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## foreword

Thank you very much for choosing the HNC-8 series CNC equipment produced by Wuhan Huazhong CNC.

place.

This manual introduces the functional characteristics, interface definitions, electrical

Design, use precautions, etc.

Before using this product, please read this manual carefully to achieve the best use

Use the effect.

Please keep the manual properly and submit it to the end user to read carefully.

Wuhan Huazhong CNC Co., Ltd.

2016.2



## Overview of Features and Functions

### 1. Brief introduction of HNC-8 series CNC device

This series of products are all-digital bus-type CNC devices, which adopt a modular and open architecture.

Based on NCUC industrial fieldbus technology with independent intellectual property rights. Support bus type full digital servo drive

unit and absolute value servo motor, supports bus-type remote I/O unit, integrates handheld unit interface, adopts

Using the electronic disk program storage method, support CF card, USB, Ethernet and other program expansion and data exchange functions

able. It adopts LED LCD display, including three specifications of 8.4", 10.4" and 15". Mainly used in CNC

Turning center, milling center, turn-milling compound, multi-axis, multi-channel and other high-end CNC machine tools.

HNC-8 series CNC device features:

• The maximum number of channels is 10 channels, the maximum number of linkage axes per channel is 9 axes, and the maximum number of spindles per channel for 4 axes.

• The maximum number of simultaneous motion axes is 64 axes.

• Various types of all-digital AC servo drive units and spindle motors (synchronous, asynchronous, direct line, torque motor).

• Support handheld unit interface.

• Using LED color liquid crystal display, full Chinese character operation interface, fault diagnosis and alarm, processing track Trace graphic display and simulation, easy to operate, easy to grasp and use.

A series: 8.4" LED LCD display with a resolution of 800\*600;

B series: 10.4" LED LCD display with a resolution of 800\*600;

C series: 15" LED LCD display with a resolution of 1024\*768;

• The interpolation period is 4ms ~ 0.125ms.

• The minimum input unit is 10-6 mm/deg/inch.

• Machining breakpoint save/restore function.

• Backlash and one-way, two-way pitch error compensation function.

• Built-in RS232 communication interface, easy to realize machine tool CNC communication.

• Support high-speed Ethernet data exchange.

• 1MB program power-off storage area, support CF card expansion, up to 2GB.

• Support USB hot plug.

• 1GB RAM processing memory buffer.

• Custom G code function.

• Background editing and blueprint programming functions (option).

• Using international standard G code programming, compatible with various popular CAD/CAM automatic programming systems.

• With linear interpolation, circular interpolation, polar coordinate interpolation, cylindrical surface interpolation, helical interpolation, etc., support

Support rotation, scaling, mirroring, canned cycle, thread cutting, tool compensation, user macro program, soft limit

and other functions.

• Support gantry axis synchronization, dynamic axis release/capture, inter-channel synchronization and other functions.

• The continuous processing function of small line segments is especially suitable for the processing of complex mold parts designed by CAD/CAM.

• Bus-type PLC I/O unit is adopted, and the input/output supports up to 1024 points respectively.

• The maximum distance between bus devices can reach 50 meters.

## 2. System options

• Handheld unit (option)

• Standard manual pulse generator

• Standard 2 coordinates or 3 coordinates selection (optional for 3 or more axes)

• 3 magnification options

• Emergency stop button

• Work indicator light

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• Bus type I/O unit

• Up to 16 I/O units can be expanded through the bus;

• Support NCUC (firewire interface, optical fiber interface optional);

• HIO-1000A type I/O unit can provide 1 communication sub-module and 8 functional sub-module slots;

HIO-1000B type I/O unit can provide 1 communication sub-module and 5 functional sub-module slots;

• Functional sub-modules include digital input/output sub-module, analog input/output sub-module, axis control

Submodules, etc.;

Digital input/output sub-module--provides 16 digital input or output signals;

Analog input/output sub-module--provides 4-channel A/D signal and 4-channel D/A signal;

Axis control sub-module--provides 2 axis control interfaces, including pulse command, analog command and programming

Encoder feedback interface;

• NPN and PNP interfaces are optional for the digital input sub-module, and the output sub-module is NPN interface.

Each switch has an indicator light.



## Description of graphic symbols

	: 必须操作。		: 禁止操作
	: 特别重要内容		: 默认或初始设置
	: 连线及设备边界。		: 成组线缆
	: 信号等的传播方向		: 交换
	: 短接点		: 接线端子
	: 成组线缆分离		: 成组线缆分离
	: 屏蔽层		: 接地
	: 常开常闭无源触点		: 线圈
	: 插头插座		: 传感器
	: 编码器		: 电机
	: 灯		: 机械连接
	: 变速机构		

Note: Important parts in this manual are often indicated in bold.





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## Chapter 1 Precautions before use

### 1.1 Safety Notice

Notice:

Before using this product, please read the following safety precautions carefully items to ensure personal safety and equipment safety.

#### 1.1.1 Transportation and storage



This product must be shipped correctly for its weight;



Stacked products shall not exceed the specified quantity;



Do not climb or stand on the product, nor place heavy objects on it;



Do not use cables or devices connected to the product to drag or carry the product;



The front panel and display screen should be specially protected from collisions and scratches;



Pay attention to moisture-proof during storage and transportation;



If the product storage has exceeded the limited time, please contact Wuhan Huazhong Data Holdings in time

Co., Ltd. contact;

#### 1.1.2 Installation



The casing of the CNC device is not designed to be waterproof, and the product should be installed in the electric cabinet without rain and

A place exposed to direct sunlight.



Between this product and the control cabinet casing or other equipment, a space must be reserved according to regulations.

gap;



The installation and use of the product should pay attention to good ventilation, avoid combustible gas and grinding liquid,

Invasion of corrosive substances such as oil mist and iron powder, avoiding metal, engine oil, etc.

Electrical substances enter it.



Do not install or place the product near flammable and explosive items;



The product must be installed securely and without vibration. During installation, do not throw the product

or percussion, there can be no impact or load on the product;

### 1.1.3 Wiring



Personnel participating in wiring and inspection must have the ability to complete this work.



The CNC device must be reliably grounded, and the grounding resistance should be less than 4 ohms. Do not use

Neutral instead of ground. Otherwise, it may not be stable and normal due to interference

Work.



The wiring must be correct and firm, otherwise malfunctions may occur;



Communication cable from CNC to drive unit, speed/position sensor to drive

Do not transfer the feedback cables of the unit through terminals and plugs. otherwise

Numerical control units may not work properly due to their susceptibility to interference.



The voltage value and positive and negative (+, -) polarity on any wiring plug must comply with

Otherwise, short circuit or permanent damage to the equipment may occur

Fault;

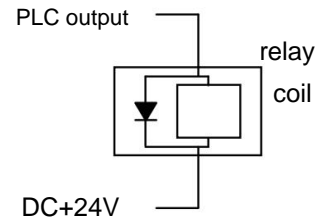


Directly controlled by the PLC output signal of the numerical control device

The surge absorbing diode on the current relay must be

Must be connected in the specified direction (as shown in the figure), otherwise

The numerical control unit may be damaged.



Before plugging in or pulling out the plug or flipping the switch, keep your fingers dry to prevent electric shock or damage

Bad CNC unit.



The connecting wires must not be damaged or squeezed, otherwise leakage or short circuit may occur

road.



Do not plug or unplug the plug or open the case of the numerical control device while it is live.

#### 1.1.4 Operation and debugging



Before running, check whether the parameter settings are correct. Wrong setting will cause the machine to send

unexpected action;



The modification of the parameters must be within the allowable range of the parameter setting and exceed the allowable range

Faults that may cause unstable operation and damage the machine;



Check whether the cables of the servo motor correspond to the encoder cables one by one.

## 1.1.5 Use



The user must have the ability to do the job;



Before plugging in the power, make sure the switch is in the off position to avoid accidental starting.



When conducting electrical design, it should be considered that the emergency stop button of the numerical control device can occur in the system

In case of failure, cut off the power supply of servo, spindle and other moving parts.



When designing or modifying the PLC program, it should be noted that before resetting the alarm signal, the

It must be confirmed that the running signal has been turned off. For example, when resetting the spindle alarm signal,

Make sure that the spindle rotation control signal is off (see PLC programming manual for details).



The equipment cannot be modified;



If there are other electronic devices near the system, it may cause electromagnetic interference and should be connected

a low-pass filter to attenuate its effect;



Do not power on and off the system frequently. After a power outage or power failure, if the power must be re-energized,

The interval is at least 3 minutes.



When operating, the operator should keep his fingers dry, clean and free from oil. suggest user

Leave the clear protective film on the operator panel.



When operating the keys, do not use too much force or force. Do not use wrenches, workpieces, etc.






Tap the keyboard with sharp or hard objects.



When the equipment is running, the operator must not leave the equipment.



#### 1.1.6 Maintenance


-  Before overhauling, replacing and installing components, the power supply must be cut off.
-  When a short circuit or overload occurs, it should be checked and eliminated before it can be powered on for operation;
-  After an alarm occurs, the fault must be corrected before restarting.
-  Do not install or operate when the system is damaged or parts are incomplete;
-  Due to the aging of electrolytic capacitors, system performance may be degraded. to prevent

As a result, failures are caused. When used in normal environments, electrolytic capacitors are the best



Replace at least every 5 years or 30,000 hours. For questions, please feel free to contact Wu

Contact Han Huazhong CNC Co., Ltd.

#### 1.1.7 Waste disposal

-  Dispose of waste as normal industrial waste.

#### 1.1.8 General instructions

-  When the product is put into use, the cover and mounting plate must be installed according to the requirements of the product manual.  
  
The full protection is installed, and the operation is carried out in accordance with the provisions of the product manual.
-  Carefully read Chapter 2 Electrical Design of this manual for each part of the proposed  
  
precautions.

## 1.2 Unpacking inspection

### 1.2.1 After opening the package, please

ÿ**Confirm** whether it is the product you purchased;

ÿ Check whether the product is damaged during transportation;

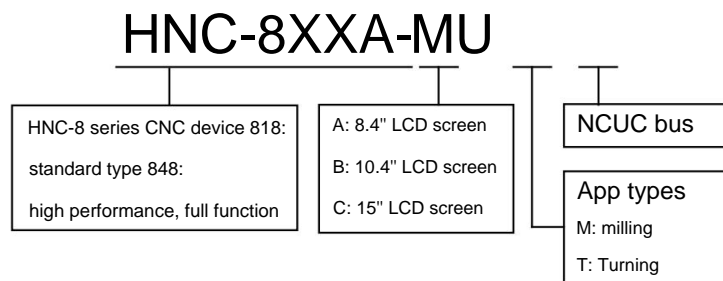
ÿ**Comparing** with the list, confirm whether all parts and accessories are complete and whether there is any damage;

If there are any product discrepancies, missing accessories or transportation damage, please contact our company in time

connect.

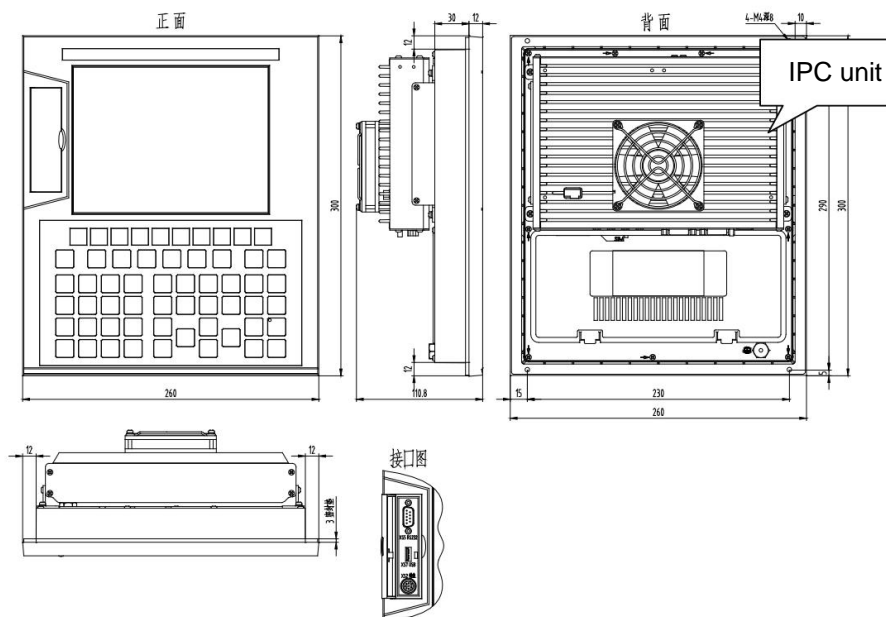
### 1.2.2 Check the product model

Please check the product model against the description of the model number of the CNC device, the number is as follows:

