

Design and Implementation of Control System of Three Axis Palletizing Machine Based on PLC

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Abstract: The content of this design is the design and implementation of three-axis palletizing machine control system based on PLC. The basic function of the three-axis palletizing machine is to carry out regular palletizing for things that need palletizing in a limited space, the design of the three axis palletizing machine system functions are divided into manual control palletizing machine and automatic control palletizing machine, manual control can realize the two directions of the lateral movement and longitudinal movement of the palletizing machine, the pickup of goods and goods down, and the reset of the three axis palletizing machine.

Keywords: Enter key words or phrases in alphabetical order, separated by commas.

1. Scheme Design

Traditional palletizing machine is through the control of human palletizing, this design is mainly designed to achieve a manual control and automatic control of the three axis palletizing machine, so the beginning of the design need to consider the following several problems. The selection of programmable logic controller CPU, CPU selection can involve cost price, design difficulty and hardware connection, choose the right CPU will make the design more time and resources. The selection needs to complete simple logic control and advanced logic control. The control system is composed of touch screen system and PLC system. For the

automation system requiring network communication function and single or multi-screen HMI[1], it is easier to carry out the project implementation.

At the same time, we should also consider the design of the palletizing layer height and the number of each layer. If the layer number is too low, the working efficiency is low. If the layer number is too much, the palletizing will lead to instability and danger. In this way, both horizontal frame distance design and vertical frame distance design need to be considered. This design to design can be manually controlled and can be automatically controlled automatic palletizing control system, such a demand more convenient program design and preparation. The main circuit diagram of three-axis palletizing machine is shown in Figure 1.

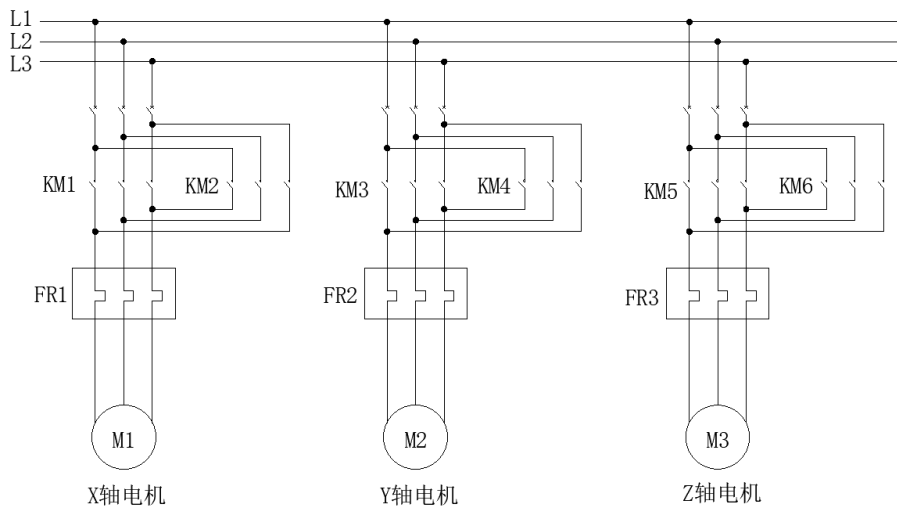


Figure 1. Main circuit diagram of three-axis palletizing machine

2. System Hardware Selection

For the whole three-axis palletizing machine control system, the hardware part not only includes the selection of PLC models, memory capacity, power module, input/output module, communication module, analog input/output module and special function module and so on. It shall also include the selection of suitable PLC peripherals, equipment and interfaces, such as input elements, actuators and field equipment controlled by actuators. The software part mainly

includes the distribution of I/O point address, internal relay, timer, etc., PLC control program design, and some technical documents. S7-1200 series PLC host is called the basic unit, its internal structure has a central processor, power components, and input part, output part, programming part. The main machine is equipped with expansion units, expansion modules and module units with special functions to expand its input and output. These units provide indispensable functions for the programmable logic controller to realize the corresponding functions, the central processing

unit can process data, input and output can provide interface information for it. In this design programmable logic controller CPU choose Siemens 1200 series CPU1214 DC/DC/DC, it has 14 digital input, 10 digital output. In this design, because the interface provided by the CPU itself is enough to use, so there is no need to add additional interface to realize the corresponding function.

