring coiling machine

Operation Manual

使用说明书

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## 1 Product introduction and general technical specifications

YLSK-550CNC and YLSK-660CNC cylindrical spring computerized spring coiling machine is a high-tech mechatronics model developed by our company in combination with the current situation of the domestic spring industry. After extensive use and improvement, this model has become a spring manufacturer. An essential machine tool for precision springs. At the same time, this machine also has the characteristics of simple operation, convenient adjustment, complete functions, high precision of coil spring and fully automated production. Due to the rapid development of computer technology, the good performance-price ratio of this machine has become one of the most prominent features.

This machine is composed of two parts: CNC system and mechanical system.

The numerical control system mainly includes: AC servo motor, servo controller, data acquisition and control board, computer control center, auxiliary output, operation keyboard and display. Some setting switches inside the numerical control system are used for debugging or repairing the computer. Please do not change it by the operator, so as to avoid damaging the computer or losing the computer software and causing unnecessary losses to you.

The mechanical system mainly includes: machine tool base, box body, wire feeding mechanism, pitch mechanism, cutting mechanism, core knife lifting mechanism, reducing mechanism, distribution shaft mechanism, straightening mechanism and wire frame device. Due to the use of computer servo-controlled motors, the spring debugging is greatly facilitated, and users basically do not need to make cams or grind the cams to debug the springs. However, due to the wide variety of springs and the

ever-changing rolling process, users can make some cams and cutters according to the actual situation to maximize the performance of the machine tool.

# Technical specification :

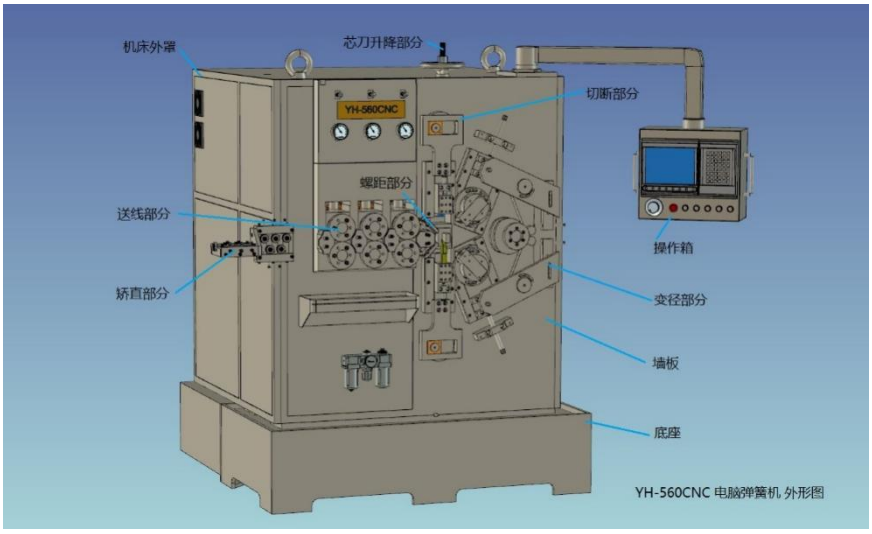
| 参数\型号 Technical Data | YH-560CNC | YH-550CNC |
|---|---|---|
| 钢丝直径范围（mm） Wire Dia.(mm) | 2-6 | 2-5 |
| 控制轴数 Controlled Axes | 6 | 6 |
| 弹簧最大外径（mm） Max O.D. of Spring | 90 | 90 |
| 送线速度（m/min） Feeding Speed | 110 | 80 |
| 送线电机功率（kw） Feeding Servo | 15 | 7 |
| 切断电机功率（kw） Cutting Servo | 4.4*2 | 3.8*2 |
| 变径电机功率（kw） Variable Dia. Servo | 2.9 | 2.9 |
| 螺距电机功率（kw） Pitch Servo | 1.5 | 1.5 |
| 滚轮组数 Feed Roller Pairs | 3 | 3 |
| 机床外形尺寸mm（L*W*H） Machine Dimension | 2170*1350*2025 | 2170*1350*2025 |
| 机床重量（kg） Weight | 3100 | 2900 |

产品不断改进仅供参考

| 参数\型号 Technical Data | YH-660CNC | YH-670CNC |
|---|---|---|
| 钢丝直径范围（mm） Wire Dia.(mm) | 2-6 | 2-7 |
| 控制轴数 Controlled Axes | 6 | 6 |
| 弹簧最大外径（mm） Max O.D. of Spring | 100 | 110 |
| 送线速度（m/min） Feeding Speed | 110 | 80 |
| 送线电机功率（kw） Feeding Servo | 15 | 15 |
| 切断电机功率（kw） Cutting Servo | 4.4*2 | 5.5*2 |
| 变径电机功率（kw） Variable Dia. Servo | 2.0 | 2.0 |
| 螺距电机功率（kw） Pitch Servo | 1.5 | 1.5 |
| 滚轮组数 Feed Roller Pairs | 3 | 3 |
| 机床外形尺寸mm（L*W*H） Machine Dimension | 2170*1350*2025 | 2170*1350*2025 |
| 机床重量（kg） Weight | 3200 | 3300 |

产品不断改进仅供参考

## 2.Machine parts description and functions




1. Machine tool base: the box used to support the machine tool, and the internal lubricating oil pool is used to store and recover the lubricating oil for recycling.

2. Wall panel: Standing on the base of the machine tool, it is the main body of the machine, which is composed of two front and rear wall panels.

3. Wire feeding mechanism: It is composed of gear transmission mechanism, roller pressing mechanism, roller and groove plate.

4. Pitch mechanism: It is composed of ball screw, pitch rod, pitch claw and pitch cutter.

6. Core knife lifting mechanism: It consists of a core knife seat, a lifting screw and a hand wheel.

7. Diameter reducing mechanism: It is composed of linear motion mechanism (or reducing cam + reducing lever), reducing slider, top spring pin seat and top spring pin.

8. Distribution shaft mechanism (no more than six shafts): consists of a gear transmission mechanism, a distribution shaft, a reducing cam seat and a cutting cam seat.

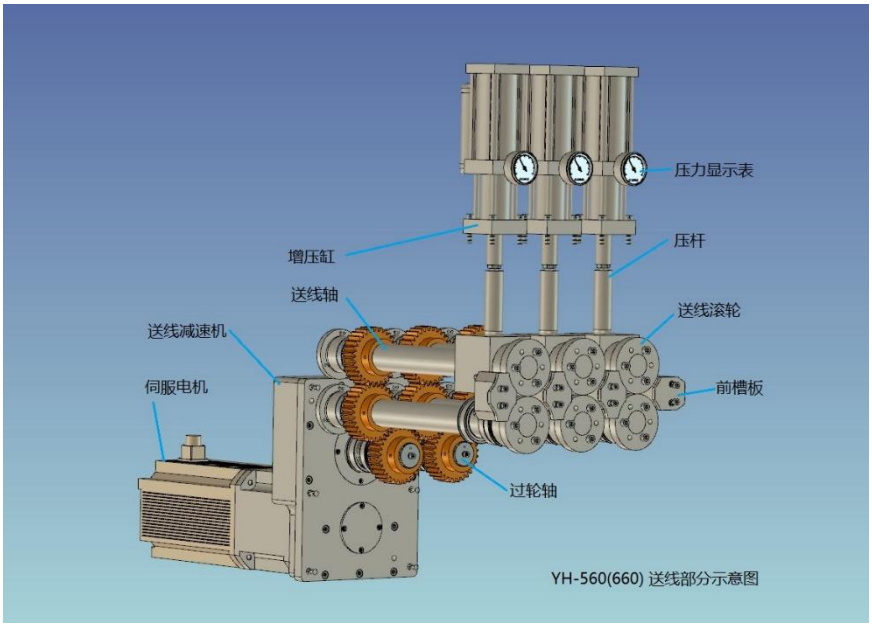
9. Straightening device: composed of horizontal straightening seat, vertical straightening seat, straightening roller and adjusting screw, etc.

10. Automatic wire rack: It is composed of a base, a material tray and a frequency converter device.

11. Operation box: Built-in display, keyboard, etc., can be rotated at any angle, which is convenient for the operator to observe and operate.

## 3. The name and function of the parts of the main organization

A.The name and function of the main parts of the wire feeding mechanism (see the figure below)

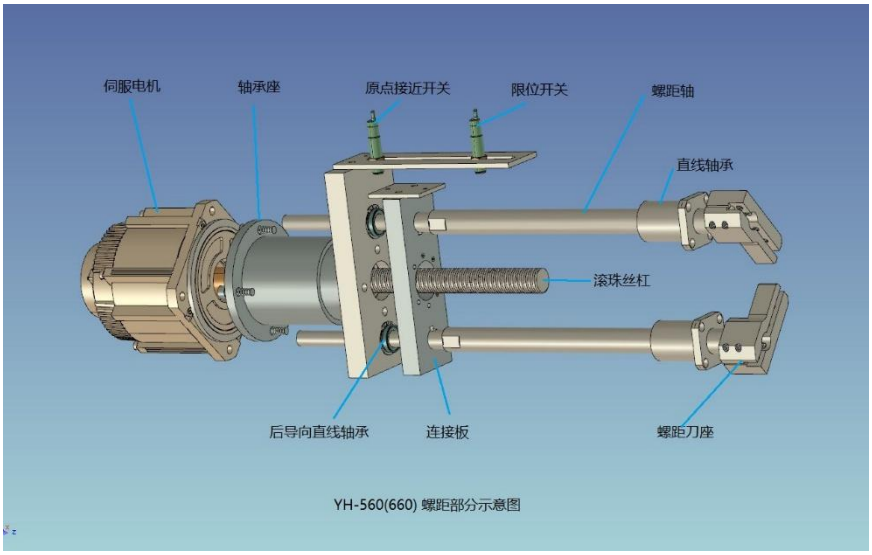



The wire feeding mechanism adopts the roller wire feeding method, and the servo motor drives the roller on the feeding shaft to realize the wire feeding action through the wire feeding reducer. This machine is equipped with some feeding rollers with different wire diameters, and the size of the corresponding groove is indicated on the rollers. Each pair of feeding rollers has 2 wire grooves. When installing the roller, you should choose the side close to the box according to the position of the wire groove. After the feeding roller is installed, tighten the set screw of the roller.