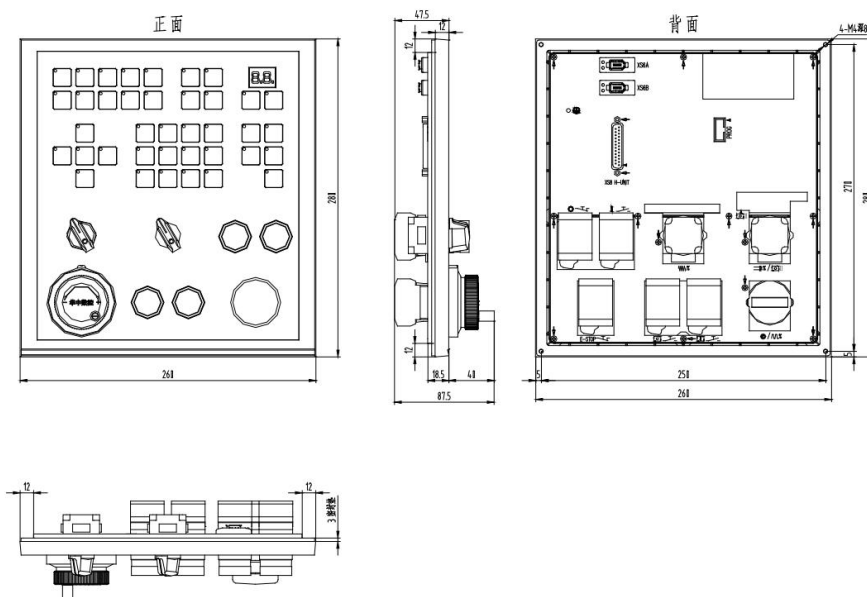


## 1.2.3 Dimensions

(1) Appearance dimension drawing of A series CNC device



a) A series top panel



b) A series lower panel

Figure 1.1 Appearance and dimension of A series CNC device

## (2) Appearance dimension drawing of B series CNC device

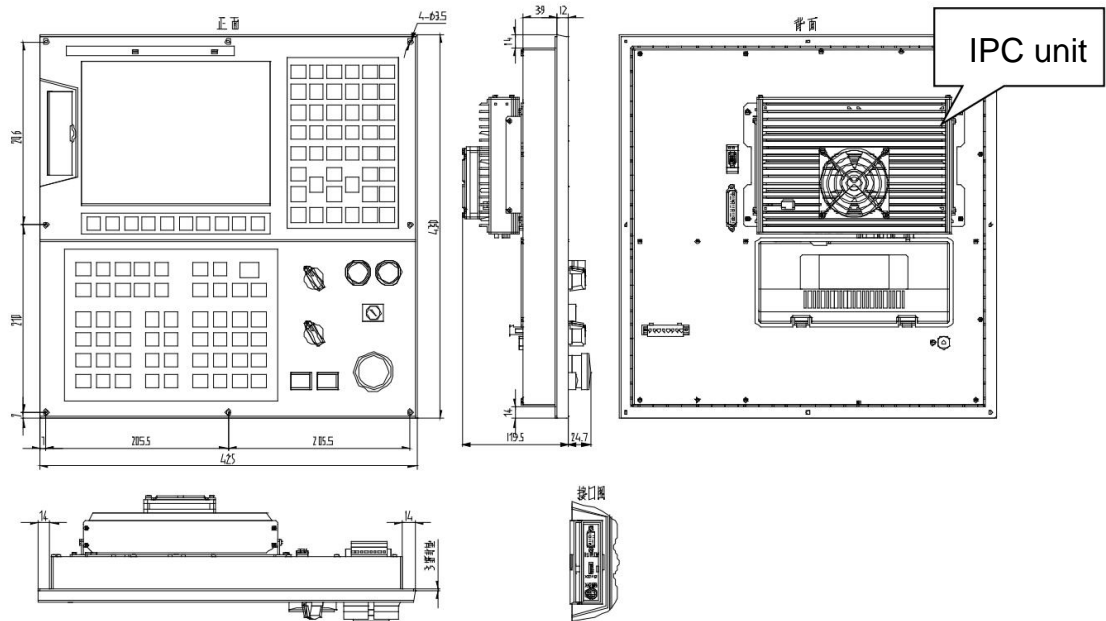
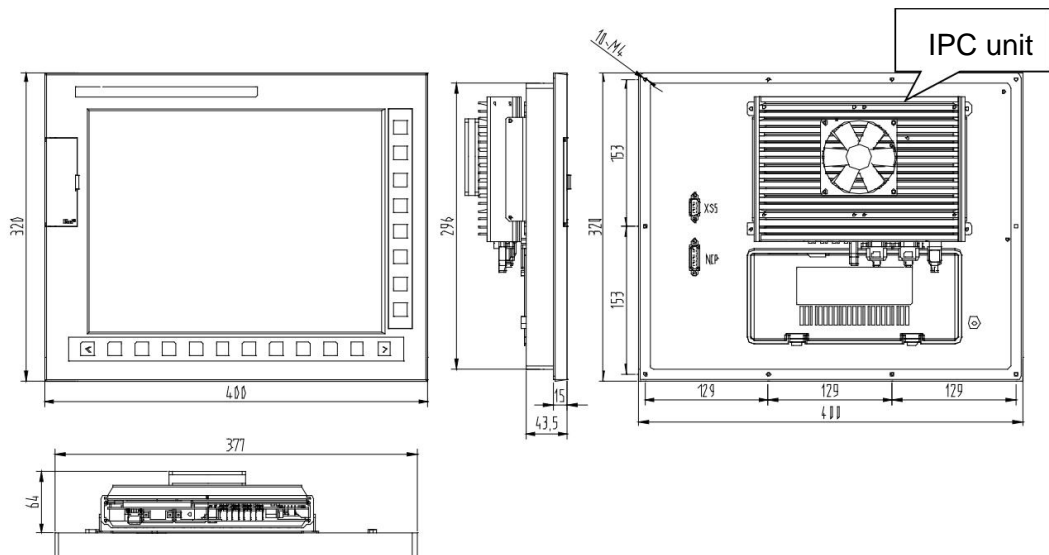
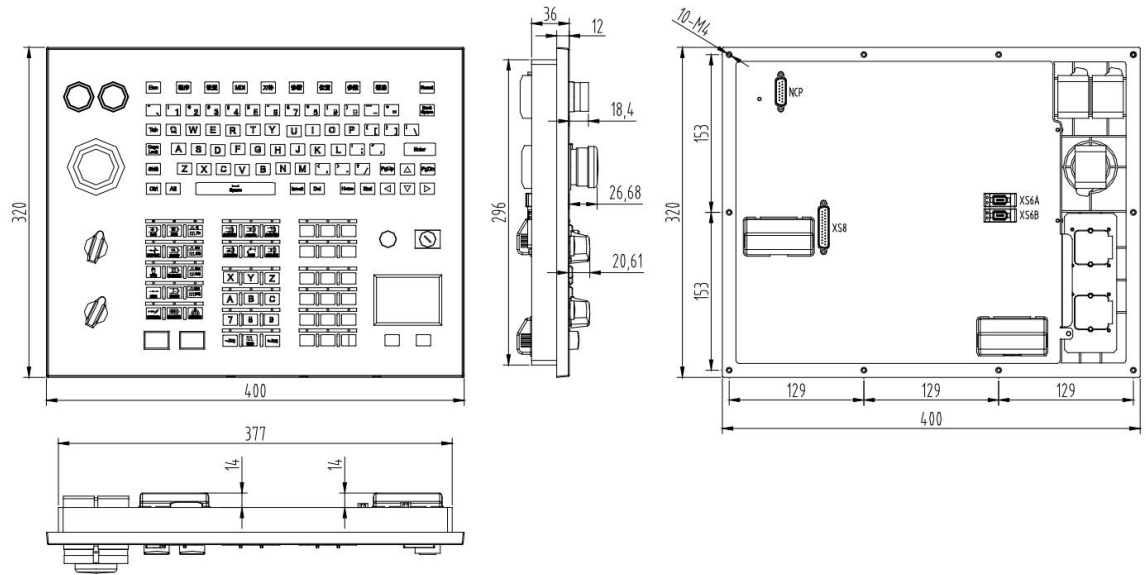


Figure 1.2 Dimensions of B series CNC device

## (3) Installation dimension diagram of C series CNC device



a) Upper panel of C series CNC device



b) Lower panel of C series CNC device

Figure 1.3 Dimensions of C series CNC device

### 1.3 Installation form

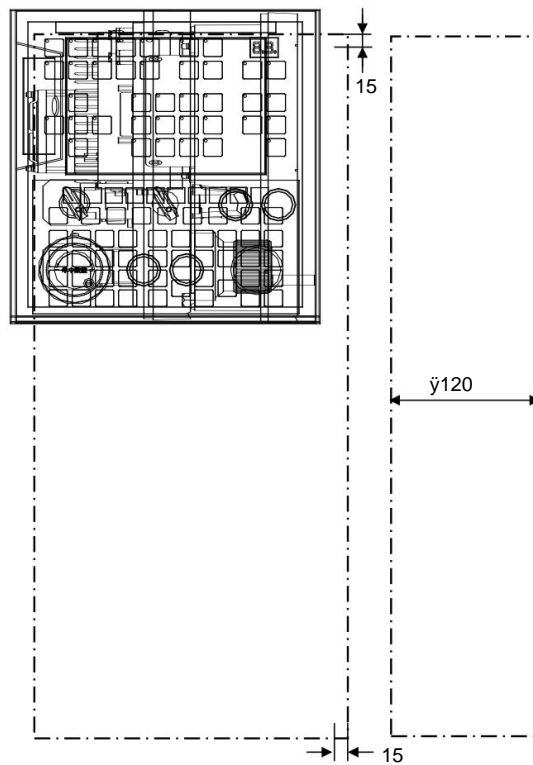


Figure 1.4 Schematic diagram of CNC device installation (take A series as an example)

Electric cabinet refers to: hanging, operating table, electric control cabinet, etc. Attention should be paid to the following during design:

- 1) As shown in Figure 1.4, the inner space of the electric cabinet of the CNC device is required to be at least 120mm, so that it can be plugged in

Connect the cables connected with the CNC device; it is convenient for air circulation and heat dissipation in the electric cabinet.

- 2) Correct screw installation must be used to avoid damage to the panel of the CNC device.

- a) A and C series are installed on the back, and M4 nuts are blindly buried, and the length should not exceed

8 mm M4 combination screw (chrome plated).

- b) B series is for front installation, the diameter of the through hole is 3.5 mm, and M3 combination screw should be used.

The maximum diameter of nails, screw heads, washers, etc. shall not exceed 6 mm.

3) The structure of the electric cabinet must meet the IP54 protection level, and pay special attention to the following requirements:

a) The materials used to make electrical cabinets should be able to withstand mechanical, chemical and thermal stress and work normally

Humidity effects encountered in

b) Sealing strips should be attached to the joints of electric cabinet doors to seal all the gaps.

c) The cable entry should be sealed, and the convenience of on-site maintenance should also be considered.

d) Use fans, heat exchangers, air conditioners, etc. to dissipate heat from the electric cabinet, or convect the internal air.

e) If fans are used for heat dissipation, air filters must be used at the air inlet/outlet.

f) Dust, cutting fluid, and mist may enter the CNC device from tiny gaps and vents,

Attached to the circuit board, the insulation will age and cause failure, so attention should be paid to the

The environment and air flow direction on the air hole side, the outflow gas should face the pollution source.

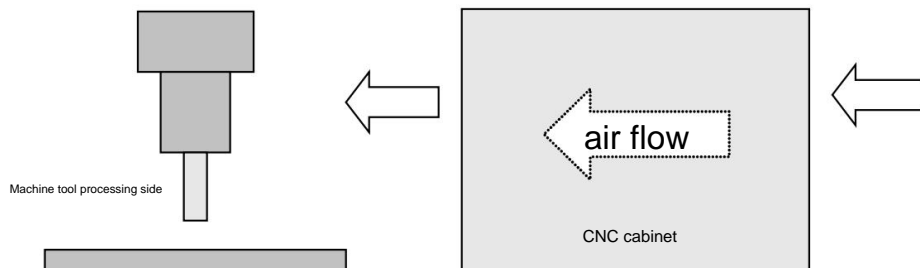


Figure 1.5 Schematic diagram of air flow in cabinet design

4) The temperature inside the electric cabinet should not be higher than 45°C. Otherwise, more effective heat dissipation measures should be adopted.

5) The CNC device panel must be installed in a place where liquids such as coolant cannot directly splash.

6) To reduce electromagnetic interference, use components and cables powered by DC or AC above 50V,

Keep a distance of more than 100mm from the CNC device.

7) When designing, it should be considered to install the CNC device in a place that is easy to debug and maintain.

## 1.4 Environmental requirements

### 1.4.1 Climate and environment

The numerical control device can work normally in the following climate environment.

• **Environment** temperature 0~45℃

• **Relative humidity** 30% ~ 95% (no condensation)

• **Atmospheric pressure** 86~106kPa

### 1.4.2 Altitude

The numerical control device can work normally below the altitude of 1000m.

### 1.4.3 Transport and storage

The numerical control device can be transported and stored within the temperature range of -40 °C to +55 °C, and can withstand

Short-term transportation and storage subject to temperatures as high as 70°C and for no more than 24 hours. but precautions should be taken

Moisture, anti-vibration and anti-shock measures to avoid damage to the CNC device.

### 1.4.4 Mechanical environment

The CNC device should be installed as far away from the vibration source as possible or additional measures should be taken to prevent vibration,

Adverse effects of impact and collision. If the CNC device can only be installed near the vibration source, it must

Take measures to ensure that the CNC device will not cause resonance, and the amplitude must be less than 0.15 mm (frequency

Frequency range: 5~55 Hz).



#### 1.4.5 Environmental Pollution

When the CNC device is transported, stored and used, measures should be taken to avoid strong microwave radiation and strong electromagnetic interference. Protection against excess pollutants (such as dust, acids, corrosive gases, salts, etc.) intrusion and work in a strong vibration environment.



Chapter 2 Connections

Abstract: This chapter introduces the interface function of **HNC-8** series numerical control device and its connection with other

Connection and use of devices and units.

2.1 Integrated wiring

Figure 2.1.1 shows the overall block diagram of the connection between HNC-8 series CNC device and other devices and units.

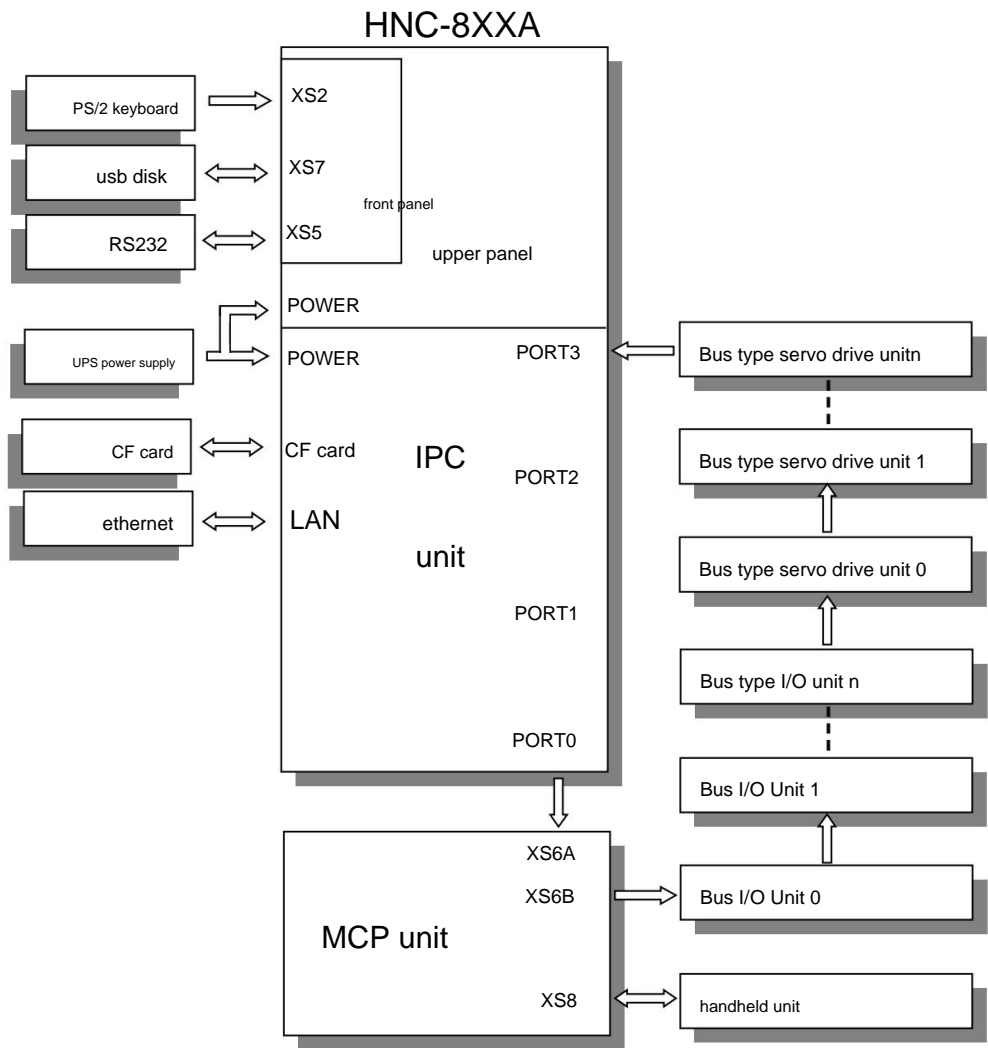


Figure 2.1.1a Overall Block Diagram of HNC-8 A Series

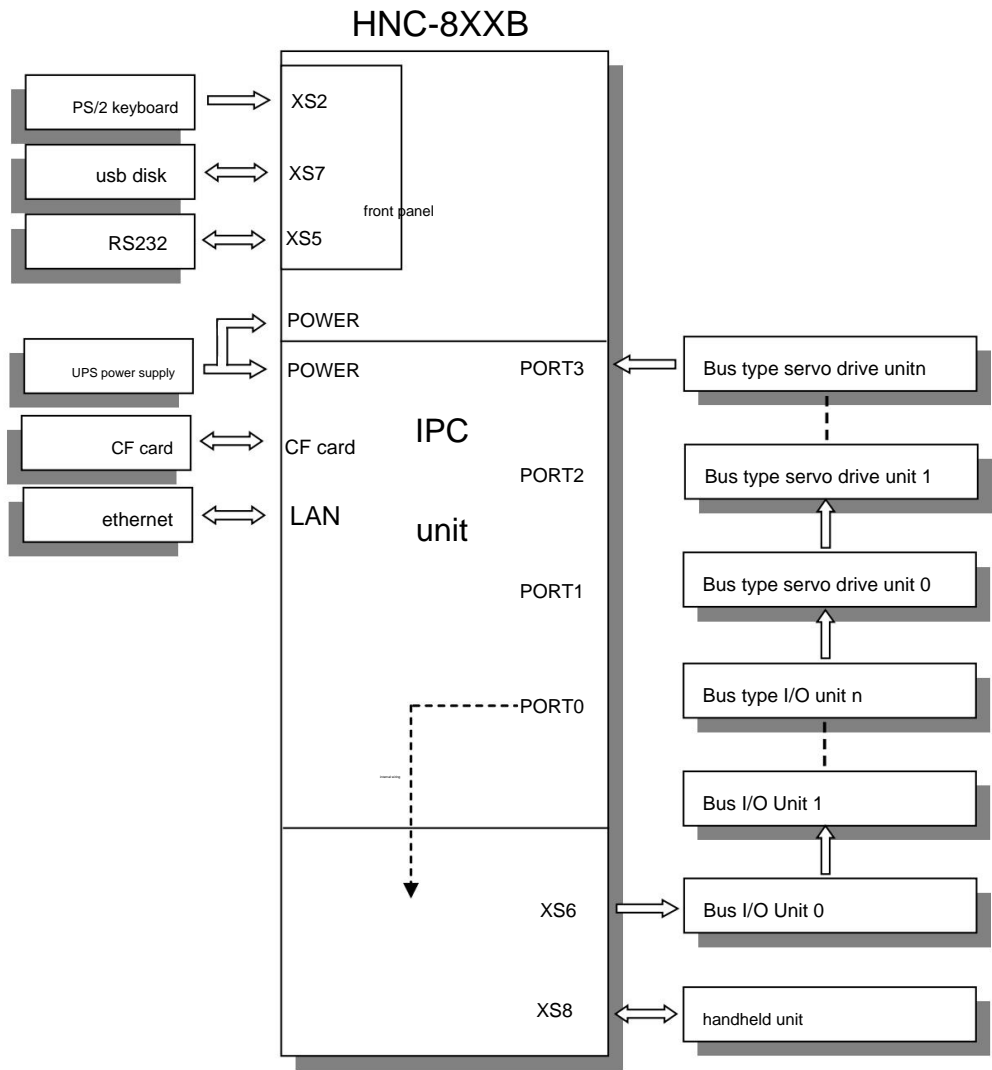


Figure 2.1.1b Overall Block Diagram of HNC-8B Series

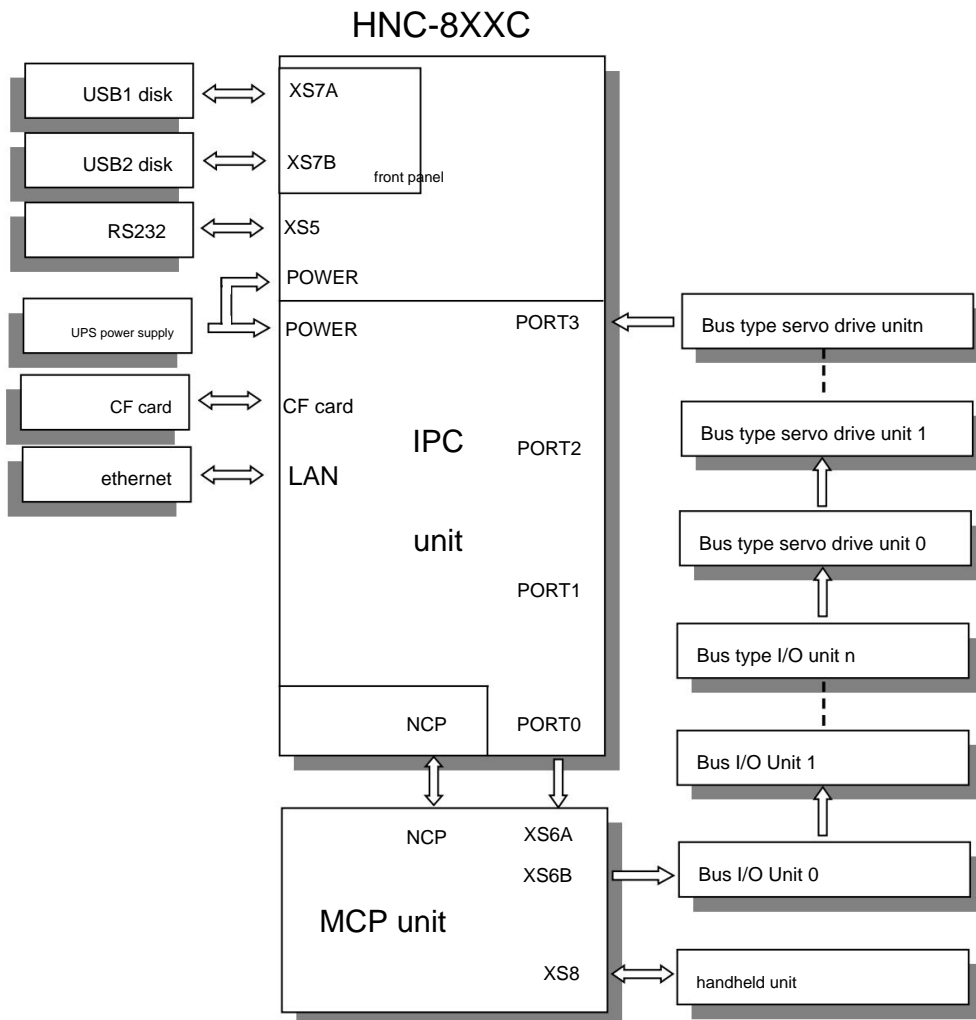


Figure 2.1.1c Overall Block Diagram of HNC-8 C Series

Note:

As shown in Figure 2.1.1, the HNC-8 series CNC device adopts NCUC industrial field bus to

In series mode, the IPC unit bus interface PORT0~PORT3 controls the bus I/O unit, bus

Line servo drive unit and other bus devices, support up to 128 devices.