By the three axis palletizing machine design requirements, draw the PLC control circuit schematic diagram. The input end of the programmable logic controller circuit is connected with 24V DC power supply, and the output end is connected with 380V AC power supply. The design uses 14 inputs and 10 outputs, because the CPU of Siemens 1200 series CPU1214C is selected, which has 14 inputs and 10 outputs. It just meets the requirements of the required number of input

interfaces and the number of output interfaces. The output variable of programmable logic controller from Q0.0 to Q0.7, and the corresponding coil or indicator light and its function of Q1.0 and Q1.1 are KM1 corresponding to the forward movement of X axis, KM2 corresponding to the reverse movement of X axis, KM3 corresponding to the forward movement of Y axis, KM4 corresponding to the reverse movement of Y axis, KM5 corresponding to the forward movement of Z axis. KM6 corresponds to the reverse movement of the Z-axis, HL1 corresponds to the start indicator, HL2 corresponds to the automatic indicator, HL3 corresponds to the manual indicator, and HL4 corresponds to the alarm. The external wiring diagram of the hardware of the three-axis palletizing machine control system is shown in Figure 2.

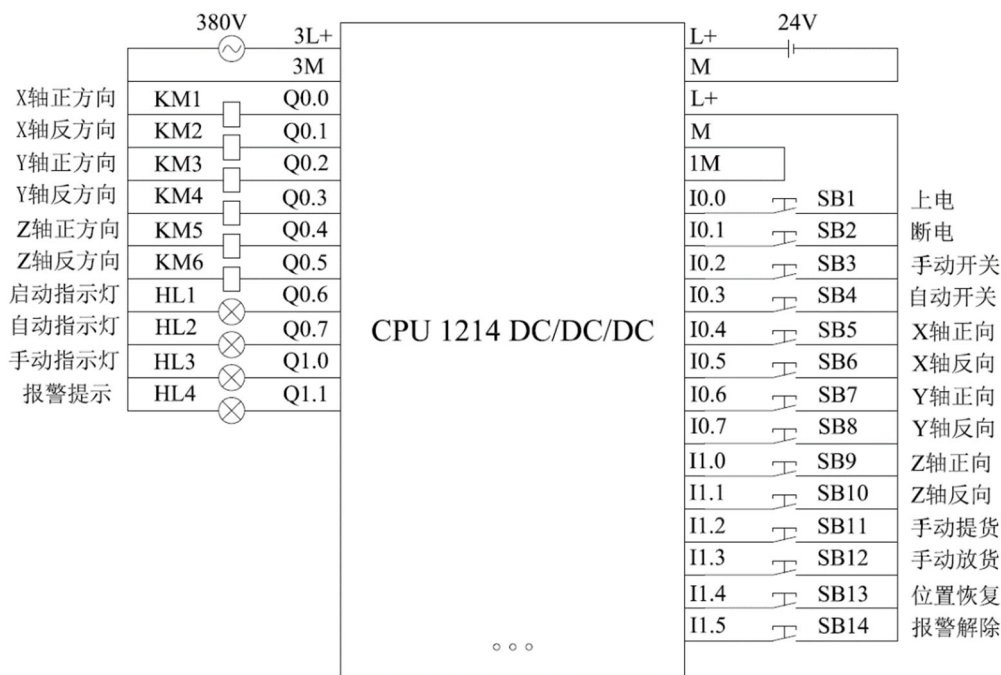


Figure 2. External wiring diagram of three-axis palletizing machine PLC

3. System Control Program Design

In the first, running is connected to electricity normally open contact, and then let the I0.0 switched on, the following program to run at this time, when on the electrical signal is issued on electrical signals from the lock, and to give the following automatic control, manual control procedures section signal on the procedures section, when the power contact I0.1 disconnected, electricity self-locking also be

disconnected, stop running the following program also. Other program segments in the program cannot be operated on the premise that the power-on self-lock is not connected. Therefore, if you want to carry out other operations, you must power on, so that the power-on self-lock is connected. The power-on self-lock is equivalent to a switch for the following program to run. The program is shown in Figure 3.