This machine provides grooved plates suitable for various steel wire diameters. At the same time, engrave the corresponding guide wire groove size on the board. If there is no suitable guide wire

groove board, use a larger one. When installing, pay attention to make the required roller groove correspond to the groove plate. And keep a certain gap between the two ends of the extension and the feeding roller, and then tighten the nut to compress the adjusted groove plate through the pressure plate.

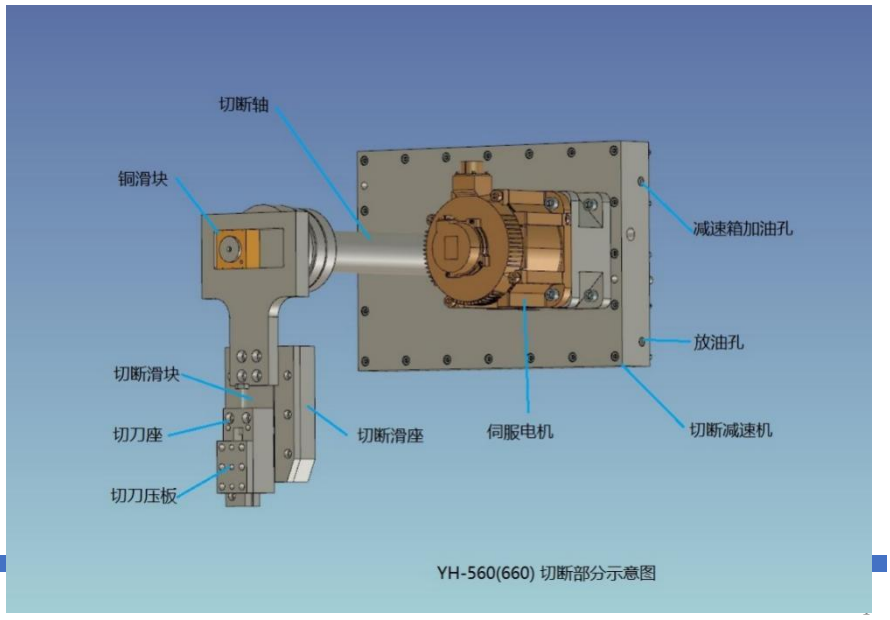
B. The name and function of the main parts of the pitch mechanism (see the figure below)



YH-560(660) 螺距部分示意图

When rolling a spring with a pitch, a pitch cutter is required to push out the pitch. The linear reciprocating motion of the pitch cutter is realized by the servo motor driving the ball screw pair to push the pitch rod. When its stroke is large, the circle pitch is large, and when the stroke is small, the circle pitch is also small. It can be realized by adjusting the data of the pitch axis. Adjust the stroke of the circle from the board to large or small. When using the pitch axis, in addition to the origin switch, in order to ensure safety, the machine is also equipped with a limit switch, which has been adjusted before leaving the factory. The user should be careful not to adjust it casually.

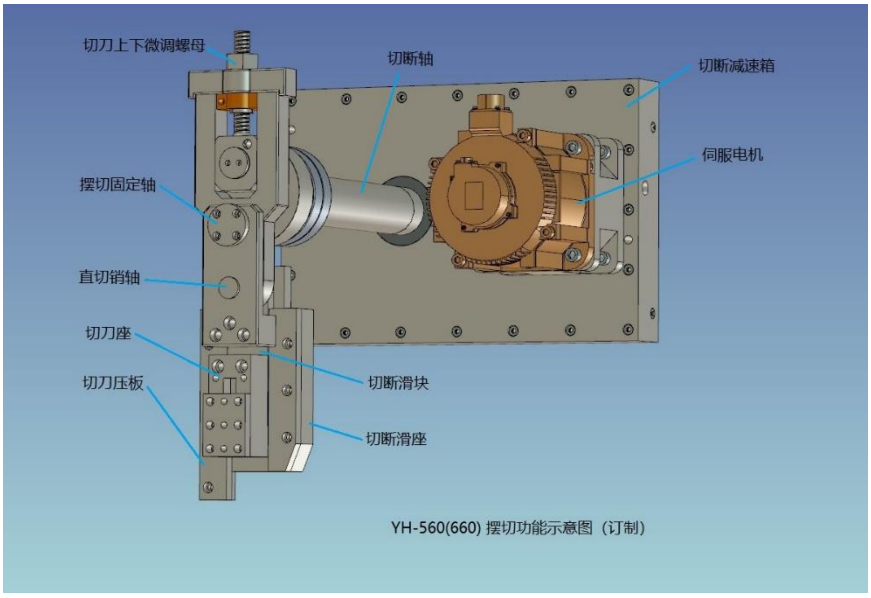
C. Cutting mechanism: name and function of main parts (see figure below)



YH-560(660) 切断部分示意图

The cutting slide block realizes linear reciprocating motion by cutting the eccentric shaft driven by the cutting reducer. The upper cutting slider is used for winding right-handed springs, and the lower cutting slider is used for winding left-handed springs. When changing from the right-handed spring to the left-handed spring, only the cutter (1) needs to be installed on the lower cutting slider and pressed with screws. Two cutters are supplied for users. In addition, the relative position of the cutter and the spring should be adjusted according to the coiled spring. When adjusting the cutter before and after, please pay attention to the appropriate force to avoid damage to the cutter. The blade can be properly sharpened according to actual needs.

The machine can customize the pendulum cutting mechanism (see the figure below) according to the needs. The adjustment screw is used to fine-tune the limit position of the cutting slider. When adjusting, loosen the lock nut first, and then re-lock it after adjustment to prevent the working process. Loose.

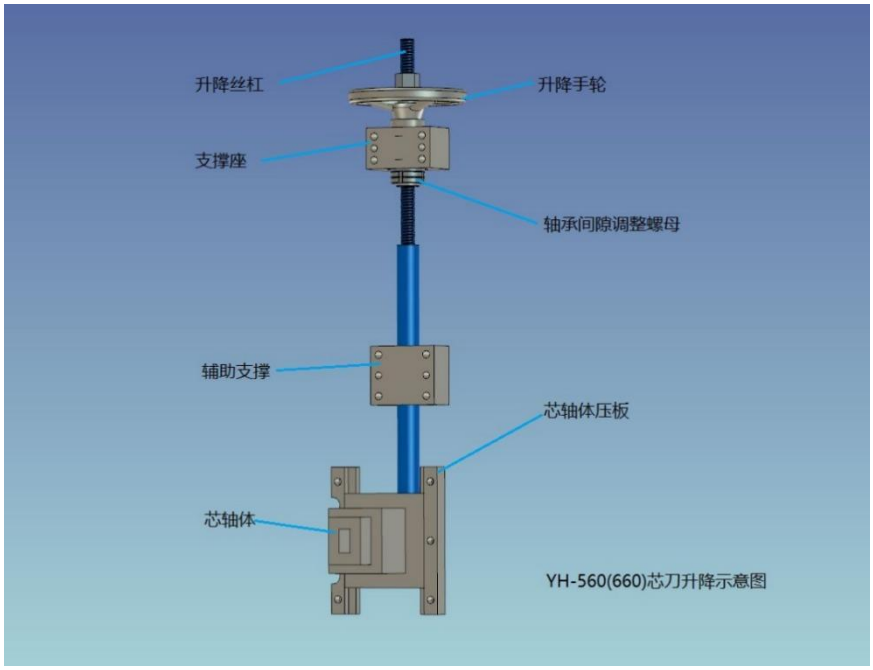



The cutting core knife is related to the wire diameter and the inner diameter of the spring. In order to prevent the core knife from breaking during cutting, the working end should be ground into a semicircular shape.

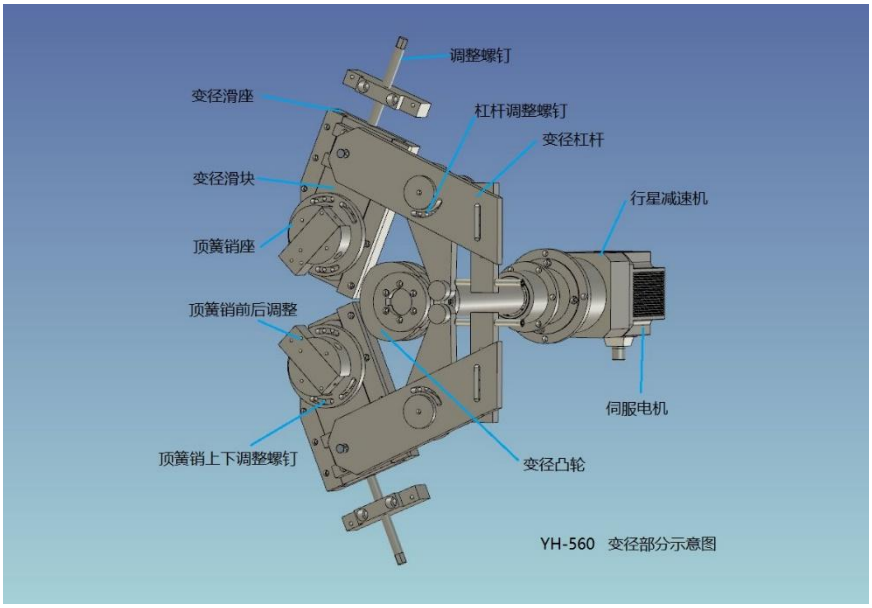
## 4. Core knife lifting mechanism: main components and functions (see the figure below)

The core knife is placed in the square hole of the core knife seat. Except that the core knife needs to be able to reciprocate back and forth when rolling the concave spring, it is generally necessary to press the adjusted core knife with an inclined iron or a set screw.