HNC-8 series CNC devices are powered by UPS power supply (HPW-145U), which has

Power failure detection function and UPS function.

HNC-8 series CNC devices only have a small amount of PLC input/output in the handheld unit interface (XS8)

Signals, therefore, need to expand external PLC input/output signals through the bus I/O unit.

- A maximum of 16 bus I/O units can be expanded through the bus, among which the HIO-1000A type I/O unit can provide 1 communication sub-module and 8 functional sub-module slots; HIO-1000B type I/O unit can provide 1 communication sub-module and 5 functional sub-module slots; the functional sub-module includes digital input/output sub-module, analog input/output sub-module, axis control sub-module, etc.
- The handheld unit of the HNC-8 series CNC device is an optional configuration;

## 2.2 Functional description

### 2.2.1 Numerical control device

HNC-8 series currently includes three series, A, B, and C, among which:

- The A series is a split structure, using an 8.4-inch color LCD screen with a resolution of 800\*600;
- The B series has an integrated structure, using a 10.4-inch color LCD screen with a resolution of 800\*600;
- The C series is a split structure, using a 15-inch color LCD screen with a resolution of 1024\*768; the maximum number of control axes of the three series is 64 axes, and the maximum number of linkage axes is 9 axes. The interface is as follows:

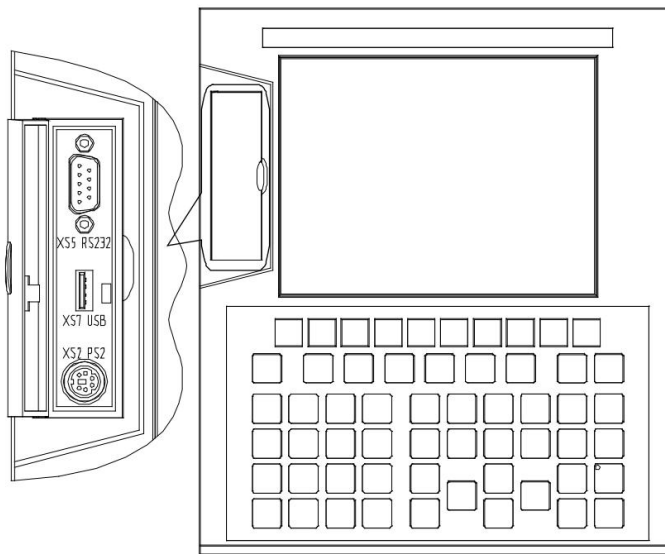


Figure 2.2.1a A series CNC device interface diagram - front of the upper panel

XS2: Standard PS/2 keyboard interface;

XS5: RS232 serial interface;

XS7: USB interface (USB2.0);

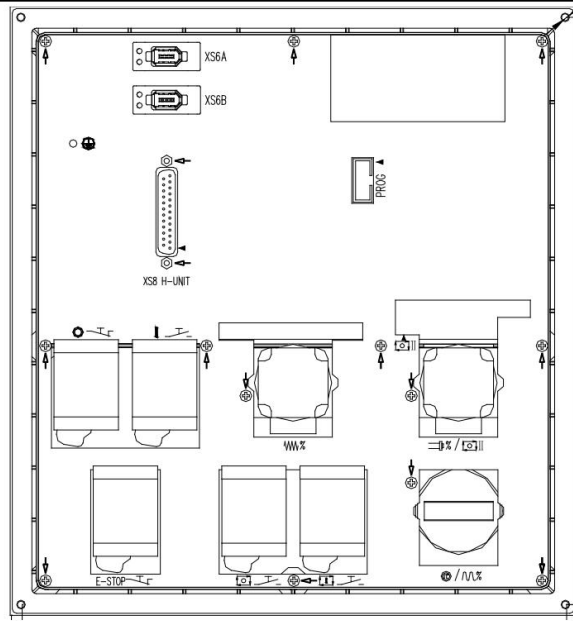


Figure 2.2.1b A series CNC device interface diagram - the back of the lower panel

XS6A, XS6B: NCUC bus interface;

XS8: handheld unit interface;

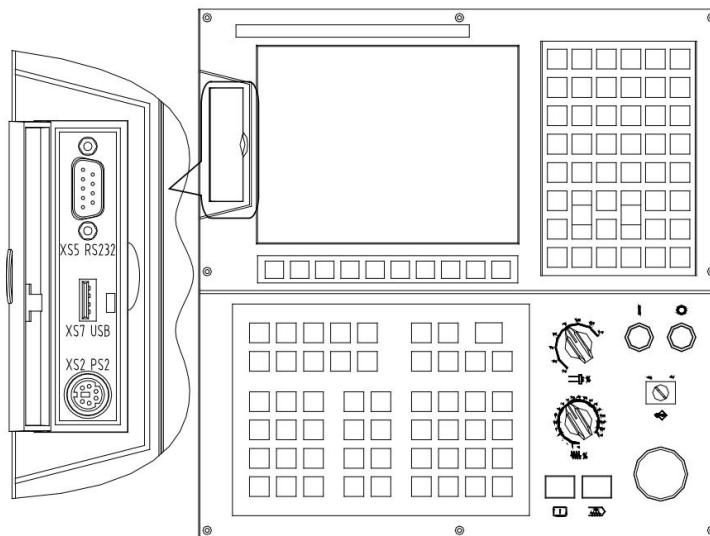


Figure 2.2.2a B series CNC device interface diagram - front

XS2: Standard PS/2 keyboard interface;

XS5: RS232 serial interface;

XS7: USB interface (USB2.0);

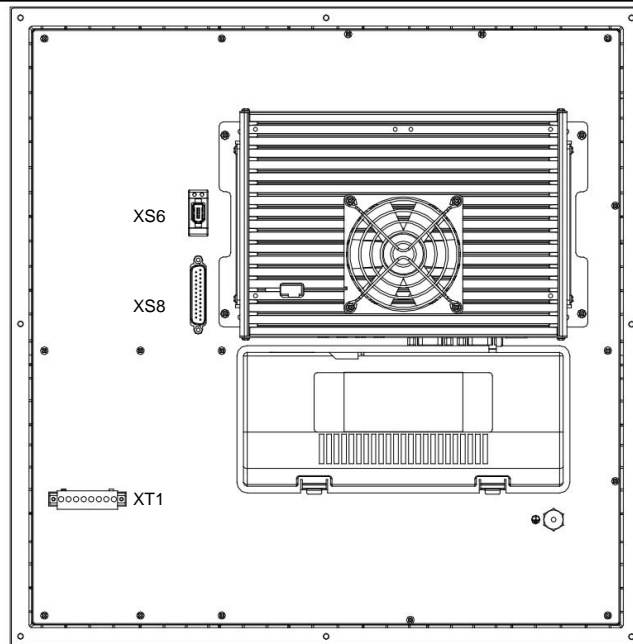


Figure 2.2.2b B series CNC device interface diagram - back panel

XS6: NCUC bus interface

XS8: handheld unit interface

XT1: external power on, power off, emergency stop interface

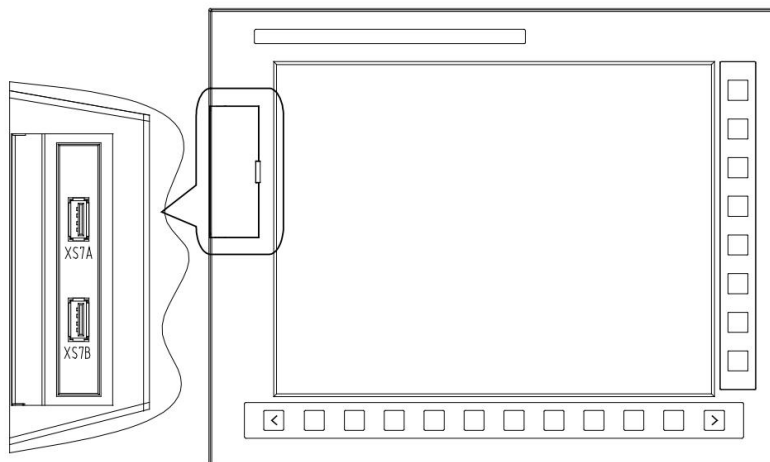


Figure 2.2.3a C series CNC device interface diagram - front of the upper panel

XS7A: USB1.1 interface

XS7B: USB2.0 interface



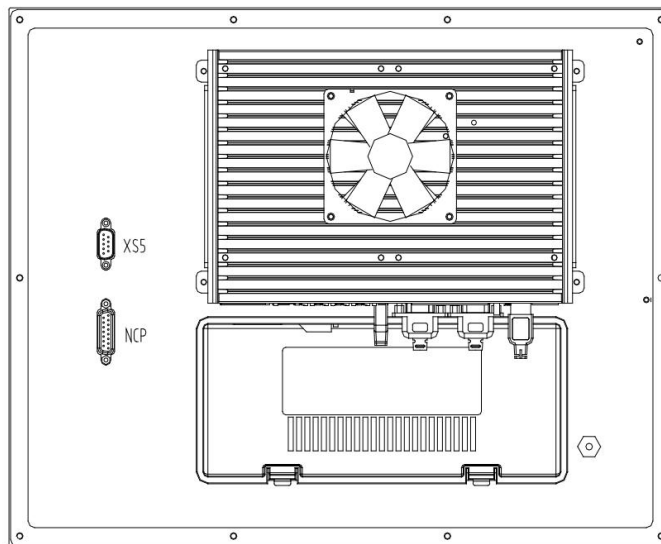


Figure 2.2.3b C series CNC device interface diagram - the back of the upper panel

XS5: RS232 interface

NCP: upper and lower panel interface

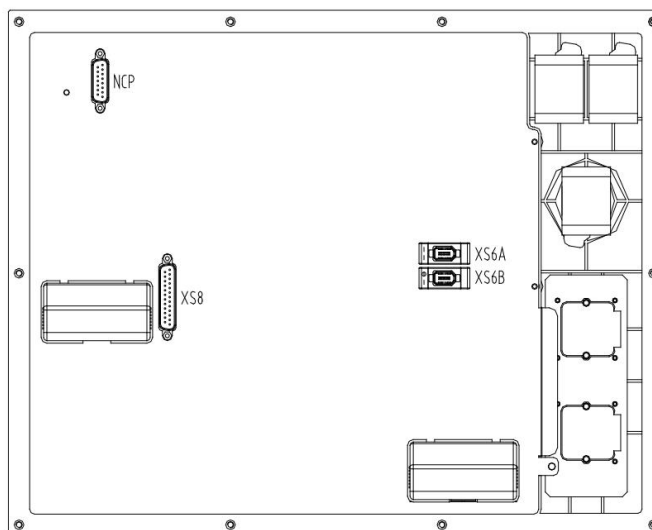


Figure 2.2.3c C series CNC device interface diagram - the back of the lower panel

NCP: upper and lower panel interface

XS8: handheld unit interface

XS6A, XS6B: NCUC bus interface.

## 2.2.2 IPC unit

IPC unit is the core control unit of HNC-8 series CNC device, the interface is shown in Figure 2.2.4.

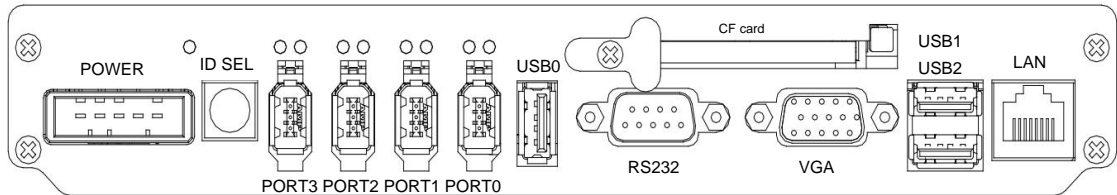


Figure 2.2.4 Schematic diagram of the interface of the IPC unit

POWER: 24V power interface;

ID SEL: device number selection switch;

PORT0 ~ 3: NCUC bus interface;

USB0: external USB1.1 interface;

RS232: serial port used internally;

VGA: the video signal port used internally;

USB1&USB2: USB2.0 interface used internally;

LAN: External standard Ethernet interface.

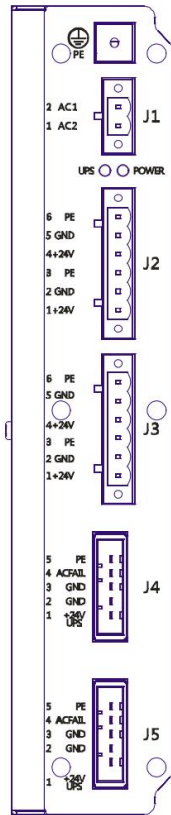
## 2.2.3 UPS switching power supply

UPS switching power supply (HPW-145U) is the switching power supply required by HNC-8 series CNC system.

Power off has power-down detection and UPS functions. A total of 6 channels of rated output voltage DC +24V, total rated output

The output current is 6A, the rated power is 145W, and it has short-circuit protection and over-current protection.

The interface diagram and definition of UPS switching power supply are shown in Figure 2.2.5.



signal name	Description
PE	of protected area

J1: AC input port

signal name	illustrate
AC1	220V AC input
AC2	220V AC input

J2, J3: DC +24V output ports

signal name	illustrate
+24V	DC +24V output power
GND	ground
PE	protection ground

J4, J5: DC +24V output port with UPS function

signal name	Description with UPS function
+24V UPS	DC +24V output power
GND	ground
SGND	signal ground
ACFail	power failure detection signal
PE	output protection ground

Figure 2.2.5 Schematic diagram and definition of UPS switching power supply interface

2.2.4 Bus type I/O unit

Introduction to the characteristics of the bus I/O unit:

- Up to 16 I/O units can be expanded through the bus;
- Two kinds of I/O units can be built by using different backplane sub-modules, among which the HIO-1009 backplane
- The sub-module can provide 1 slot for communication sub-module and 8 slots for functional sub-module, the I/O
- The unit is called the HIO-1000A bus type I/O unit; the HIO-1006 backplane sub-module can provide
- It provides 1 communication sub-module slot and 5 functional sub-module slots, and the I/O unit formed is called
- HIO-1000B bus type I/O unit;

• **Functional** sub-modules include digital input/output sub-module, analog input/output sub-module, axis

Control sub-modules, etc.;

Digital input/output sub-module--provides 16 digital input or output signals;

Analog input/output sub-module--provides 4-channel A/D signal and 4-channel D/A signal;

Axis control sub-module--provides 2 axis control interfaces, including pulse command, analog command and

Encoder feedback interface;

• **NPN** and PNP interfaces are optional for the digital input sub-module, and the output sub-module is NPN interface.

Each switch has an indicator light.

The names and models of each sub-module are shown in Table 2.2 below.