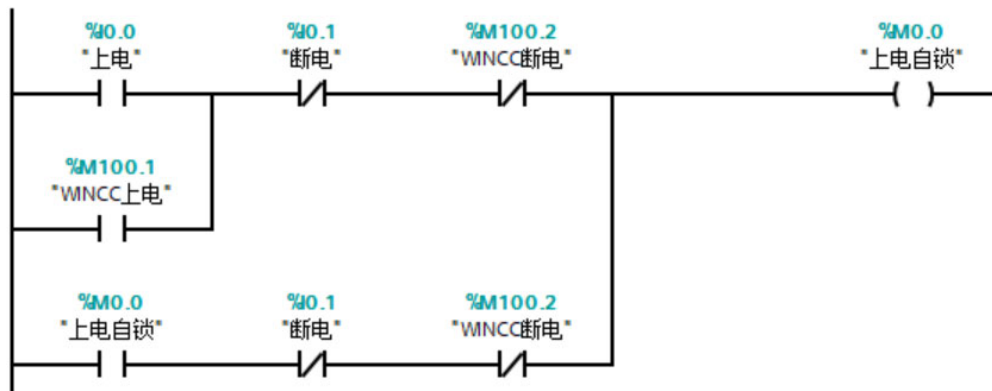


Figure 3. Power-on program segment

When the manual control contact is closed, the manual control signal is connected to the program for manual control, the manual control signal is on, and then the program is self-locked, and the running state of the program is switched to

manual control. When the power contact is disconnected, the manual control signal is cut off and stops running. The program is shown in Figure 4.

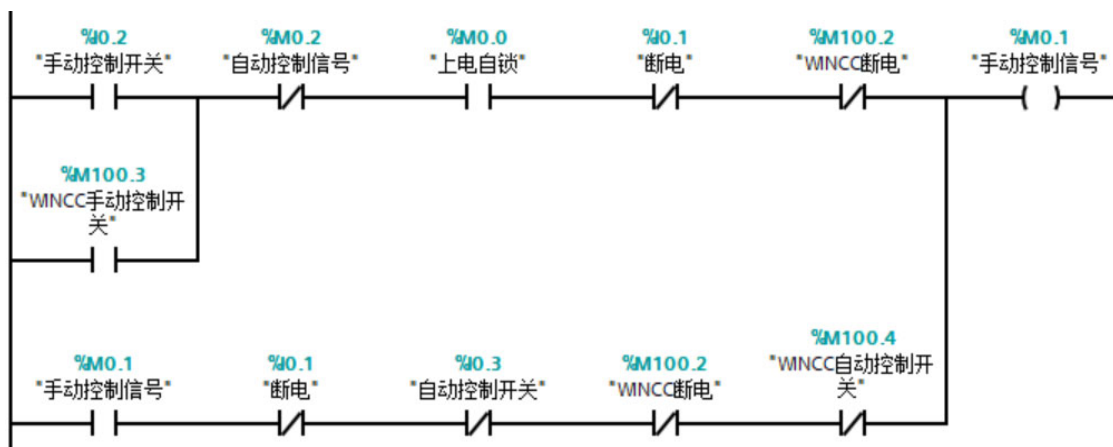


Figure 4. Switching manual control program segment

In automatic control was not connected, the manual control switch in the program automatic control signal conduction does not affect the manual control, automatic control if is connected, the manual control will disconnect switch for automatic control, after the launch of the program, is the need to manually choose is manual control or automatic control, two kinds of control mode.

4. Summary

The design and implementation of the control system of three-axis palletizing machine is based on the design of Siemens S7-1200. The program is controlled by PLC chip to realize the start and stop of peripheral equipment. The three-axis palletizer control system based on PLC control is a kind of direct operation of the configuration interface to control the three-axis movement of the palletizer and the stacking of goods.

This design, completed the three-axis palletizing machine control system design system composition, the most basic

part of the controller, regulator, controlled object and other components, and in the actual control engineering application, a good combination of theory and practice. In general, go through the following steps: cognitive controlled object, design control scheme, control law, the selection process instrumentation, selection process module, the design flow chart of system and configuration diagram, data dictionary design picture, design, etc., until the last program, hardware and configuration of these functions connection run successfully, and meet the control requirements.

References

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