The hand wheel is used to adjust the high and low position of the core knife seat to make the core knife fit the diameter of the coil spring. When the core knife is adjusted, first loosen the locking screw, and then re-lock it after adjustment.




5. Reducing mechanism: name and function of main parts (see figure below)

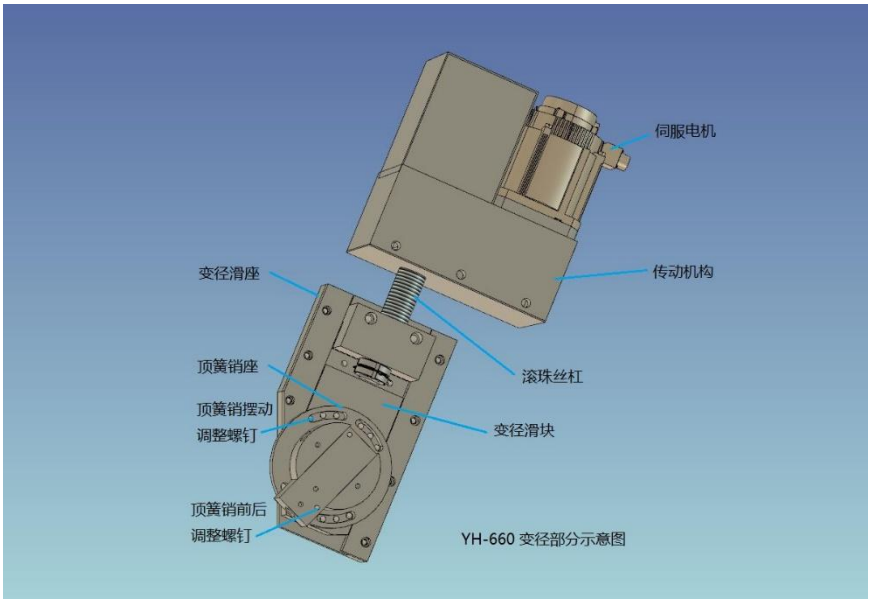



The diameter reducing mechanism realizes the rolling of cylindrical, convex, concave and conical springs through the movement of the reducing slider.

The displacement of the YLSK-560CNC variable diameter slider is driven by a large lever and a small lever. The lever ratio fine-tuning device changes the lever ratio of the lever system by adjusting the position of the roller, so that it can roll without changing the cam. When adjusting the springs with different tapers, loosen the set screws first, and then tighten the screws after adjustment. When the lever transmission is relatively large, attention should be paid to adjusting the front limit position of the coil spring pin to avoid collision and cutting off the core knife.

When rolling a cylindrical spring, a large lever and a small lever are unnecessary. The slider adjustment screw is directly used to adjust the diameter of the spring. For this reason, the roller can be moved to a position with a relatively small lever.

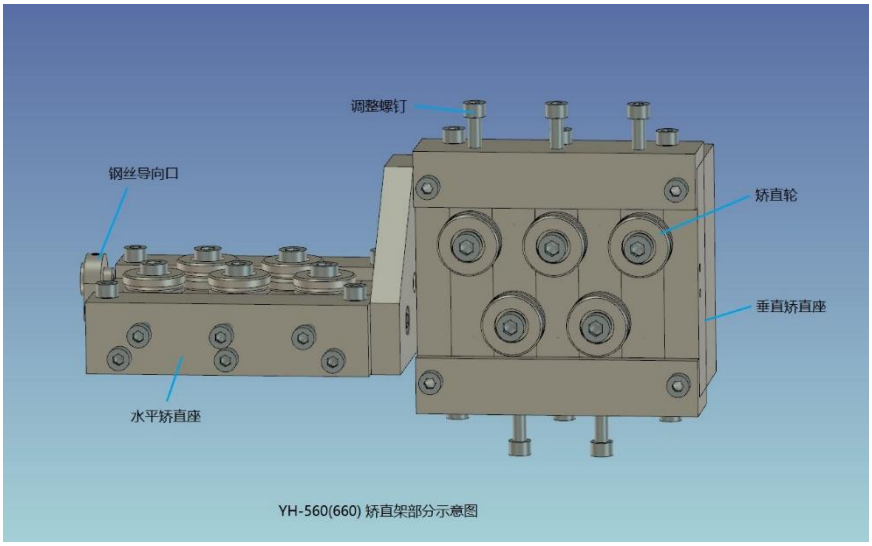
The displacement of the YLSK-660CNC and YLSK-670CNC variable diameter sliders is realized




by the servo motor driving the ball screw. The stroke of the slider has been limited by the limit switch and software before leaving the factory. There is no need to change the position and Software settings. The position of the slider is controlled by the program. When rolling the variable diameter spring, first adjust the small diameter and large diameter of the spring, and then roll out springs with different tapers by changing the data of the intermediate program. The adjustment should focus on the accuracy of the data. In order to avoid collision cutting core knife and upper and lower sliding block hitting the knife.

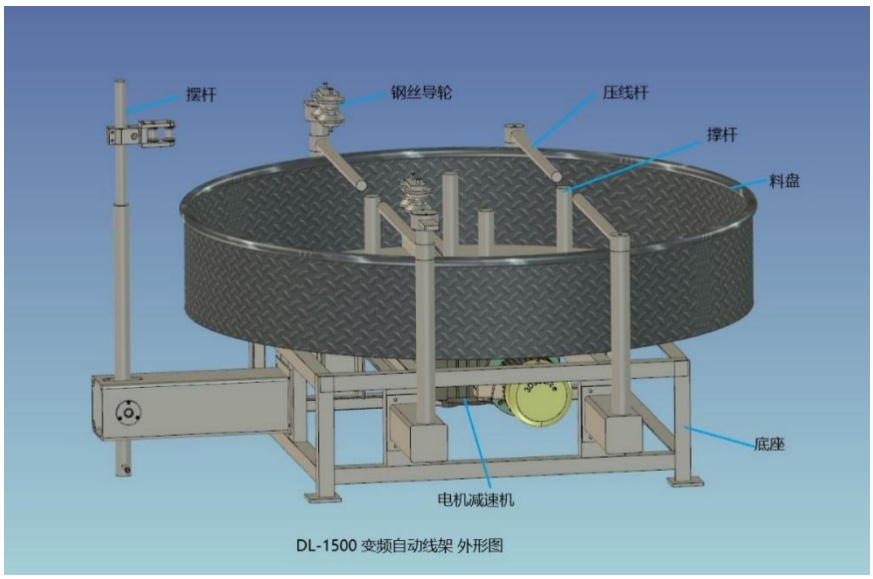
The top spring pin is installed on the adjustment block, and then it is locked with a set screw. The adjustment block is installed on the top spring pin seat, and the adjustment block can swing a certain angle around the supporting shaft. The angle of the two top spring pins is generally controlled between 60° and 90°. The angle of the two top spring pins is adjusted by the top spring pin seat. After adjustment, it should be firmly locked to avoid affecting the spring accuracy. This machine is supplied with some top spring pins suitable for coiled steel wire diameter φ2-φ6 mm for users to use, and users can also make them according to their needs.

6. Straightening device: name and function of main parts (see the figure below)




After the wire is drawn from the wire frame, the thread end is inserted into the hole of the guide sleeve, and the wire is straightened by successively passing through five straightening rollers in the horizontal and vertical directions. The mutual position adjustment of the straightening rollers is realized by adjusting screws. The steel wire groove on the roller is made into a "V" or "U" shape, and the wire diameter can pass through 2-6 mm. The wire centerline of the straightening device should be aligned with the centerline of the wire groove of the feeding roller. It should be adjusted before the machine leaves the factory, and can be re-corrected when necessary.

7.Automatic wire stand: the name and function of the main parts (see the figure below)