Table 2.2 Model specifications of HIO-1000 series sub-modules

submodule name		Submodule model	illustrate
Bottom plate	9-slot backplane sub-module	HIO-1009	Provide 1 communication sub-module and 8 function sub-module slots
	6-slot backplane submodule	HIO-1006	Provide 1 communication sub-module and 5 function sub-module slots
communication	NCUC protocol communication sub-module (1394-6 FireWire interface)	HIO-1061	Mandatory (in FireWire interface communication mode); Supported system: Huazhong 8
	NCUC protocol communication sub-module (SC optical fiber interface)	HIO-1063	Mandatory (in optical fiber interface communication mode); Supported system: Huazhong 8
axis control	Incremental pulse axis control submodule	HIO-1041	Optional, each sub-module provides 2 axis control interfaces, each interface includes: pulse command; D/A analog voltage command; encoder feedback command
	Absolute axis control	HIO-1042 optional,	each sub-module provides 2 axis control interfaces
Analog	submodule Analog input/output submodule	HIO-1073	Optional, each sub-module provides 4 channels of analog input and 4 channels of analog
Switch	NPN type digital input sub-module	HIO-1011N	output Optional, each sub-module provides 16 channels of NPN type PLC digital input signal interface, low-level active
	PNP type digital input sub-module	HIO-1011P	option, each sub-module provides 16 channels of PNP Type PLC digital input signal interface, active high level optional,
	NPN switch output sub-module	HIO-1021N	each sub-module provides 16 NPN type PLC digital output signal interface, active low level
temperature check	temperature analog input module	HIO-1075 optional,	each sub-module provides 6 analog inputs
hand control	Hand control module HIO-1015		Optional, each sub-module provides 32 points of input, including manual emergency stop, emergency stop, axis selection, override, manual pulse input points

The bus I/O unit interface and each sub-module interface (HIO-1000A type and HIO-1000B type) are shown in the figure

### 2.2.6a, 2.2.6b.

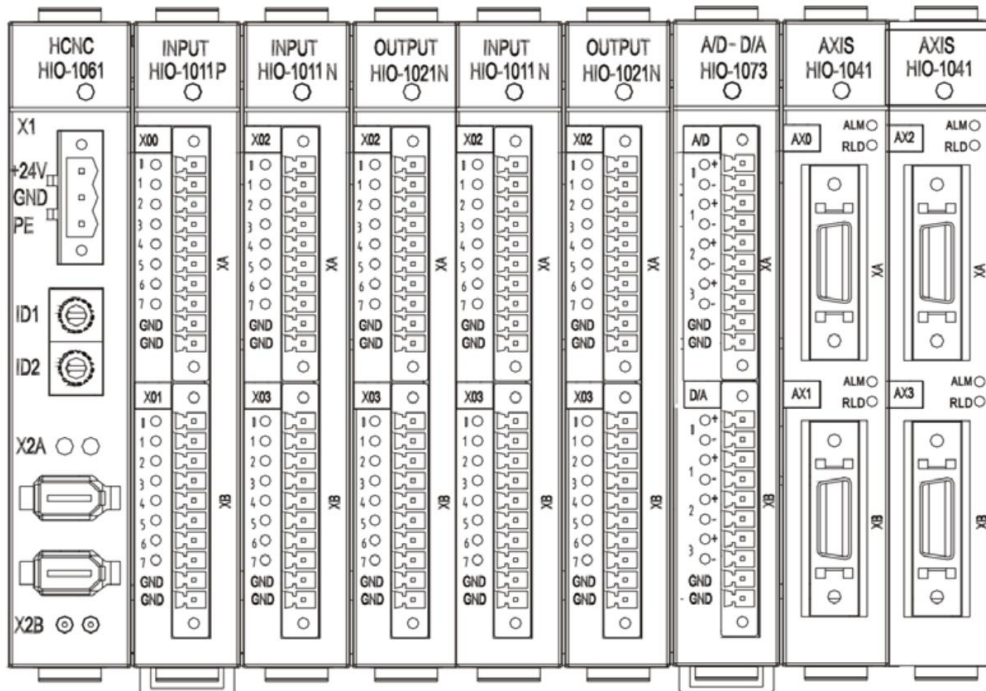


Figure 2.2.6a HIO-1000A bus I/O unit interface diagram

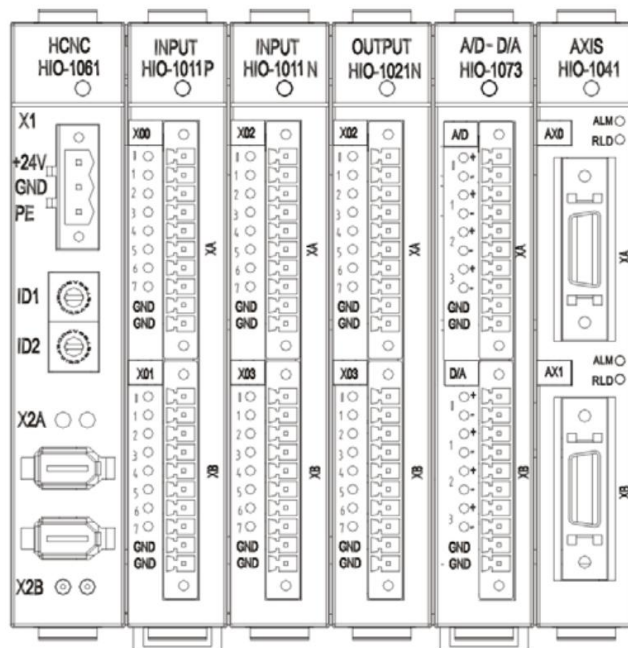


Figure 2.2.6b HIO-1000B bus I/O unit interface diagram

2.2.4.1 Communication sub-module function and interface

The communication sub-module (HIO-1061) is responsible for completing the communication function with the HNC-8 series CNC system (X2A, X2B interface) and provide power input interface (X1 interface), the output power of the external switching power supply should not be less than 50W. Its function and interface diagram are shown in Figure 2.2.6c.

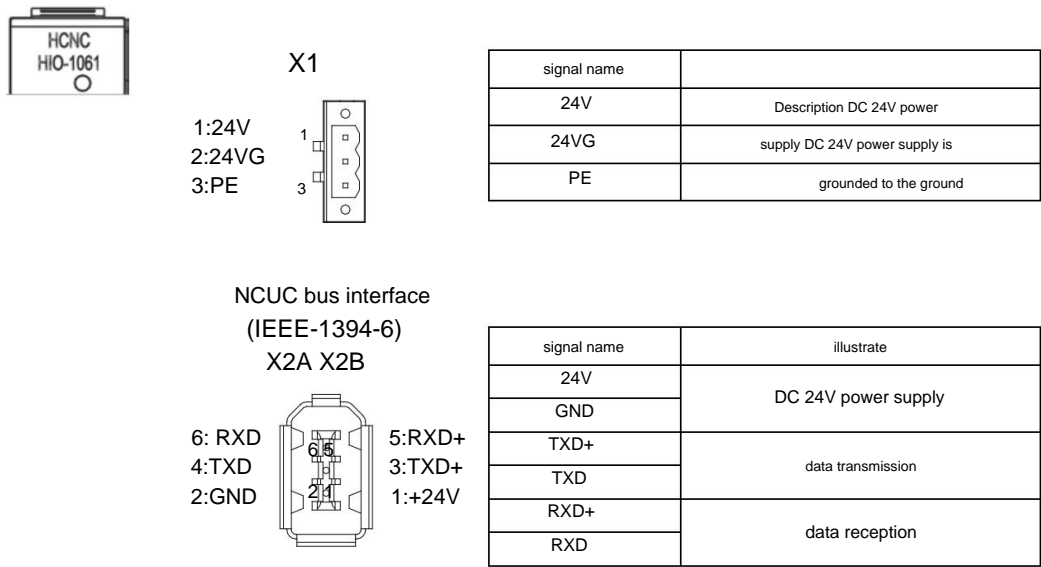


Figure 2.2.6c Communication sub-module interface definition diagram

Note: The power introduced by the communication sub-module is the working power of the bus I/O unit, the power should be

The external circuit involved with the input/output sub-module (that is, the PLC circuit, such as non-contact switch, travel switch

Off, relay, etc.) use different switching power supplies, the latter is called PLC circuit power supply;

The GND terminal of the input/output sub-module should be reliably connected to the power ground of the PLC circuit power supply;

2.2.4.2 Function and interface of digital input/output sub-module

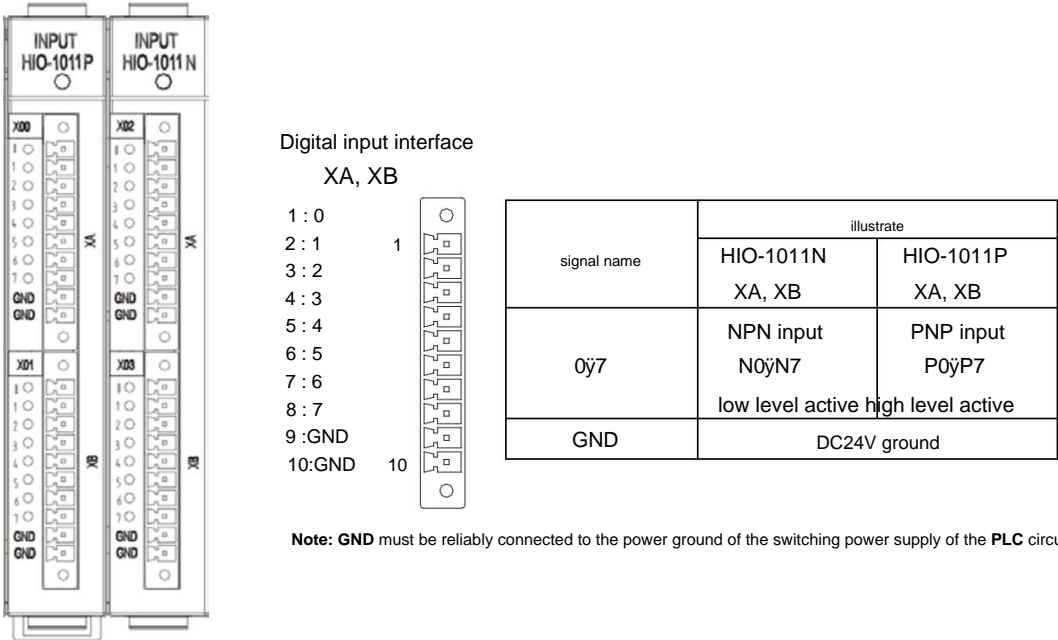
Switch input sub-module functions and related interfaces

The digital input sub-module includes NPN type (HIO-1011N) and PNP type (HIO-1011P).

The difference is: the NPN type is active at low level, and the PNP type is active at high level (+24V). Each switch

The quantity input sub-module provides 16 channels of digital signal input. Digital input interface XA, XB (gray)

The definition is shown in Figure 2.2.6d.



**Note:** GND must be reliably connected to the power ground of the switching power supply of the PLC circuit.

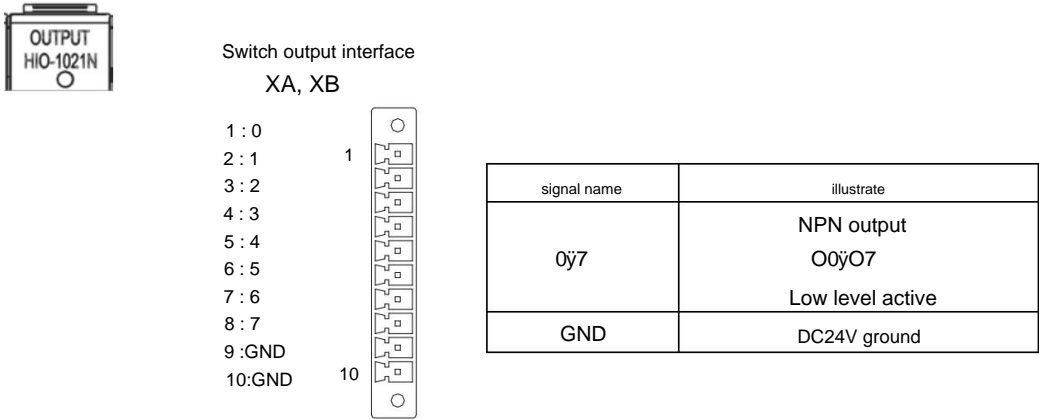
Figure 2.2.6d Interface definition diagram of digital input sub-module

Switch output sub-module function and interface

The switch output sub-module (HIO-1021N) is NPN type, the effective output is low level, otherwise the output

In the high-impedance state, each switch output sub-module provides 16 switch signal outputs. switch output connection

The definitions of ports XA and XB (black) are shown in Figure 2.2.6e.



**Note:** GND must be reliably connected to the power ground of the switching power supply of the PLC circuit.

Figure 2.2.6e Interface definition diagram of switch output sub-module

2.2.4.3 Analog input/output sub-module function and interface

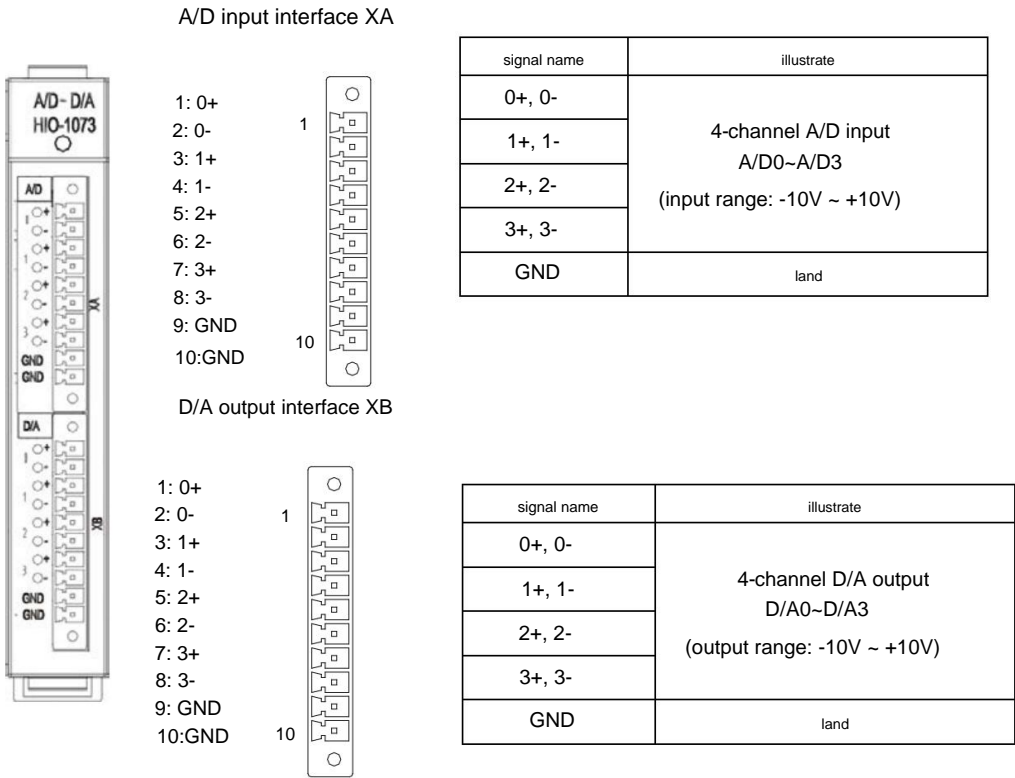
The analog input/output (A/DD/A) sub-module (HIO-1073) is responsible for completing the machine tool to CNC system

The A/D signal input of the CNC system and the D/A signal output of the machine tool. Each A/DD/A submodule provides

For 4-channel 12-bit differential/single-ended analog signal input and 4-channel 12-bit differential/single-ended analog signal output.

A/D input interface XA: (green); D/A output interface XB: (orange). Its interface definition is shown in Figure 2.2.6f

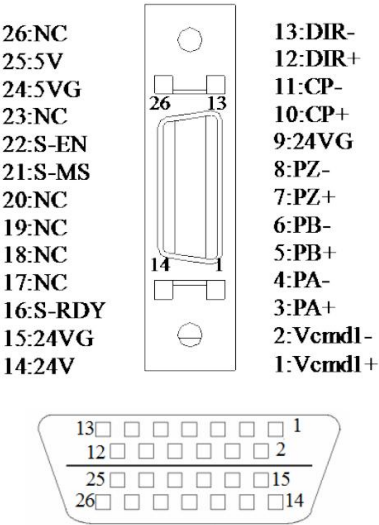
shown.







轴控制接口 XA、XB



高密度对应的插头焊片的引脚排序（面对插头的焊片看）

Signal Name	Description
Vcmd1+, Vcmd1-	Analog output (-10V~+10V) Encoder A
PA+, PA-	phase feedback signal
PB+, PB-	Encoder B phase feedback
PZ+, PZ-	signal Encoder Z phase feedback signal
24V, 24VG	DC24V power
CP+, CP-	command pulse output (phase A)
DIR1+, DIR1-	command direction output (phase B)
24VB	DC24V
S-RDY	Ready
S-MS	Mode Toggle
S-EN	Enable
5V, 5VG	DC5V power supply
NC	empty

Figure 2.2.6g Interface definition diagram of axis control sub-module

2.2.4.5 Temperature detection sub-module function and interface

The temperature detection sub-module (HIO-1075) corresponds to the HC7175 board, which is only used for three-wire and two-wire heating Resistance temperature measurement. One HIO-1075 board can be connected to 6 sets of thermal resistors at the same time, and each IO box can only hold

The interface definition of a HIO-1075 board is shown in Figure 2.2.6h.

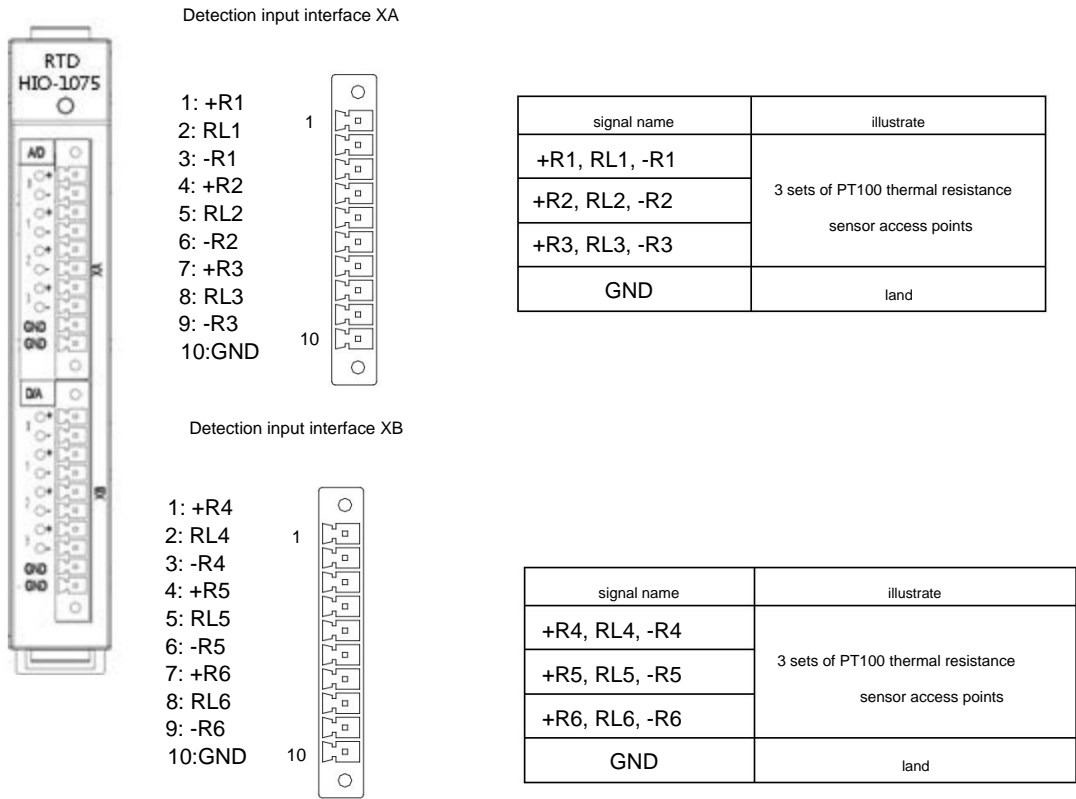


Figure 2.2.6h Interface definition diagram of mold temperature detection sub-module

2.2.4.6 Manual control sub-module function and interface

Manual control sub-module (HIO-1015) provides manual emergency stop, axis selection, override point, manual pulse Enter point. The manual control interface is a 25-core high-density interface, and its interface definition is shown in Figure 2.2.6i.

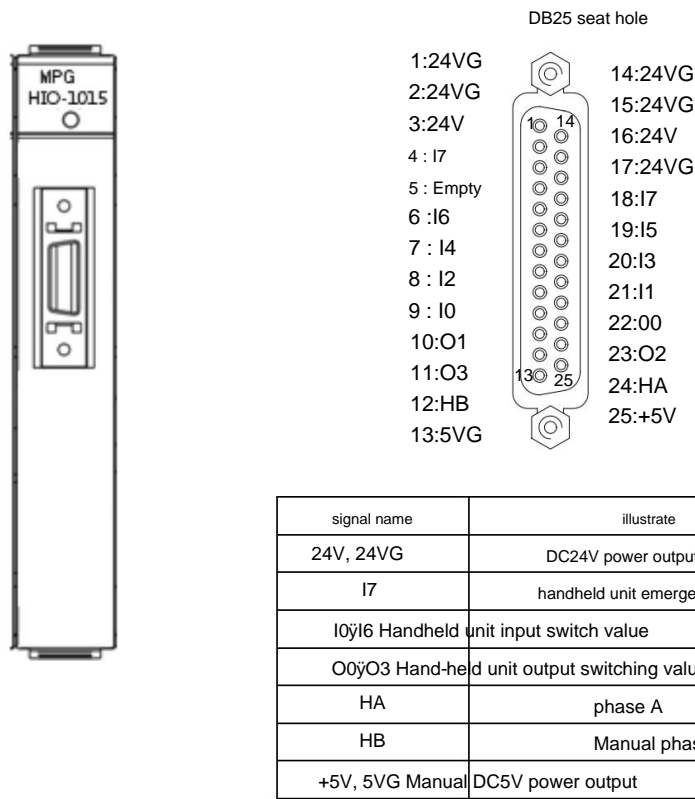


Figure 2.2.6i Interface definition diagram of manual control sub-module

2.2.4.7 HIO-1031 I/O module function and interface

The 1031 module includes two boards HC7179 and HC7180, this module is the function of the HIO-1000 unit

The energy sub-module needs to be used with the backplane and communication board of the HIO-1000 unit. The module supports 24 inputs and 16 outputs, the input port is compatible with PNP and NPN input signals, and its interface definition is shown in Figure 2.2.6j

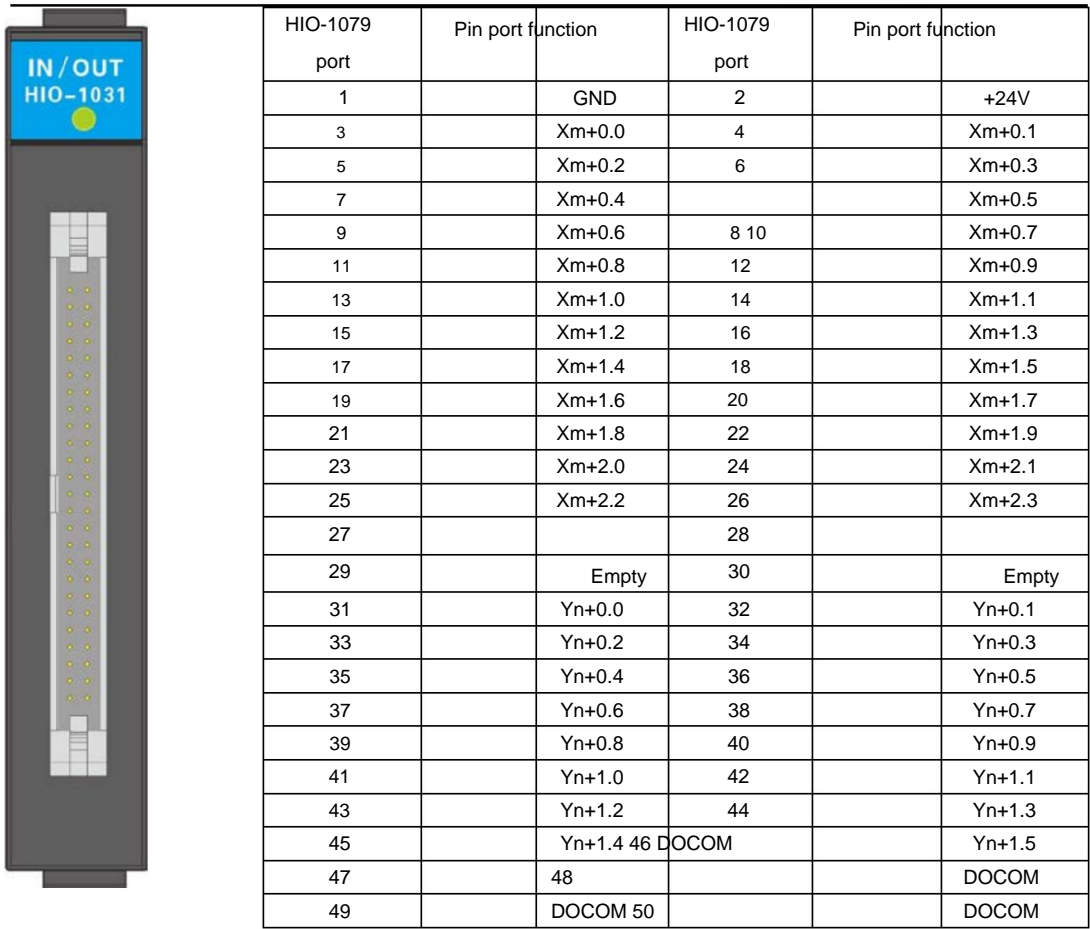


Figure 2.2.6j HIO-1031 I/O module interface definition diagram

2.2.5 Handheld unit (option)

The handheld unit provides emergency stop button, enabling button, working indicator light, coordinate selection (OFF, X, Y, Z, 4), magnification selection (X1, X10, X100) and manual pulse generator.

The handheld unit has only one DB25 interface, as shown in Figure 2.2.7.

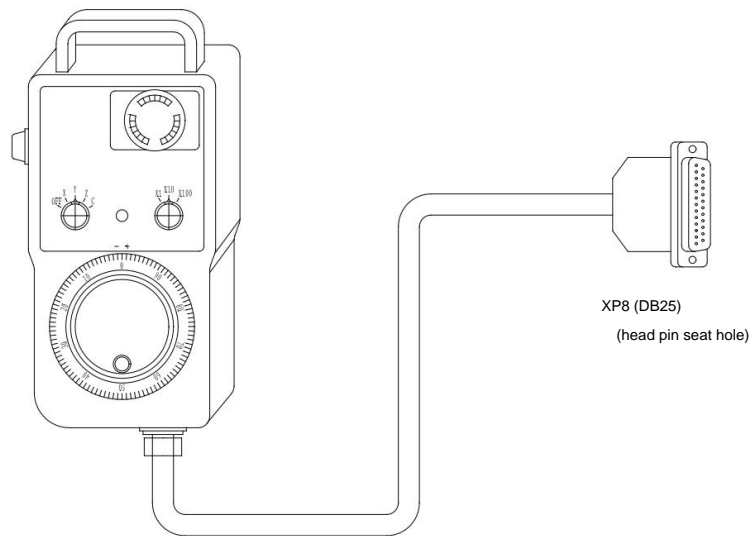


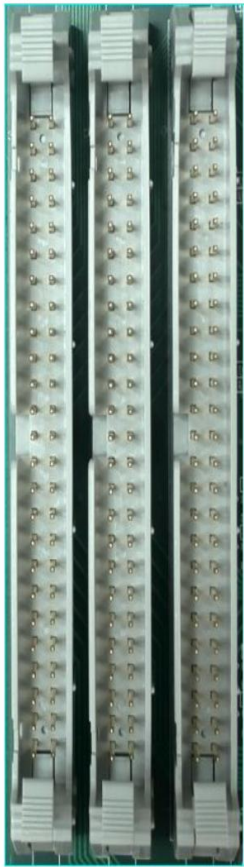
Figure 2.2.7 Handheld unit interface diagram

The hand-held interface plug is connected to the hand-held control interface XS8 of the HNC-8 series CNC device.

## 2.2.6 HBUS-M20 bus type IO interface

The bus-type IO module integrated board corresponds to HC7181, which is three sets of 50-pin interface plugs, which are suitable for working conditions. It can be connected to 72 sets of inputs and 48 sets of outputs at the same time; the input port is a PNP type input signal; its interface definition is shown in Figure 2.2.8a:

Note: The pin definitions of the three interfaces are the same.



HC7181 Port Pins	Port Functions	HC7181 Port Pins	Port Functions		
1		GND	2		+24V
3		Xm+0.0	4		Xm+0.1
		Xm+0.2	6		Xm+0.3
5 7		Xm+0.4	8		Xm+0.5
		Xm+0.6	10		Xm+0.7
9 11		Xm+0.8	12		Xm+0.9
13		Xm+1.0	14		Xm+1.1
15		Xm+1.2	16		Xm+1.3
17		Xm+1.4	18		Xm+1.5
19		Xm+1.6	20		Xm+1.7
21		Xm+1.8	22		Xm+1.9
23		Xm+2.0	24		Xm+2.1
25		Xm+2.2	26		Xm+2.3
27			28		
29		Empty	30		Empty
31		Yn+0.0	32		Yn+0.1
33		Yn+0.2	34		Yn+0.3
35		Yn+0.4	36		Yn+0.5
37		Yn+0.6	38		Yn+0.7
39		Yn+0.8	40		Yn+0.9
41		Yn+1.0	42		Yn+1.1
43		Yn+1.2	44		Yn+1.3
45		Yn+1.4	46		Yn+1.5
47		DOCOM	48		DOCOM
49		DOCOM	50		DOCOM

Figure 2.2.8a HBUS-M20 bus IO interface definition diagram

## 2.3 Power supply and grounding

### 2.3.1 CNC device power interface

There are two power interfaces of CNC device: IPC unit power interface and panel power interface. Adopt AMP

5-core power socket: D-3100S-178295-2 (curved) and D-3100S-1-178315-2 (straight), as shown in Figure 2.3.1

shown.

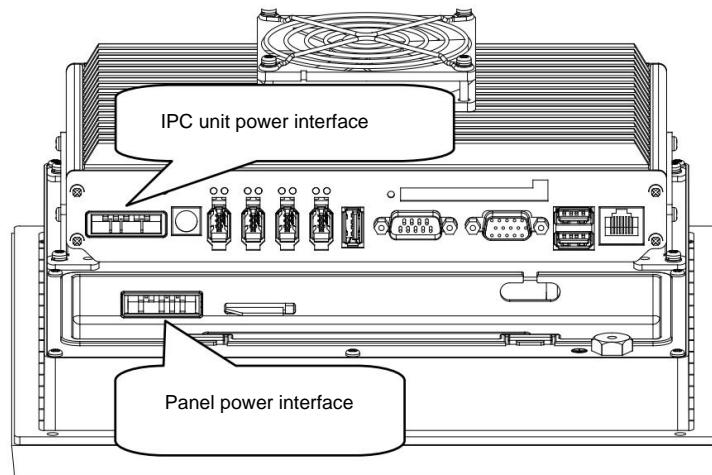


Figure 2.3.1 CNC device power interface

### 2.3.2 Power supply requirements



battery capacity:

Numerical control device (external power supply 1): DC24V, 50W, with UPS function and power failure detection function.

Bus type I/O unit (external power supply 2): DC24V, 50W.

PLC circuit (external power supply 3): DC24V, the power depends on the number of PLC external switches and PLC

Active devices are OK.

Power cord: use shielded cable, the shielding layer coverage rate is not less than 80%.

External power supply 1: powered by J4 or J5 power output interface of HPW-145U switching power supply (with

Backup UPS and power failure detection function). The power failure detection circuit notifies the system to start relevant protection after abnormal power failure

operation, at this time, the UPS function can continuously supply power to the CNC device for a period of time, so that the system can perform

Relevant protection operations, save the current data; the CNC device does not share this power supply with other external equipment.

External power supply 2: Powered by the J2 or J3 power output interface of the HPW-145U switching power supply.

The external power supply 3 is powered by an ordinary switching power supply; the ground of the power supply must be connected with the **input /**

The **GND** terminals of the **output sub-modules (HIO-1011N, HIO-1011P, HIO-1021N)** are reliably connected.

After the external power supply 1 is transformed by the internal switching power supply of the numerical control device,

XS8 provides DC24V and DC5V power to the components on the handheld unit;

**The NCUC bus interface (PORT0~PORT3) of the IPC unit and the HNC-8B series**

The NCUC bus interface XS6 on the panel of the control device provides DC24V power to the outside (do not over 12W); the remaining bus interfaces do not provide DC24V power.

The maximum power capacity that the UPS switching power supply can provide through the above interface is: DC24V: 6A;

If the above-mentioned capacity is exceeded, please add an additional power supply, and at the same time disconnect the

The line powered by the port is powered by an additional power supply.

### 2.3.3 Grounding



In order to reduce interference, please use a yellow-green copper wire with a cross-sectional area of not less than **2.5** square millimeters as the ground wire



The chassis grounding terminal of the numerical control device is reliably connected to the protection ground of the electric cabinet and the machine tool.



Components for input/output switching value control or receiving signals (such as relays, button lights, proximity switches

Off, Hall switch) power supply should be separate, and the power ground of the power supply must be the same as the bus type

The GND terminal of the input/output sub-module of the I/O unit is reliably connected. Otherwise, the numerical control device cannot pass the input

Output switches reliably control these components, or receive signals from these components.



2.4 Connection between CNC device and external computer

2.4.1 Connect with external computer via RS232 interface

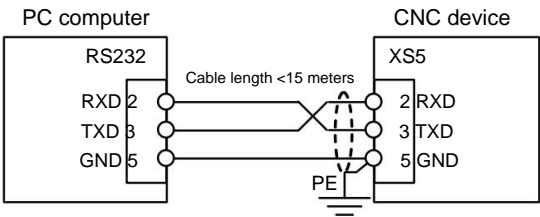


Figure 2.4.1 The CNC device is connected to the PC computer through the RS232 interface

2.4.2 External connection via Ethernet interface

It can be directly connected to the external computer through the Ethernet interface (see Figure 2.4.2), or through the HUB (hub) into the local area network, and then connect with any other computer on the local area network (see Figure 2.4.3).