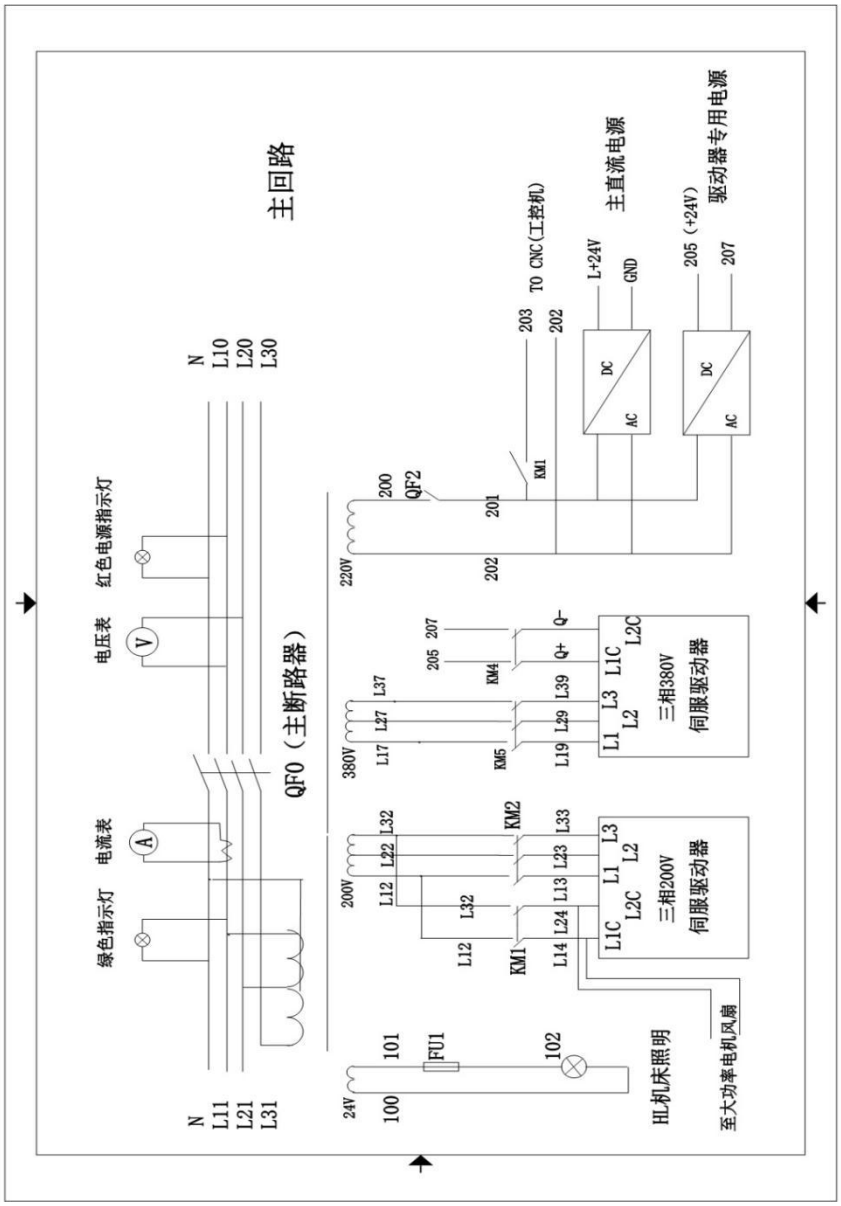

Before loading the coiled steel wire into the wire frame, move the support rod to the center, and then move the support rod to a position suitable for the diameter of the coil, and tighten the nut. Pull out the wire end of the steel wire, pass through the steel wire guide wheel on the guide rod, and then send it to the straightening device and the feeding roller.

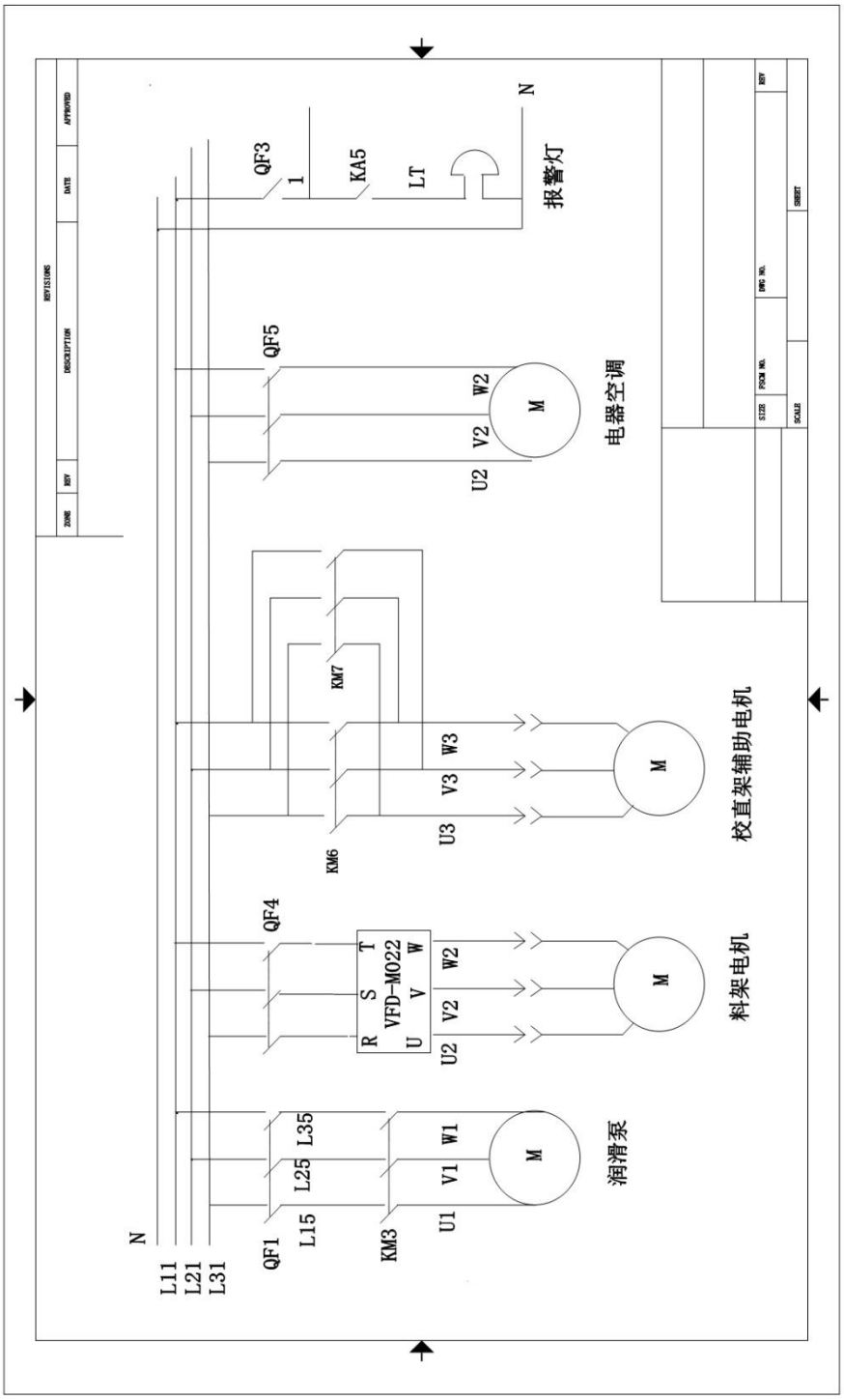
The function of the guide rod is to synchronize the rotation of the material tray with the feeding, that is, when feeding, the steel wire is dragged by the feeding roller, which also causes the induction rod to swing to supplement the feeding. The tray automatically stops when the machine stops.

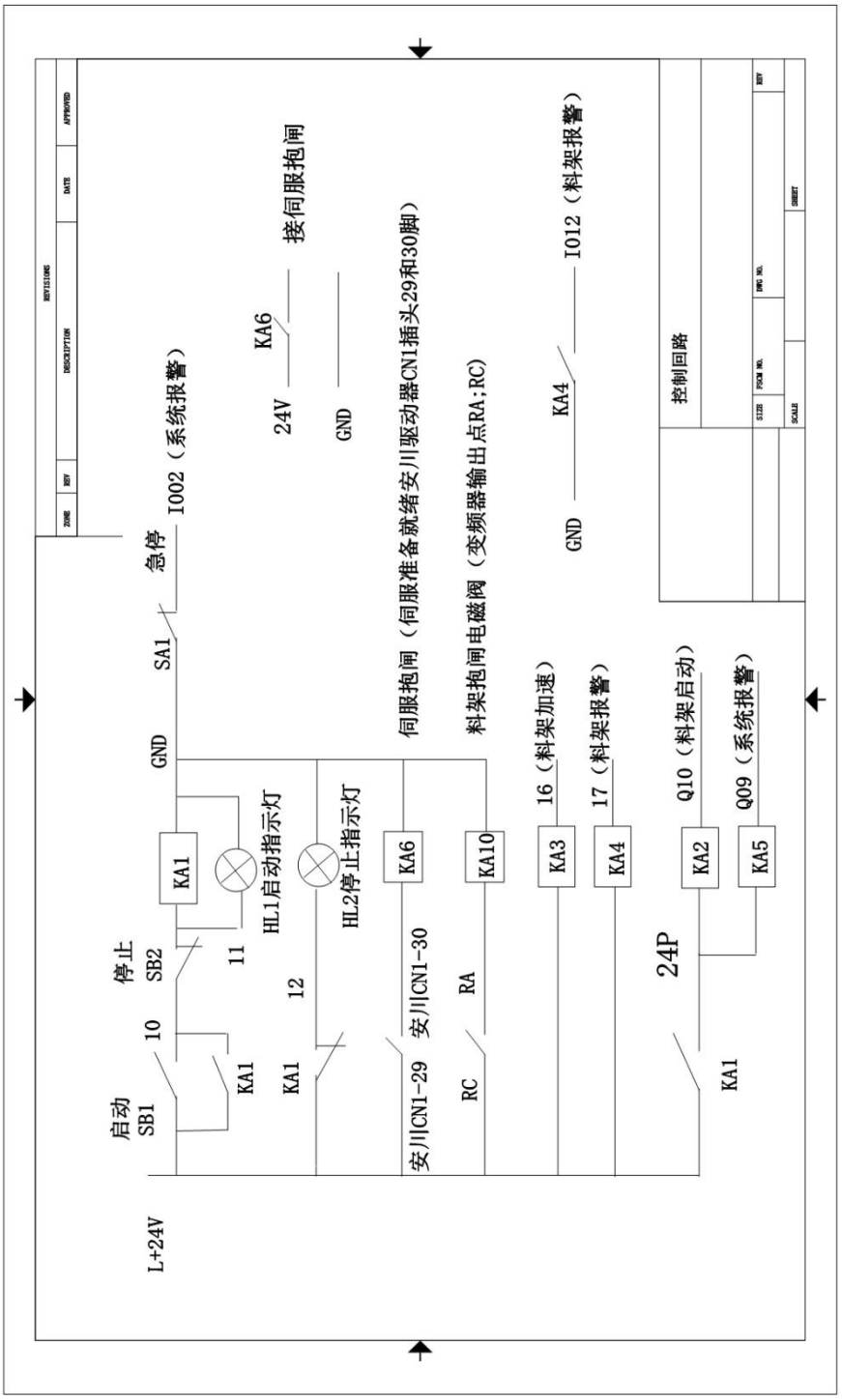
There is also a travel switch on the wire frame. When the wire is bundled in disorder, the travel switch will be pressed down due to the excessive displacement of the guide rod. At this time, the electric interlock guarantees immediate shutdown to avoid malfunction.