Use a dedicated network cable for the connection

cable. The models of the Ethernet interface plugs are

all **RJ45**. **YDirect** connection:

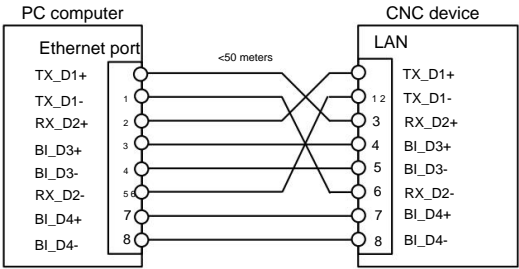


Figure 2.4.2 The CNC device is directly connected to the external computer through the Ethernet interface **YConnected** through the HUB

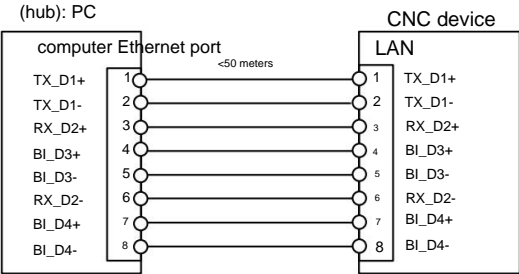


Figure 2.4.3 The CNC device is connected to the external computer LAN through the Ethernet interface

## 2.5 Connection between CNC device and bus servo drive unit

Adopt NCUC bus and connect in series, as shown in Figure 2.5.1.

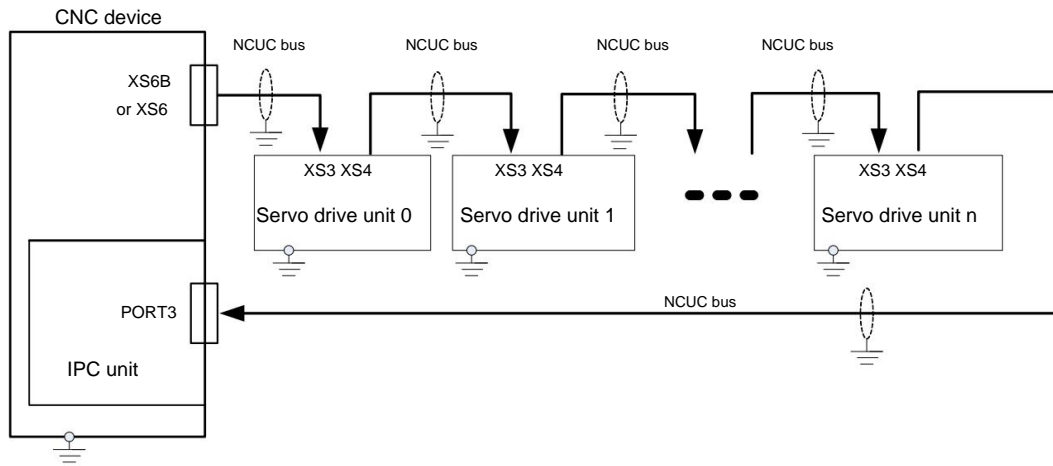


Figure 2.5.1 Connection Diagram of Numerical Control Device and Bus Servo Drive Unit

## 2.6 Connection between CNC device and bus I/O unit

Adopt NCUC bus and connect in series, as shown in Figure 2.6.1.

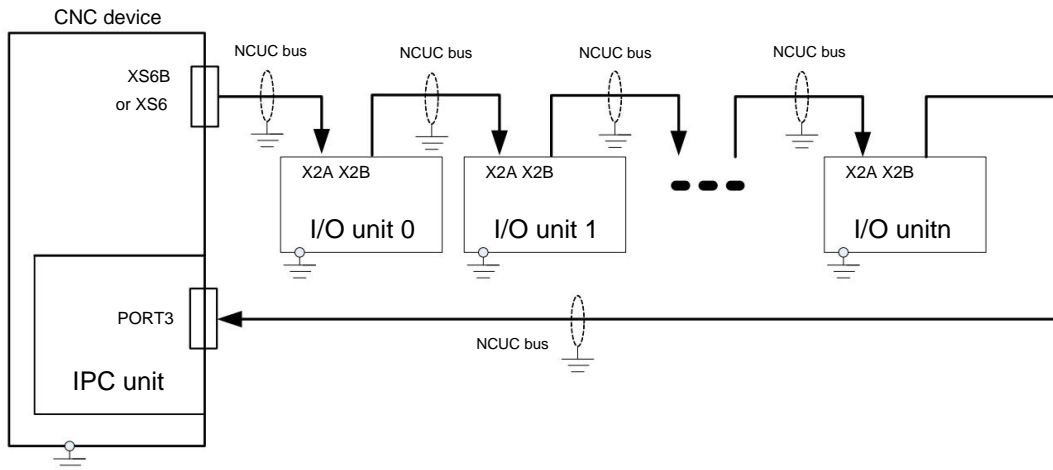


Figure 2.6.1 Connection Diagram of Numerical Control Device and Bus I/O Unit

The PLC input/output interface, non-bus axis control interface, etc. can be expanded through the bus I/O unit.

## Chapter 3 Typical Design Examples of Lathes

Abstract: This chapter introduces the application of **HNC-8** series CNC devices to the control of CNC lathes

Typical design of the system.

### 3.1 Typical connection of CNC system

The typical connection between HNC-8 series CNC device and bus I/O unit, bus servo drive unit,

As shown in Figure 3.1.1.

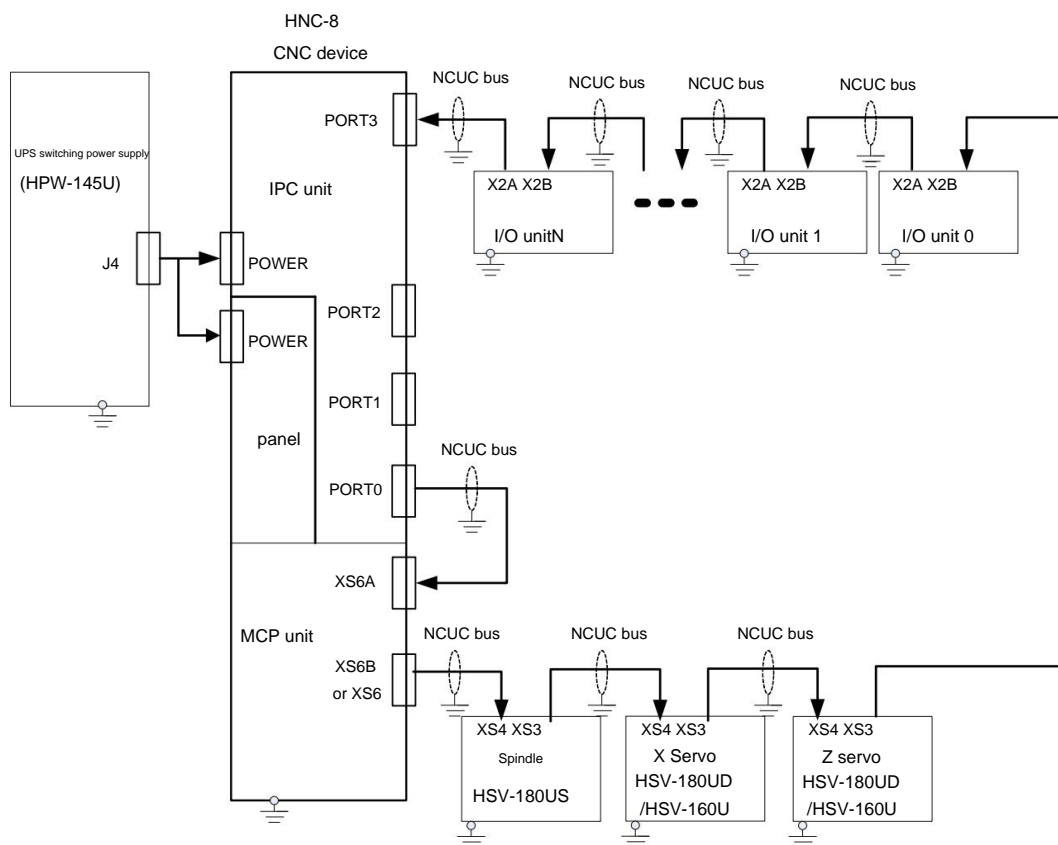


Figure 3.1.1 Typical connection between CNC device, bus-type I/O unit and bus-type servo drive unit

### 3.2 Overview of typical design of lathe CNC system

HNC-8 series CNC devices are applied to different CNC machine tools, and there are two main differences:

•The logical relationship between the input and output switches, that is, the PLC programming is different.

—For details, refer to the book "PLC Programming Manual";

•The definition of input and output switch is different from the electrical design.

-- This chapter mainly deals with this part.

The input and output switching values are usually divided into two categories: the switching value connected inside the electric cabinet and the switching value connected to the machine tool.

Off volume. During commissioning, electrical cabinet commissioning and electromechanical joint commissioning are generally carried out separately.

3.3 Example of lathe CNC system design

3.3.1 System Introduction

Machine tool: two-coordinate lathe, X, Z linear coordinate axes;

Control cabinet structure: strong current control cabinet + hanging box;

Spindle: Spindle drive.

The main components of a typical CNC system design are shown in Table 3.1.

Table 3.1 The main components of a typical CNC system design

Serial No.	Name, Specification,	Main Application Remarks	1 Numerical Control Device HNC-818B-T System Control	Huazhong
	Numerical Control 2 Handheld Unit HWL-1002 Manual Control	Huazhong Numerical Control 3 Servo Transformer	3P AC380/220V	
	2.5KW Servo Power Supply Module	Huazhong Numerical Control	AC380/220V 300W Servo Control power supply, switching	
	power supply/110V 250W heat exchanger and AC contactor power supply	Huazhong CNC/24V 100W lighting power supply	NCUC	
4	Control Transformer	communication sub-module base board sub-module (6 slots) Huazhong CNC PLC input sub-module: 2 blocks, a total of 32 PLC outputs Sub-module: 2 blocks with 32 channels in total		
5	bus type I/O unit	HIO-1061 HIO-1006 HIO-1011N HIO-1021N		
6	switching power supply	HPW-145U CNC device and bus I/O unit power supply	Huazhong CNC 7 switching	
	power supply AC220/DC24V 50W switching value and intermediate relay	Mingwei 8 switching power supply		
	AC220/DC24V 100W lifting shaft brake and solenoid valve	Mingwei 9 servo drive HSV-160UD -030 10	Spindle	
	driver HSV-180US-075 11	Servo motor 130ST- X, Z axis motor drive device	Huazhong CNC spindle	
	M07220LMBB (with brake)	12 Servo motor 130ST- motor drive device	Huazhong CNC	
	M07220LMBB		X-axis feed motor Huada Motor (Tamagawa absolute encoder)	
			Z-axis feed motor (Tamagawa absolute encoder)	Huada Motor

Example 13 Spindle Motor GM71054SB61-H AC Servo Spindle Motor	Dengqi Electromechanical 14 Reactor AC380V 5.5kVA Power
Incoming Line Isolation for Drive Device (1 set) Huazhong CNC	

3.3.2 Overall block diagram

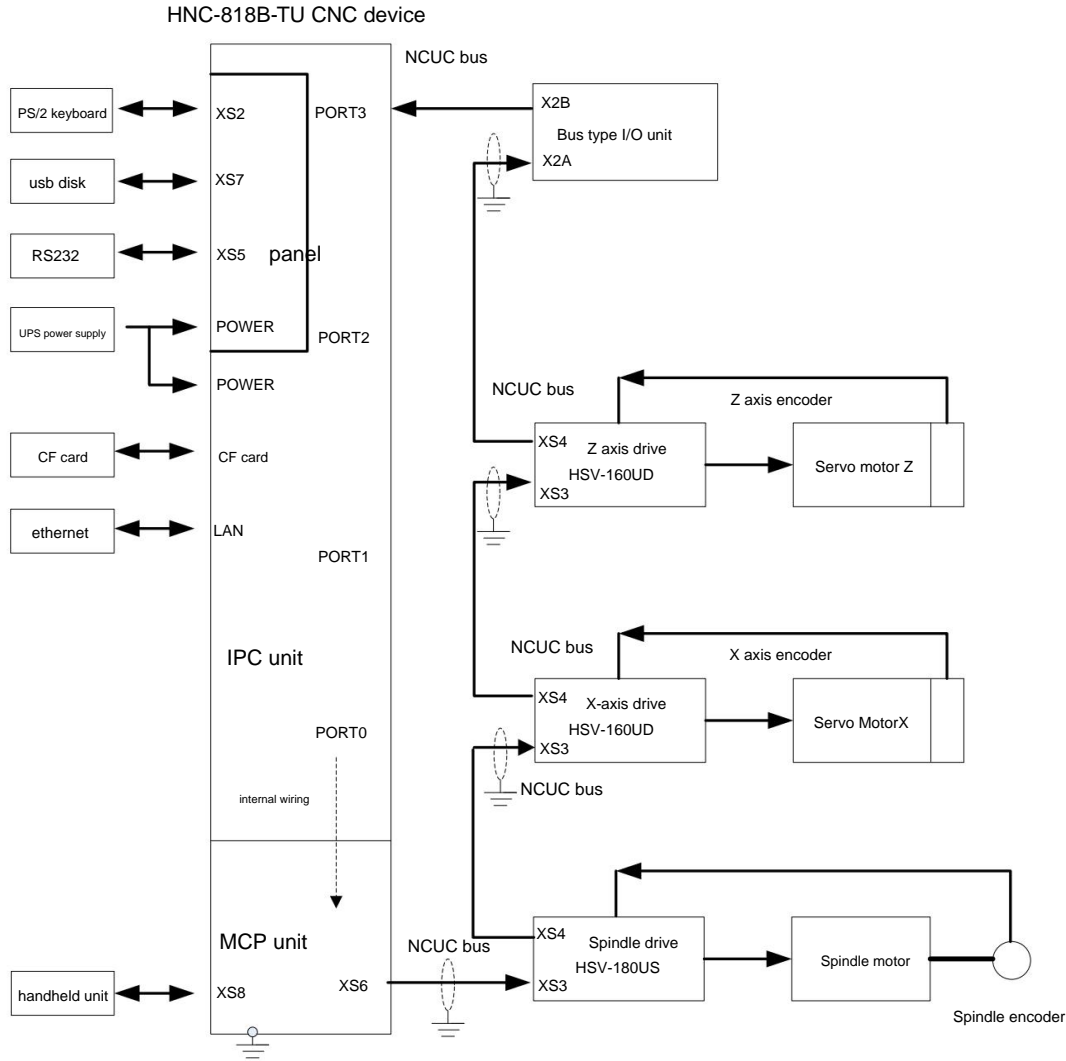


Figure 3.3.1 Overall block diagram of typical CNC system design

3.3.3 Definition of input and output switch

Except for a small amount of I/O signals provided by the hand-held unit interface of Huazhong 8 CNC system, the rest of the I/O signals

Provided by the bus I/O unit; in this example an input submodule of the HIO-1000 series is required

(HIO-1011N) and 2 output sub-modules (HIO-1021N). The specific definitions are shown in the table below.

XS8 (DB25/F header pin seat hole) handheld unit interface:

Pin No. Signal	Name	Define
	5V ground	manual pulse generator +5V power supply
25	+5V	ground manual pulse generator +5V
12	HB	power manual pulse generator
	HA	B phase manual pulse generator
11	O3	phase A
	O2	undefined;
10	O1	undefined; hand-held unit working indicator light, active
	O0	low; undefined
9	I0	hand-held unit coordinate selection input X-axis, normally open point, closed valid;
21	I1	Handheld unit coordinate selection input Z axis, normally open point, closed valid;
8	I2	undefined;
20	I3	is undefined;
7	I4	Incremental magnification input X1 of handheld unit, normally open point, closed valid;
19	I5	handheld unit incremental magnification input X10, normally open point, closed valid;
6	I6	Hand-held unit incremental magnification input X100, normally open point, closed valid;
4,18	I7	Handheld emergency stop button;
5	empty	
3,16 +24V 1,2,14,15,		DC24V power supply for the input and output switching value of the handheld unit
17	24V Ground	

**Input interface (Bus I/O unit input sub-module HIO-1011N):**

X00:

pin number	signal name	signal definition
0	X0.0 X-axis	positive overtravel limit switch, normally open, closed and valid; X0.1 X-axis
1		negative overtravel limit switch, normally open, closed and valid; Z-axis positive overtravel limit
2	X0.2	switch, Normally open point, closed effective; Z-axis negative overtravel
3	X0.3	limit switch, normally open point, closed effective; Four-station electric tool
4	X0.4	post tool position 1 Four-station
5	X0.5	electric tool post tool position 2 Four-
6	X0.6	station electric tool post tool position
7	X0.7	3 Four-station electric tool holder Tool
GND 24V ground GND		position 4 External DC 24V power
24V ground		supply ground External DC 24V power supply ground

X01:

pin number	signal name	signal definition
0	X1.0 Eight-	station tool post, hydraulic tool post, power tool post coding point X1.1
1	Eight-station	tool post, hydraulic tool post, power tool post coding point

2	X1.2	Eight-station tool post, hydraulic tool post, power tool post coding point
3	X1.3	Eight-station tool post, hydraulic tool post, power tool post coding point
4	X1.4	
5	X1.5	
6	X1.6	
7	X1.7	
GND 24V	ground	Reserved Reserved Reserved External
GND 24V	ground	DC 24V power supply ground External DC 24V power supply ground

X02:

Pin No.	Signal Name	Signal definition
0	X2.0	Hydraulic tool holder presses in place signal
1		Hydraulic tool holder tool position
2	X2.2	signal
3	X2.3	Reserves pedal
4	X2.4	chuck Emergency
5	X2.5	stop
6	X2.6	button retains chuck
7	X2.7	loose in position Chuck
GND 24V	ground	tight in position External DC 24V power
GND 24V	ground	supply ground External DC 24V power supply ground

X03:

pin number	signal name	Signal definition
0	X3.0	power tool post indexing signal
1	X3.1	power tool post locking signal
2	X3.2	reserved
3	X3.3	reserved
4	X3.4	reserved
5	X3.5	reserved
6	X3.6	reserved
7	X3.7	external
GND 24V	ground	DC 24V power supply ground external
GND 24V	ground	DC 24V power supply ground

**Output interface (bus I/O unit output sub-module HIO-1021N):**

Y00:

pin number	signal name	signal definition
------------	-------------	-------------------

0	Y0.0	Hydraulic output
1	Y0.1	overtravel release
2	Y0.2	chuck release
3	Y0.3	chuck clamp
4	Y0.4	tailstock
5	Y0.5	loose
6	Y0.6	tailstock
7	Y0.7	tight
GND 24V	ground	lubrication cooling external DC 24V
GND 24V	ground	power supply ground external DC 24V power supply ground

## Y01:

Pin No.	Signal Name	Signal definition
0	Y1.0	tool post forward
1	Y1.1	rotation tool post
2	Y1.2	reverse tool post
3	Y1.3	clamping tool post
4	Y1.4	release work
5	Y1.5	light reserved
6	Y1.6	The X-axis brake
7	Y1.7	retains
GND 24V	ground	the ground of the external DC 24V power
GND 24V	ground	supply The ground of the external DC 24V power supply

## Y02:

Pin No.	Signal Name	Signal definition
0	Y2.0	chip removal motor forward
1	Y2.1	rotation chip removal motor
2	Y2.2	reverse
3	Y2.3	reserved
4	Y2.4	reserved
5	Y2.5	reserved
6	Y2.6	reserved
7	Y2.7	reserved
GND 24V	ground	external DC 24V power supply ground
GND 24V	ground	external DC 24V power supply ground

## Y03:

Pin No.	Signal Name	Signal definition
0	Y3.0	Power tool post mode selection 0
1	Y3.1	Power tool post mode selection 1





2	Y3.2	Power tool post mode selection 2
3	Y3.3	Power tool post tool selection
4	Y3.4	0 Power tool post tool
5	Y3.5	selection 1 Power tool post
6	Y3.6	tool selection 2 Power tool
7	Y3.7	post tool selection
GND 24V	ground	3 Parity check External DC 24V power
GND 24V	ground	supply ground External DC 24V power supply ground

3.3.4 Introduction to Electrical Schematic Diagram

The main part of the electrical schematic diagram is given below in the form of a schematic diagram. For wire numbers, only the  
The wire numbers of the cables appear on different pages.