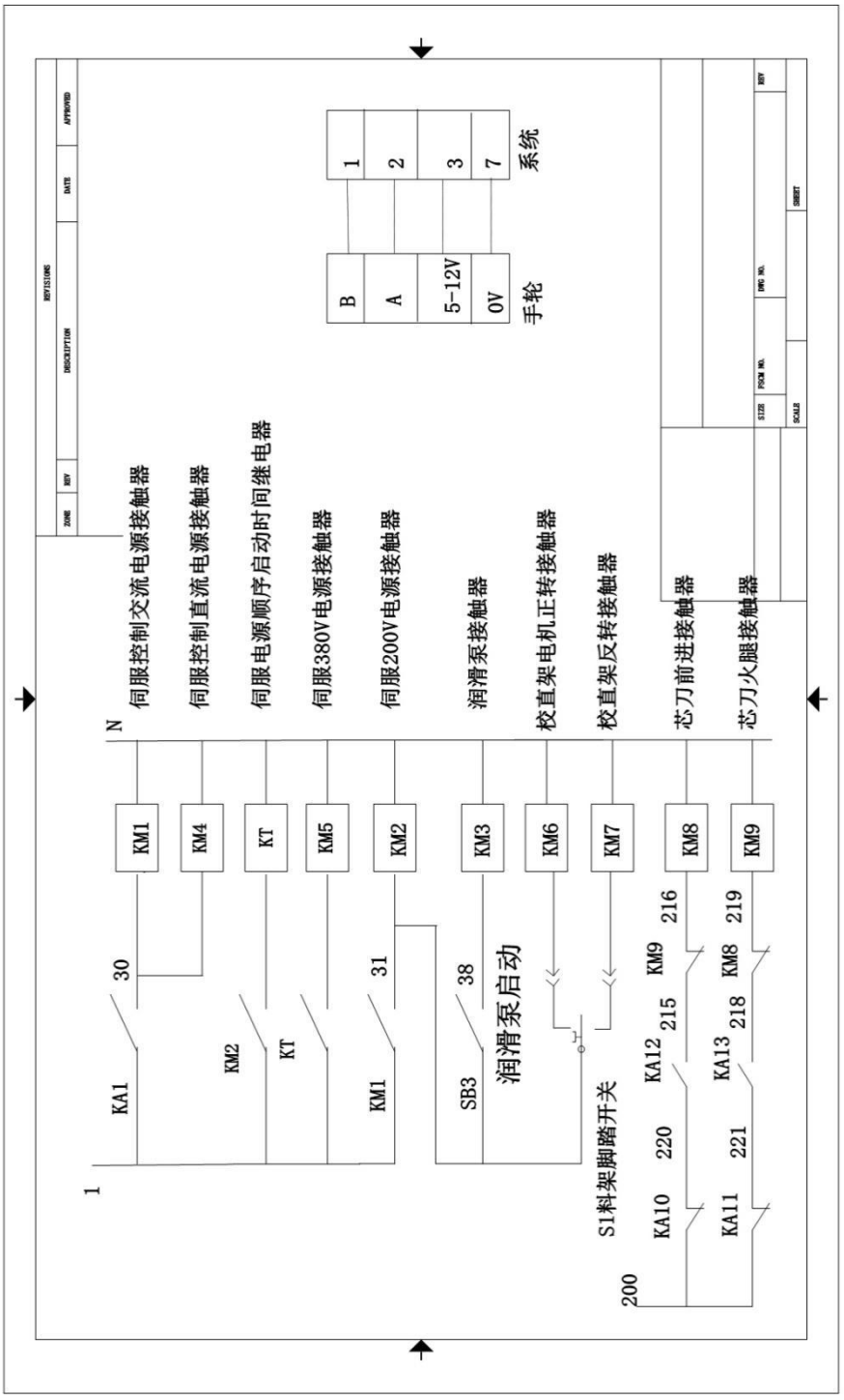
**Attachments : Electrical schematic diagram**

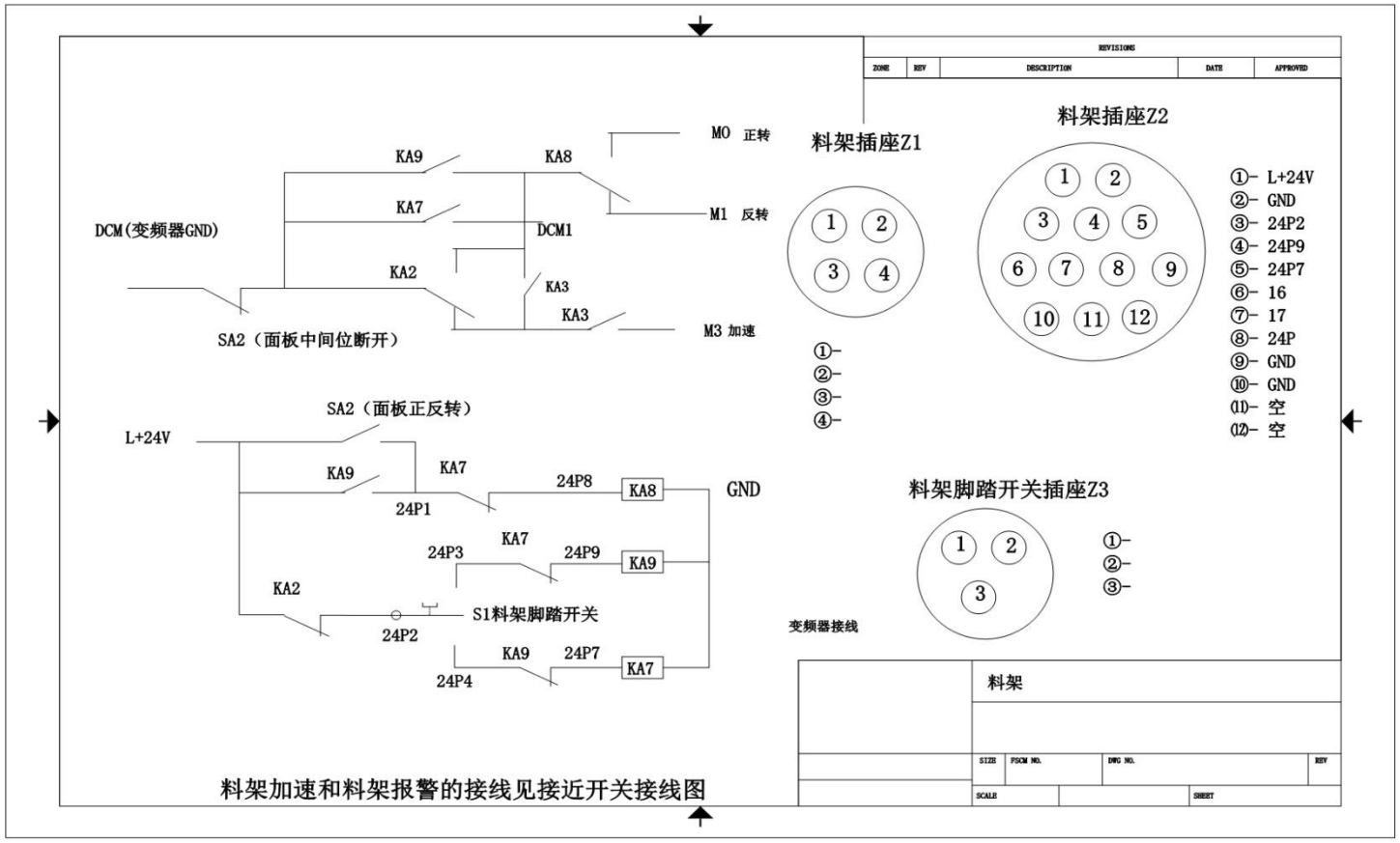
**The following electrical schematic diagram is for reference only (take the seven-axis as an example)**

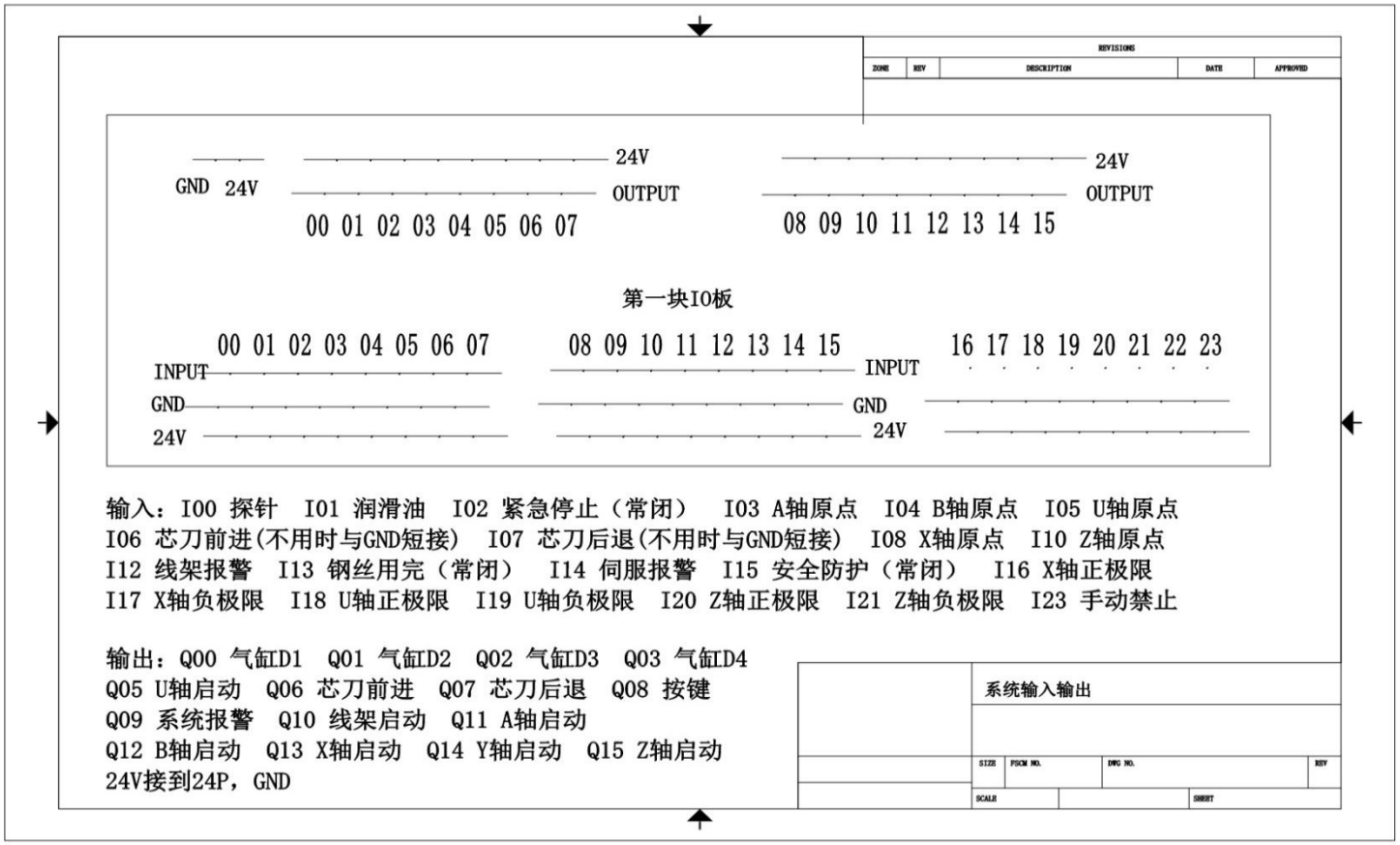


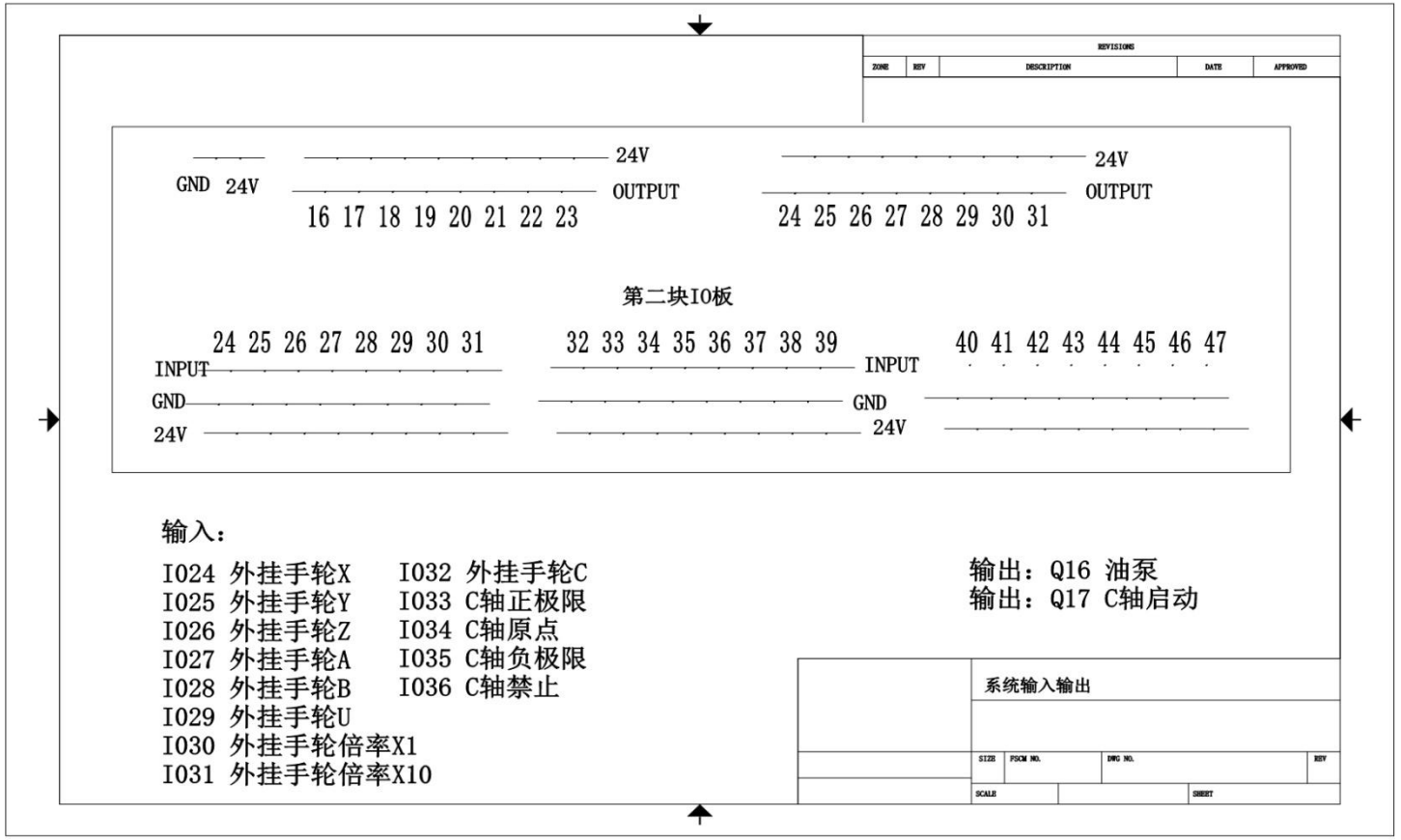

N
L11
L21
L31
QF1
L15
L25
L35
KM3
U1
V1
W1
润滑泵
QF4
R
S
T
VFD-M022
U
V
W
U2
V2
W2
料架电机
KM6
KM7
U3
V3
W3
校直架辅助电机
QF5
U2
V2
W2
电器空调
QF3
1
KA5
LT
N
报警灯

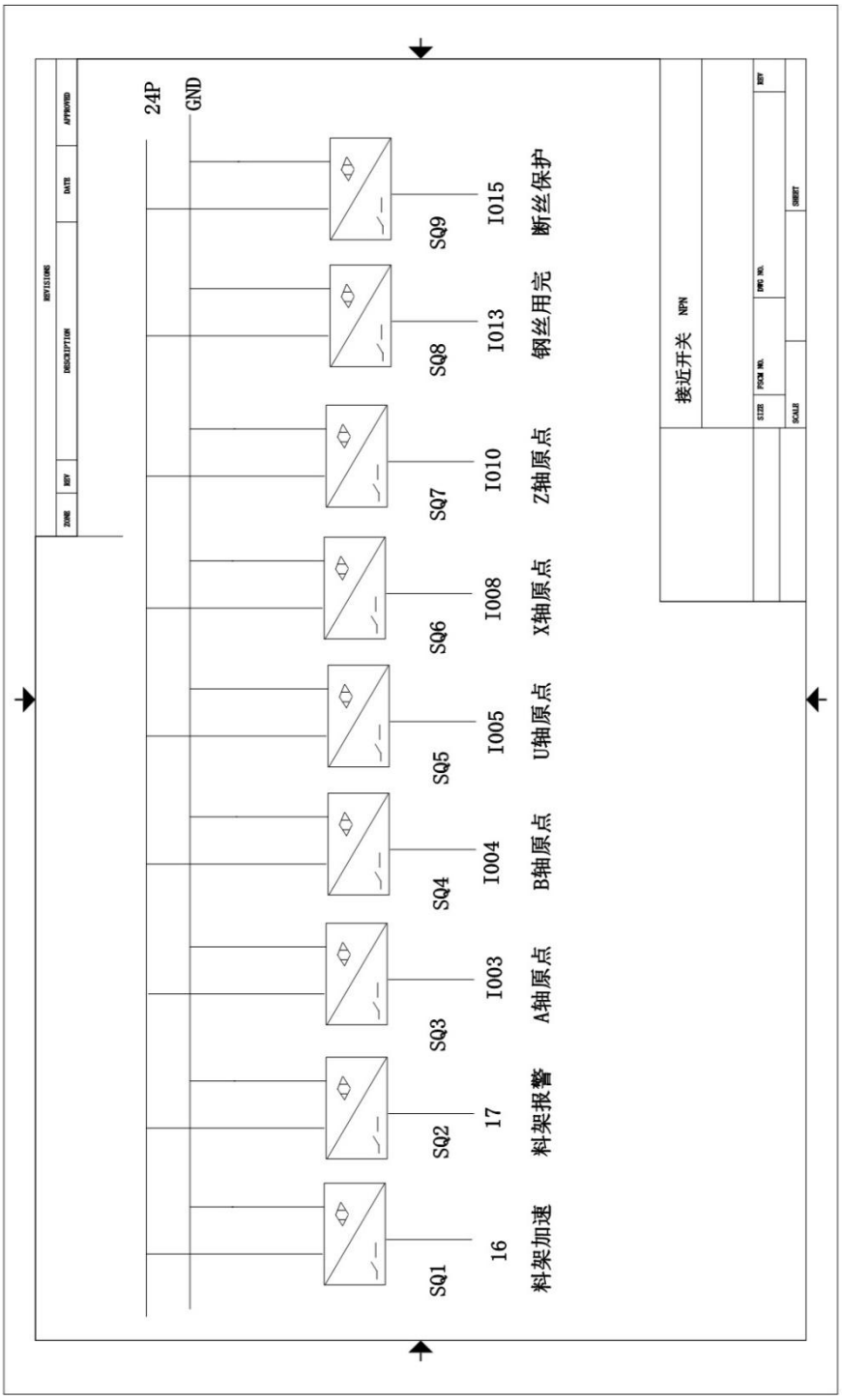

L+24V
启动
SB1
10
KA1
停止
SB2
11
KA1
HL1启动指示灯
12
KA1
HL2停止指示灯
安川CN1-29
安川CN1-30
KA6
RC
RA
KA10
KA3
KA4
24P
KA1
KA2
KA5
GND
急停
SA1
I002（系统报警）
24V
KA6
接伺服抱闸
GND
伺服抱闸（伺服准备就绪安川驱动器CN1插头29和30脚）
料架抱闸电磁阀（变频器输出点RA;RC）
16（料架加速）
17（料架报警）
Q10（料架启动）
Q09（系统报警）
GND
KA4
I012（料架报警）
控制回路