3.3.4.1 Power section

In this design, the AC24V power supply of the lighting lamp and the solenoid valve with a large working current use  
DC24V power supply, DC24V power supply for output switching value (such as relay, servo control signal, etc.)  
They are independent and separated by a low-pass filter in the middle.

The anti-interference magnetic rings and high-voltage ceramic capacitors at the main power supply line, transformer input terminal, etc. are not shown in the figure  
show it. As shown in Figure 3.3.2.

In Figure 3.3.2, QF0~QF4 are three-phase air switches; QF5~QF11 are single-phase air switches;  
KM1~KM4 are three-phase AC contactors; RC0~RC3 are three-phase RC absorbers (arc extinguishers); RC4~  
RC12 is a single-phase resistance-capacitance absorber (arc extinguisher); KA1~KA14 are DC 24V relays; V1,  
V2, V3, VZ are freewheeling diodes; YV1, YV2, YV3, YVZ are solenoid valves and X-axis motor  
brake.

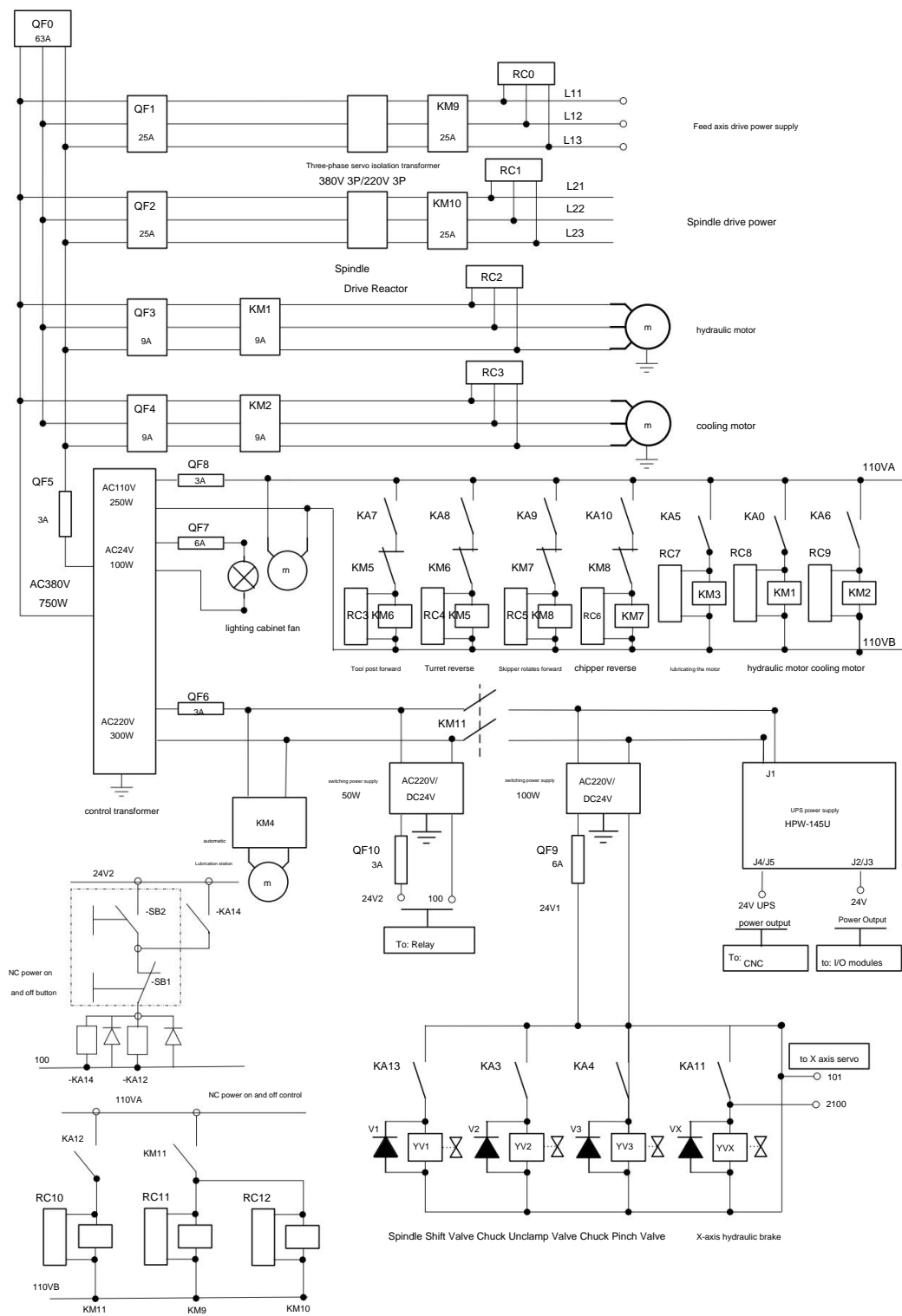


Figure 3.3.2 Electrical schematic diagram of typical CNC system - power supply diagram

3.3.4.2 Relay and input and output switching value

The relay is mainly controlled by the output switching value; the input switching value mainly refers to the feed drive device, spindle drive

The status information and alarm information of the moving device, machine tool electrical and other parts. Figure 3.3.3 is a typical lathe CNC system

Electrical Schematic - Relay Section. Input and output switch wiring are shown in Figure 3.3.4 and Figure 3.3.5 respectively.

The switching value of the two-axis lathe requires two input sub-modules HIO-1011N in the bus I/O unit.

There are 2 sub-modules HIO-1021N.

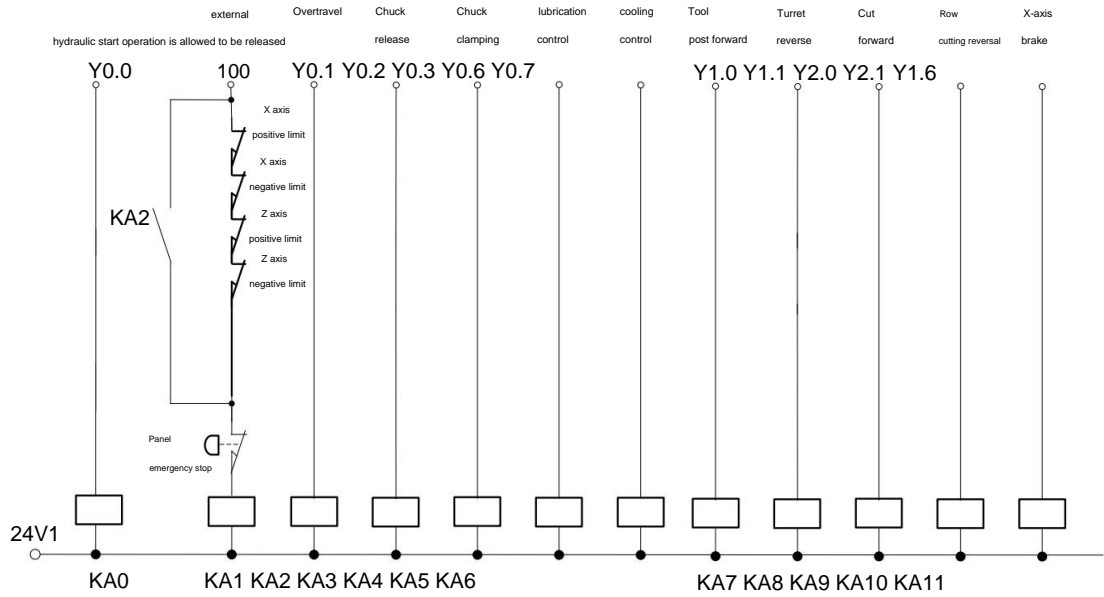


Figure 3.3.3 Electrical schematic diagram of typical CNC system - relay part

100 is the ground of the DC24V 50W switching power supply in Figure 3.3.2;

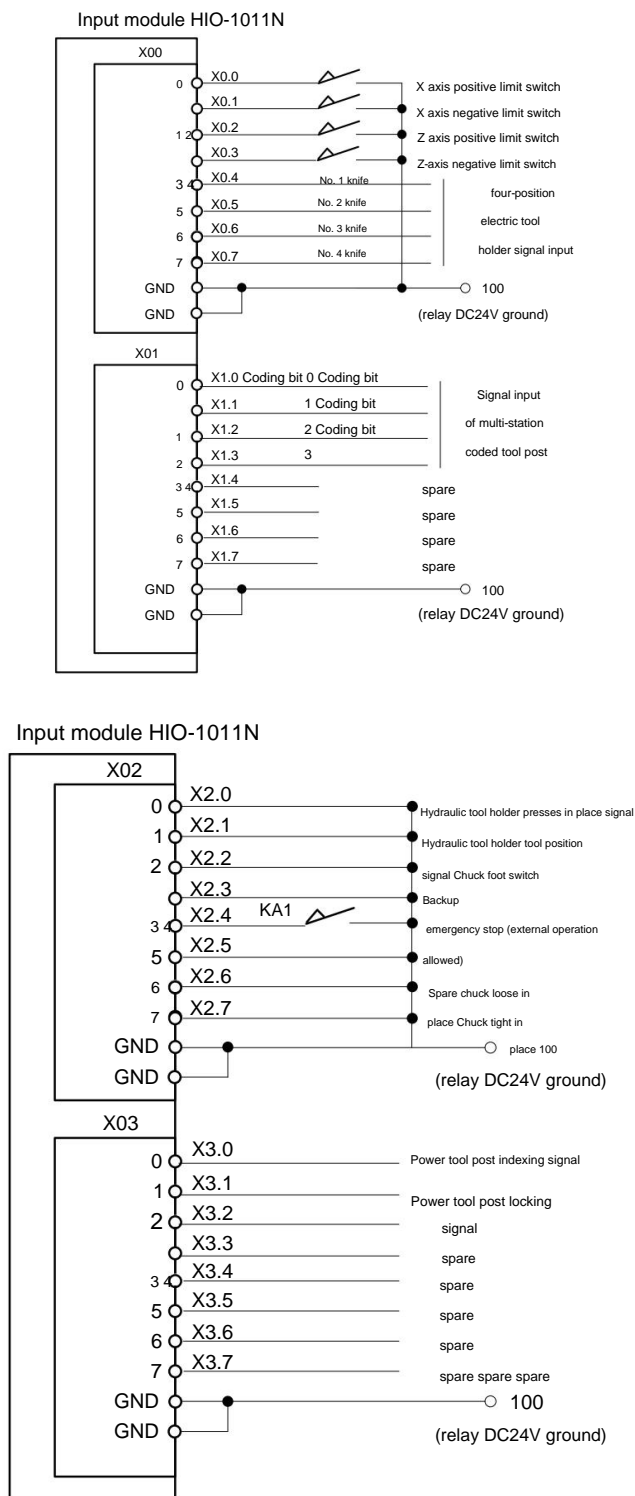


Figure 3.4.4 Electrical schematic diagram of typical CNC system - NPN input module

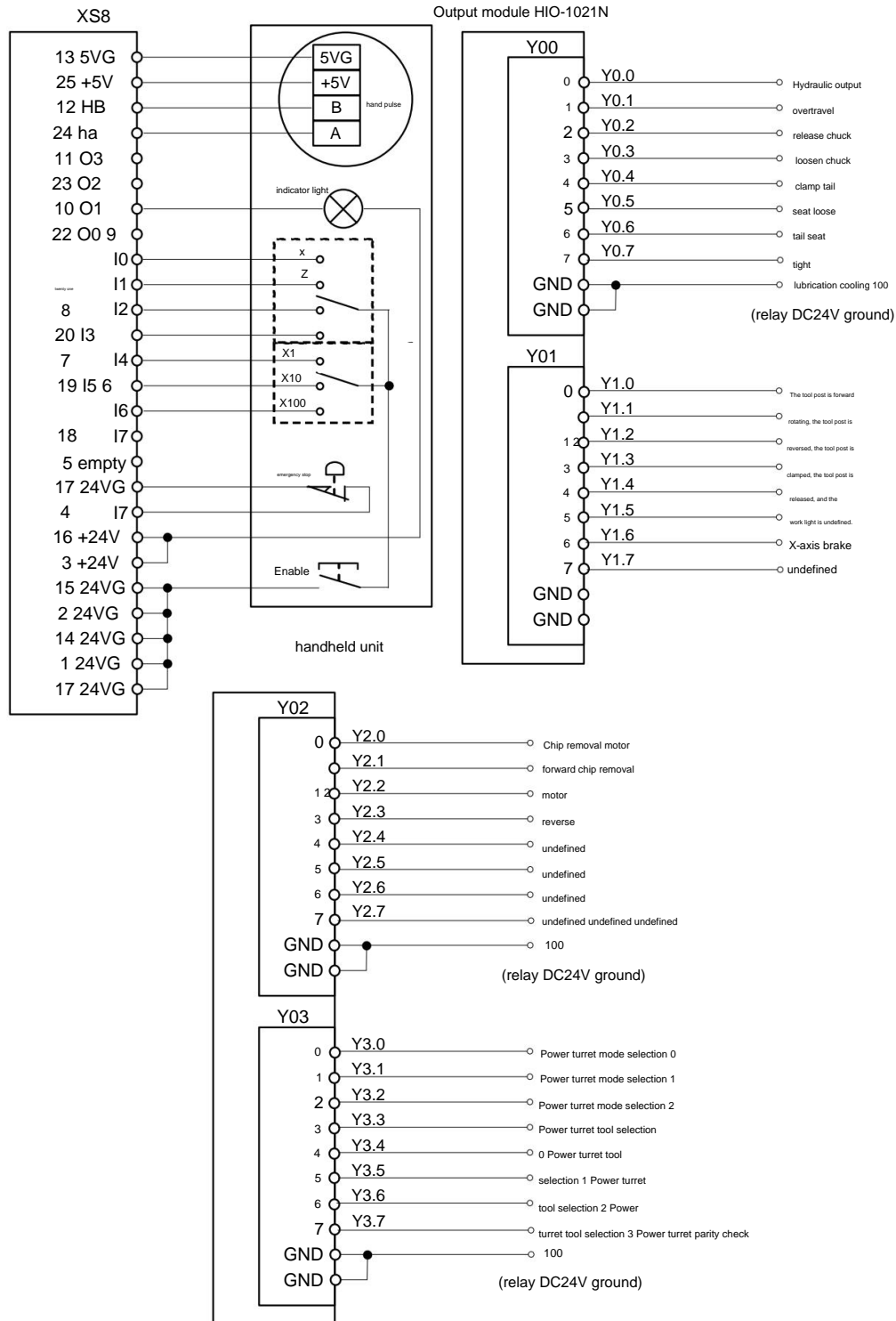


Figure 3.3.5 Electrical schematic diagram of a typical CNC system - input and output switch 2