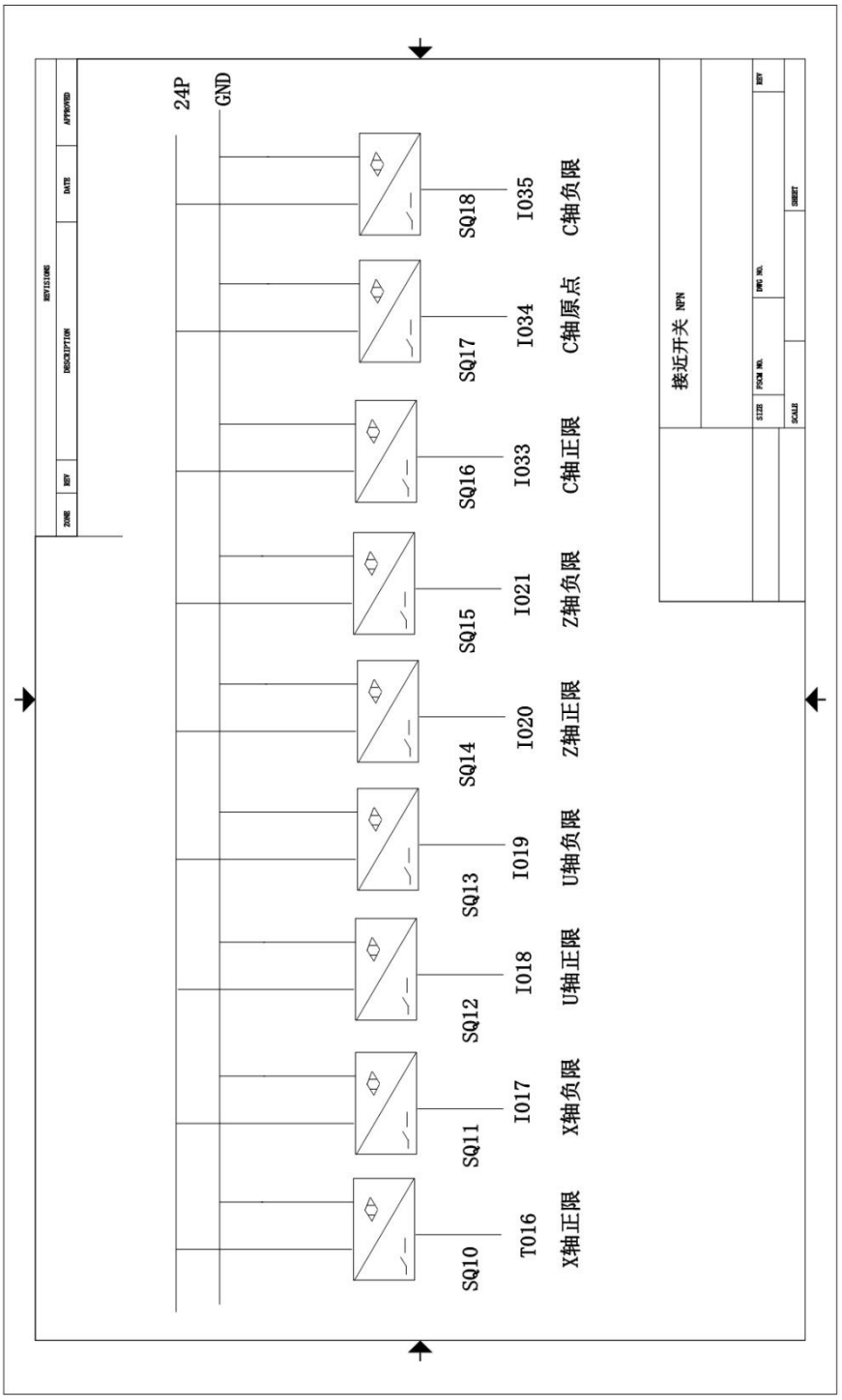

伺服控制交流电源接触器
伺服控制直流电源接触器
伺服电源顺序启动时间继电器
伺服380V电源接触器
伺服200V电源接触器
润滑泵接触器
校直架电机正转接触器
校直架反转接触器
芯刀前进接触器
芯刀火腿接触器
KM1
KM4
KT
KM5
KM2
KM3
KM6
KM7
KM8
KM9
KA1
KM2
KT
KM1
SB3
润滑泵启动
S1料架脚踏开关
KA10
KA11
KA12
KA13
KM9
KM8
30
31
38
216
219
215
218
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221
200
1
N
B
A
5-12V
0V
手轮
1
2
3
7
系统

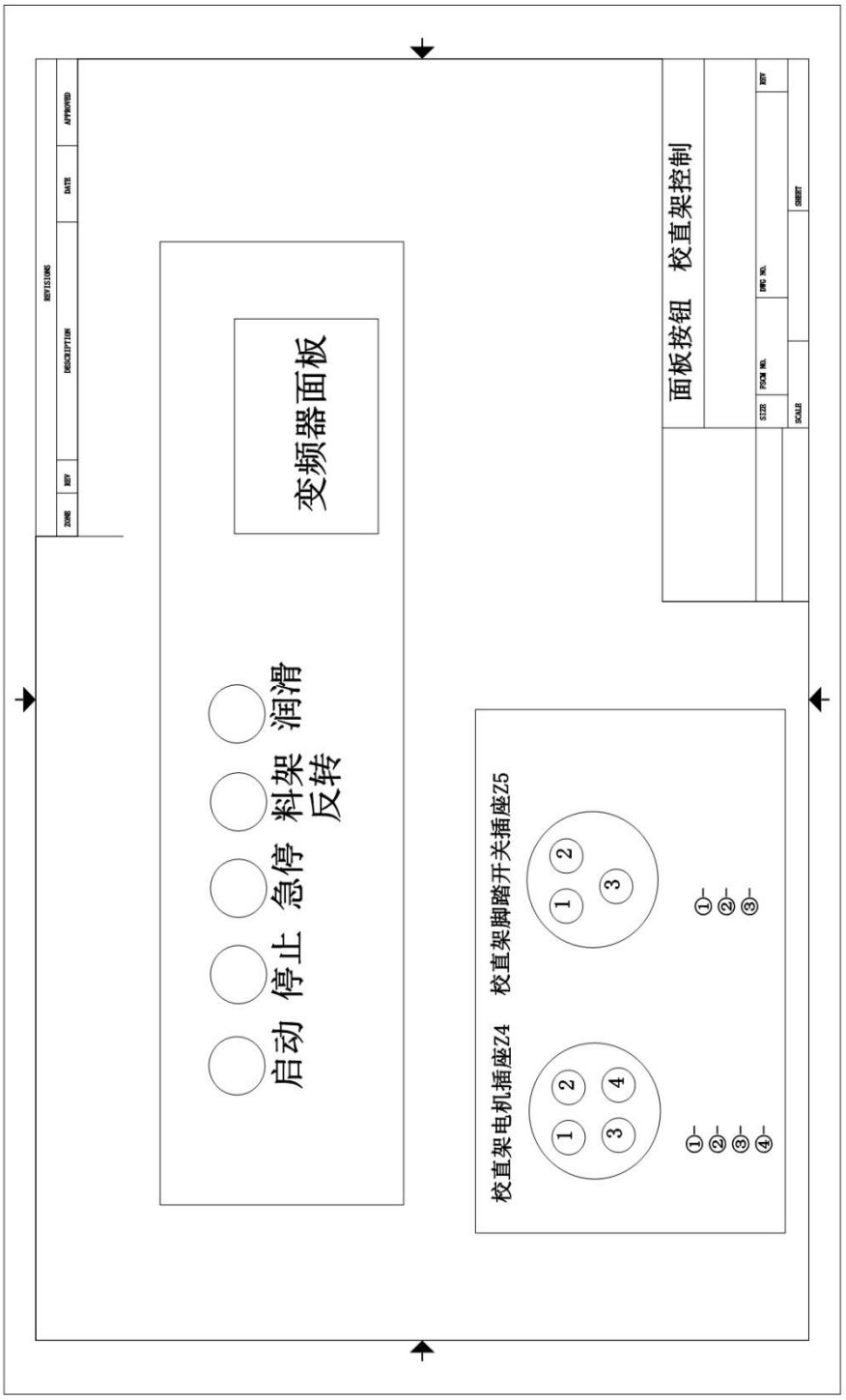

REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
MO 正转
M1 反转
M3 加速
KA9
KA8
KA7
KA2
KA3
DCM(变频器GND)
DCM1
SA2（面板中间位断开）
料架插座Z1
料架插座Z2
①- L+24V
②- GND
③- 24P2
④- 24P9
⑤- 24P7
⑥- 16
⑦- 17
⑧- 24P
⑨- GND
⑩- GND
⑪- 空
⑫- 空
SA2（面板正反转）
L+24V
24P1
24P8
24P3
24P9
24P2
S1料架脚踏开关
24P4
24P7
GND
料架脚踏开关插座Z3
变频器接线
料架
SIZE FSCM NO. DWG NO. REV
SCALE SHEET
料架加速和料架报警的接线见接近开关接线图

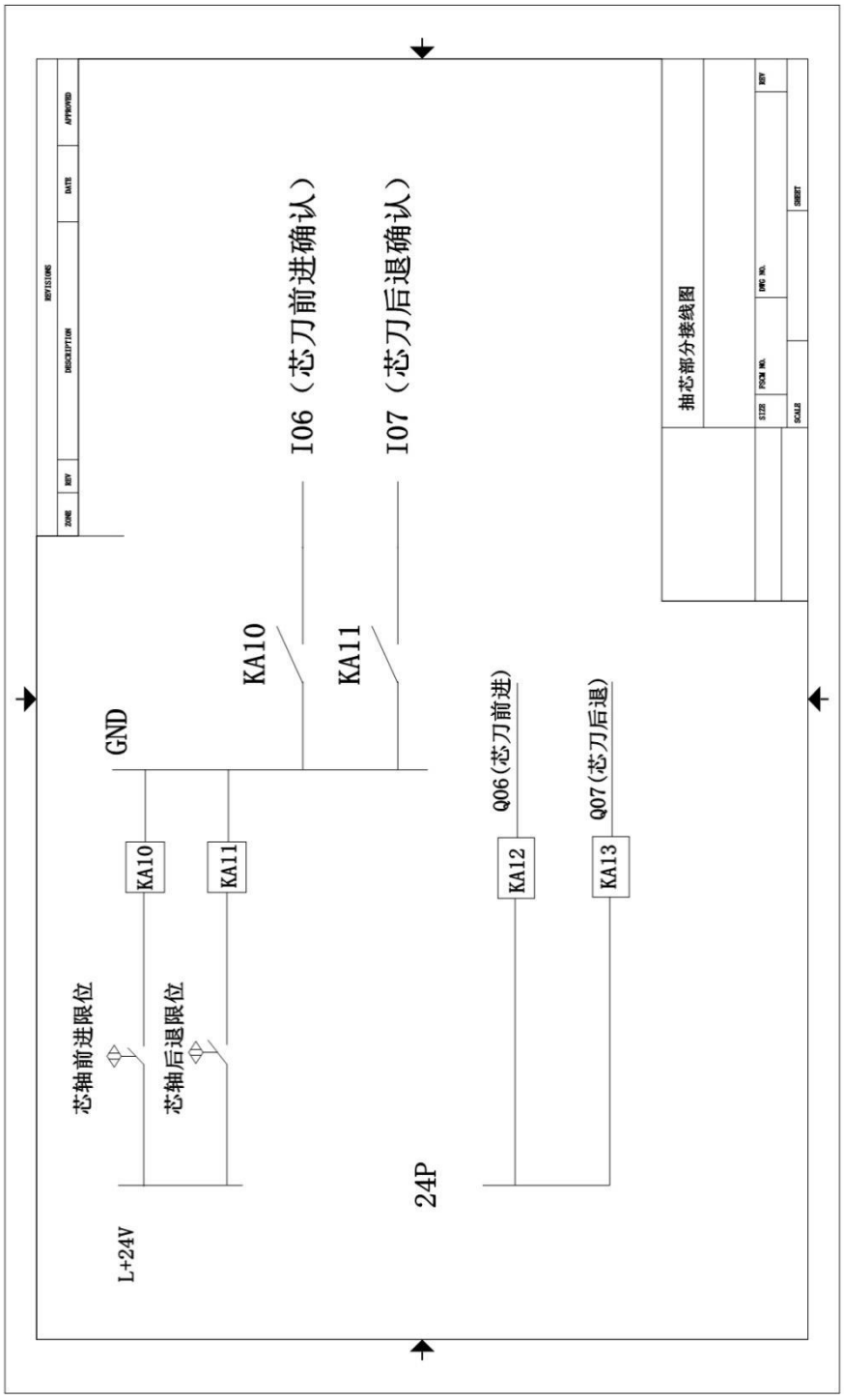

REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
GND 24V
24V
OUTPUT
00 01 02 03 04 05 06 07
24V
OUTPUT
08 09 10 11 12 13 14 15
第一块IO板
00 01 02 03 04 05 06 07
INPUT
GND
24V
08 09 10 11 12 13 14 15
INPUT
GND
24V
16 17 18 19 20 21 22 23
输入：I00 探针 I01 润滑油 I02 紧急停止（常闭） I03 A轴原点 I04 B轴原点 I05 U轴原点
I06 芯刀前进(不用时与GND短接) I07 芯刀后退(不用时与GND短接) I08 X轴原点 I10 Z轴原点
I12 线架报警 I13 钢丝用完（常闭） I14 伺服报警 I15 安全防护（常闭） I16 X轴正极限
I17 X轴负极限 I18 U轴正极限 I19 U轴负极限 I20 Z轴正极限 I21 Z轴负极限 I23 手动禁止
输出：Q00 气缸D1 Q01 气缸D2 Q02 气缸D3 Q03 气缸D4
Q05 U轴启动 Q06 芯刀前进 Q07 芯刀后退 Q08 按键
Q09 系统报警 Q10 线架启动 Q11 A轴启动
Q12 B轴启动 Q13 X轴启动 Q14 Y轴启动 Q15 Z轴启动
24V接到24P，GND
系统输入输出
SIZE FSCM NO. DWG NO. REV
SCALE SHEET


REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
24V
GND 24V
OUTPUT
16 17 18 19 20 21 22 23
24V
OUTPUT
24 25 26 27 28 29 30 31
第二块IO板
24 25 26 27 28 29 30 31
INPUT
GND
24V
32 33 34 35 36 37 38 39
INPUT
GND
24V
40 41 42 43 44 45 46 47
输入：
I024 外挂手轮X
I025 外挂手轮Y
I026 外挂手轮Z
I027 外挂手轮A
I028 外挂手轮B
I029 外挂手轮U
I030 外挂手轮倍率X1
I031 外挂手轮倍率X10
I032 外挂手轮C
I033 C轴正极限
I034 C轴原点
I035 C轴负极限
I036 C轴禁止
输出：Q16 油泵
输出：Q17 C轴启动
系统输入输出
SIZE FSCM NO. DWG NO. REV
SCALE SHEET


24P
GND
SQ1
SQ2
SQ3
SQ4
SQ5
SQ6
SQ7
SQ8
SQ9
16
17
I003
I004
I005
I008
I010
I013
I015
料架加速
料架报警
A轴原点
B轴原点
U轴原点
X轴原点
Z轴原点
钢丝用完
断丝保护
接近开关 NPN


24P
GND
SQ10
SQ11
SQ12
SQ13
SQ14
SQ15
SQ16
SQ17
SQ18
T016
I017
I018
I019
I020
I021
I033
I034
I035
X轴正限
X轴负限
U轴正限
U轴负限
Z轴正限
Z轴负限
C轴正限
C轴原点
C轴负限
接近开关 NPN


变频器面板
启动
停止
急停
料架
反转
润滑
校直架电机插座Z4
校直架脚踏开关插座Z5
面板按钮 校直架控制


I06（芯刀前进确认）
I07（芯刀后退确认）
KA10
KA11
GND
KA10
KA11
Q06(芯刀前进)
Q07(芯刀后退)
KA12
KA13
芯轴前进限位
芯轴后退限位
24P
L+24V
抽芯部分接线图

## 9 Delta inverter panel operation instructions

# 10 数字操作器说明

**KPMS-LE01 键盘面板外观**




❶ 状态显示区
分别可显示驱动器的运转状态运转、停止、PLC、正转、反转等

❷ 主显示区
可显示频率、电流、电压、转向、使用者定义单位、异常等

❸ 频率设定旋钮
可设定此旋钮作为主频率输入

❹ 数值上移键
设定值及参数变更使用

❺ 左移键/数值下移键
设定值及参数变更使用(使用左移键需长按MODE键)

**功能显示项目说明**

| 显示项目 | 说明 |
|---|---|
|  | 显示变频器目前的设定频率 |
|  | 显示变频器实际输出到马达的频率 |
|  | 显示用户定义之物理量输出。 左图范例为参数 00-04=30 |
|  | 显示负载电流 |
|  | 正转命令 |
|  | 反转命令 |
|  | 显示计数值 |
|  | 显示参数项目 |

Delta inverter panel operation instructions

(For more information, please refer to the electronic version of MS-300 user manual)

Inverter general parameter setting

1. 00-02 parameter management settings: 1 is write protection; 9 is the basic frequency of 50Hz; 10 is the basic frequency of 60Hz; 11 is custom
2. 00-21 operation command source setting: 1 is external terminal
3. 01-12 first stage acceleration time setting: generally set to 1.5 times the motor power
4. 01-13 first stage deceleration time setting: generally set to 1.5 times the motor power
5. 02-00 operation control mode: 1 is two-line mode 1 (M1 forward/stop; M2 reverse/stop); 2 is two-line mode two (M1 run/stop; M2 reverse/stop)

6. 02-03 function setting: set M3 to multi-speed command 1

Seven, 02-13 multi-function output RY1:1 indicates during operation, 34 is zero speed or STOP

8. The frequency setting of the first stage speed of 04-00: the factory value is 35Hz