## 3.3.4.3 Driver wiring diagram

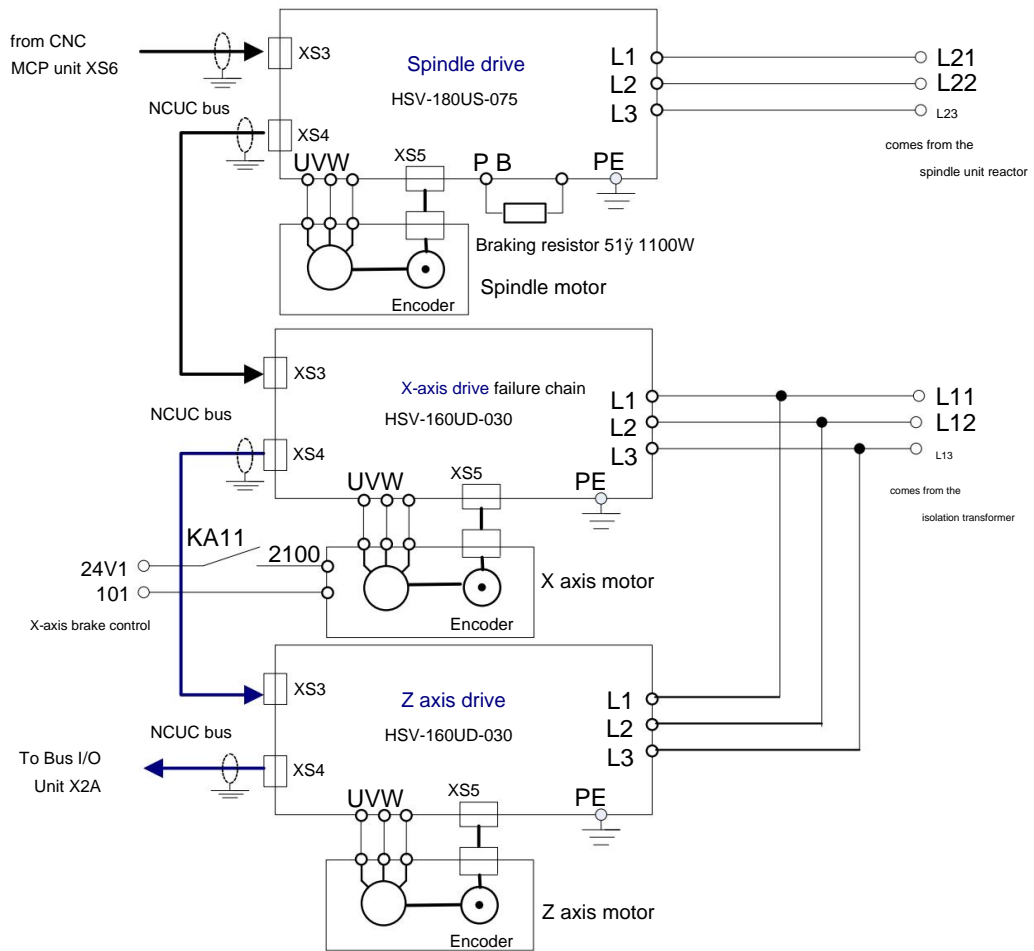


Figure 3.3.6 Electrical schematic diagram of typical CNC system - driver wiring diagram

The cable connection of NCUC bus is shown in Figure 3.3.7.

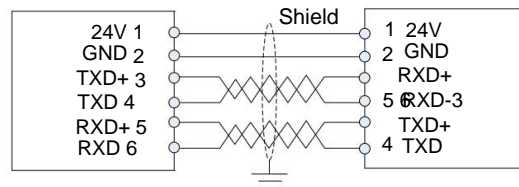


Figure 3.3.7 Electrical schematic diagram of typical CNC system - NCUC bus cable connection diagram

## Chapter 4 Typical Design Example of Milling Machine

Abstract: This chapter introduces the application of **HNC-8** series CNC device to the control of CNC milling machine

Typical design of the system.

### 4.1 Typical connection of CNC system

The typical connection between HNC-8 series CNC device and bus I/O unit, bus servo drive unit,

As shown in Figure 4.1.1.

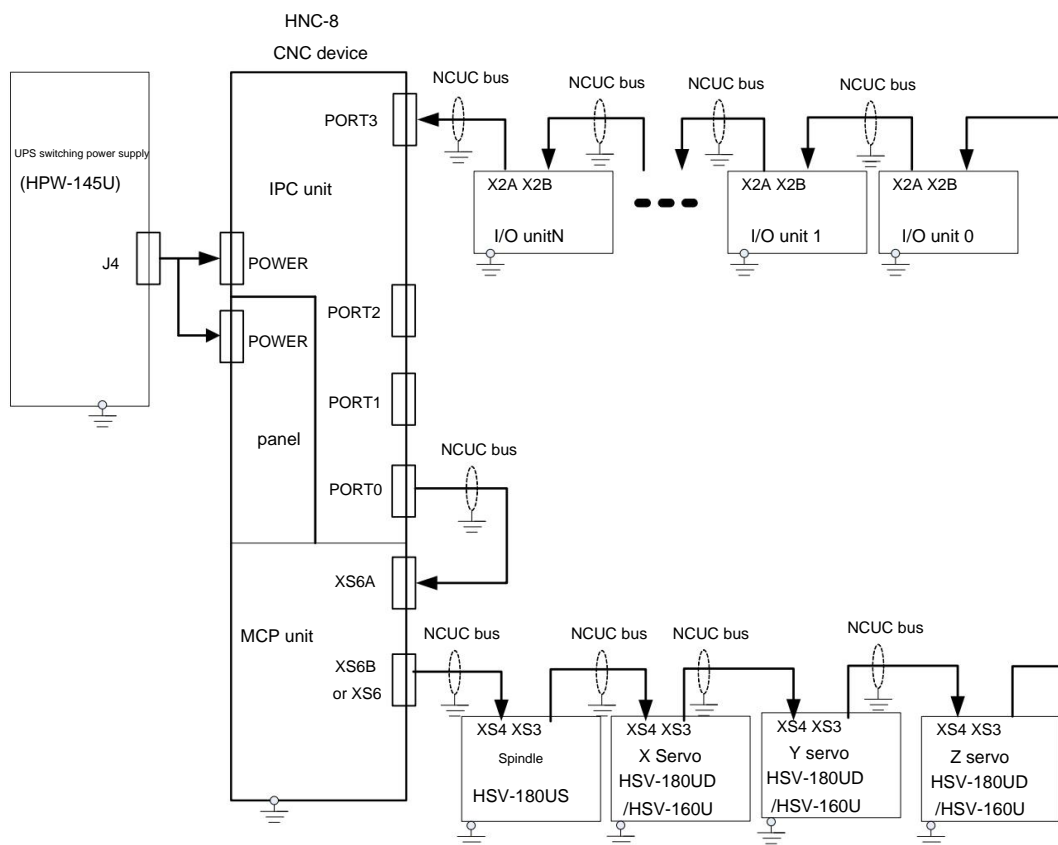


Figure 4.1.1 Typical connection between CNC device and bus-type I/O unit, bus-type servo drive unit

### 4.2 Overview of Typical Design of CNC System

HNC-8 series CNC devices are applied to different CNC machine tools, and there are two main differences:

•The logical relationship between the input and output switches, that is, the PLC programming is different.

—For details, refer to the book "PLC Programming Manual";

•The definition of input and output switch is different from the electrical design.

-- This chapter mainly deals with this part.

The input and output switching values are usually divided into two categories: the switching value connected inside the electric cabinet and the switching value connected to the machine tool.

Off volume. During commissioning, electrical cabinet commissioning and electromechanical joint commissioning are generally carried out separately.

4.3 Design example of CNC system for milling machine

4.3.1 System Introduction

Machine tool: three-coordinate lathe, X, Y, Z linear coordinate axes;

Control cabinet structure: strong current control cabinet + hanging box;

Spindle: Spindle drive.

The main components of a typical CNC system design are shown in Table 4.3.1.

Table 4.3.1 Main components of typical CNC system design

Serial No.	Name Specification	Main Purpose	Remarks	1 Numerical Control Device HNC-818B-M System Control	Huazhong
	Numerical Control 2 Handheld Unit				
		HWL-1003 hand control		Huazhong CNC 3 servo transformer 3P AC380/220V 8KW	
	power supply for servo power	module Huazhong CNC			
4	Control Transformer	AC380/220V 300W servo control power supply, switching power supply /110V 250W heat exchanger and AC contactor power Huazhong CNC /24V 100W Lighting Power Supply			
5	bus type I/O unit	HIO-1061	NCUC communication sub-		
		HIO-1006	module backplane sub-module (6 slots)		
		HIO-1011N	PLC input sub-module: 3 blocks with a total of 32 channels		
		HIO-1021N	PLC output sub-module: 2 blocks with a total of 32 channels		
6	switching power supply	HPW-145U CNC device and bus I/O unit power supply			
	power supply AC220/DC24V	50W switching value and intermediate relay Mingwei 8 switching power supply AC220/DC24V			
	100W lifting shaft brake and solenoid valve Mingwei 9 servo driver	HSV-160UD -075 X, Y, Z axis motor drive device			
	Huazhong CNC 10 spindle driver HSV-180US-050 Spindle motor	drive device Huazhong CNC 11 servo motor 130ST-			
	M14320LMBB X, Y axis feed motor	Huada motor			
			(Tamagawa absolute encoder)		
12	Servo motor 130ST-M14320LMBB (with brake)		Z-axis feed motor		
			(Tamagawa absolute encoder)		Huada Motor



of Milling Machine 13 Spindle Motor GM71054SB61-H AC Servo Spindle Motor 7.5KW Dengqi Electromechanical 14 Reactor AC380V	
7.5kVA Drive Device Power Line Isolation (1 set) Huazhong CNC	

4.3.2 Overall block diagram

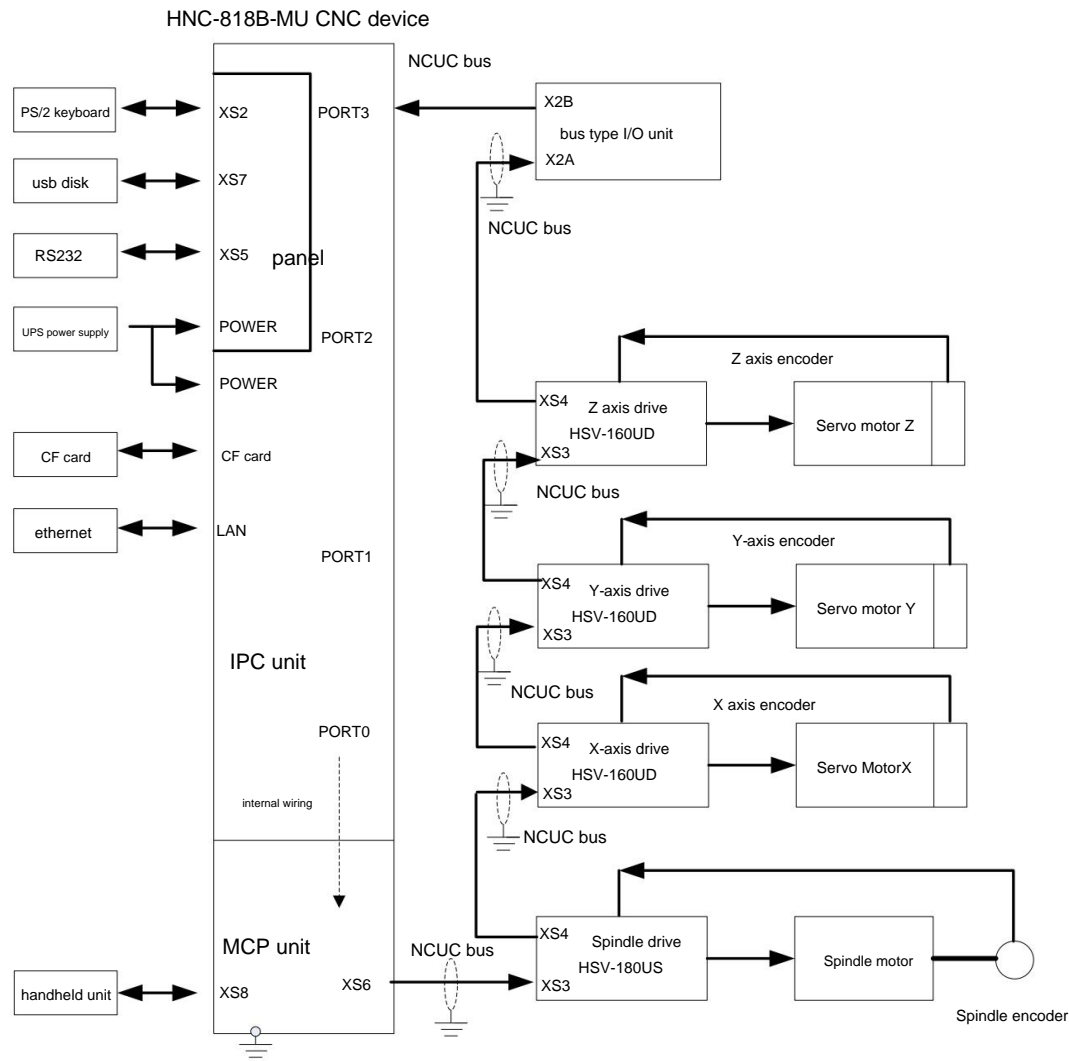


Figure 4.3.1 Overall block diagram of typical CNC system design

4.3.3 Definition of input and output switch

Except for a small amount of I/O signals provided by the hand-held unit interface of Huazhong 8 CNC system, the rest of the I/O signals

Provided by bus I/O unit; input submodule (HIO-1011N) of HIO-1000 series is required in this example

3 pieces, 2 pieces of output sub-module (HIO-1021N). The specific definitions are shown in the table below.

XS8 (DB25/F header pin seat hole) handheld unit interface:

Pin No. Signal	Name	Define
	5V ground	manual pulse generator +5V power supply
25	+5V	ground manual pulse generator +5V
12	HB	power manual pulse generator B
	HA	phase manual pulse generator
11	O3	phase A
	O2	undefined;
10	O1	undefined; hand-held unit working indicator light, active
	O0	low; undefined
9	I0	hand-held unit coordinate selection input X-axis, normally open point, closed valid;
21	I1	hand-held unit coordinate selection input Y-axis, normally open point, closed valid;
8	I2	Handheld unit coordinate selection input Z axis, normally open point, closed valid;
20	I3	undefined;
7	I4	Incremental magnification input X1 of handheld unit, normally open point, closed valid;
19	I5	handheld unit incremental magnification input X10, normally open point, closed valid;
6	I6	Hand-held unit incremental magnification input X100, normally open point, closed valid;
4,18	I7	Handheld emergency stop button;
5	empty	
3,16 +24V	1,2,14,15,	DC24V power supply for the input and output switching value of the handheld unit
17	24V Ground	

**Input interface (Bus I/O unit input sub-module HIO-1011N):**

**X00:**

Pin No. Signal	Name	signal definition
X0.0		X positive limit
1	X0.1	X negative limit
2	X0.2	Y positive limit
3	X0.3	Y negative limit
4	X0.4	Z positive limit
5	X0.5	Z negative limit
6	X0.6	undefined
7	X0.7	undefined
GND 24V	ground	external DC 24V power supply ground
GND 24V	ground	external DC 24V power supply ground

**X01:**

Pin No. Signal	Name	Signal definition
0	X1.1	Axis 0 returns to
1		zero Axis 1 returns to zero

2	X1.2	Axis 2 home
3	X1.3	return
4	X1.4	undefined
5	X1.5	Spindle alarm
6	X1.6	Pressure alarm
7	X1.7	Cooling alarm
GND 24V	ground	External alarm External DC 24V
GND 24V	ground	power supply ground External DC 24V power supply ground

**X02:**

Pin No.	Signal Name	Signal
0	X2.0	definition External
1	X2.1	24V DC
2	X2.2	power
3	X2.3	supply
4	X2.4	ground
5	X2.5	External
6	X2.6	DC 24V
7	X2.7	power
GND 24V	ground	supply ground Undefined
GND 24V	ground	Undefined Undefined Emergency stop Undefined Undefined Undefined

**X03:**

Pin No.	Signal Name	Signal definition
0	X3.0	Tool magazine in-position signal (bamboo hat-style
1	X3.1	tool magazine) Tool magazine back-to-position signal
2	X3.2	(bamboo hat-style tool magazine)
3	X3.3	Spindle tight tool in-position signal
4	X3.4	Spindle
5	X3.5	loose tool
6	X3.6	in-position
7	X3.7	signal
GND 24V	ground	Undefined Undefined Undefined
GND 24V	ground	Undefined External DC 24V power supply DC 24V power ground

**X04:**

Pin No.	Signal Name	Signal definition
0	X4.0	tool magazine count (all tool
1	X4.1	magazines) tool magazine origin (robot
2	X4.2	tool magazine) knife arm origin (robot
3	X4.3	tool magazine) knife arm brake (robot
4	X4.4	tool magazine) buckle in place (robot tool magazine)

5	X4.5	Back tool in place (manipulator tool magazine)
6	X4.6	Tool back in place (manipulator tool
7	X4.7	magazine)
GND 24V	ground	Undefined External DC 24V power
GND 24V	ground	supply ground External DC 24V power supply ground

### Output interface (bus I/O unit output sub-module HIO-1021N):

Y00:

Pin No.	Signal Name	signal definition
0	Y0.0	Z-axis brake
1	Y0.1	overtravel release
2	Y0.2	lubrication
3	Y0.3	cooling
4	Y0.4	work light
5	Y0.5	chip removal
6	Y0.6	forward rotation
7	Y0.7	chip removal
GND 24V	ground	reverse undefined external DC 24V power
GND 24V	ground	supply ground external DC 24V power supply ground

Y01:

Pin No.	Signal Name	Signal definition
0	Y1.0	Three-color light-
1	Y1.1	Green three-color light-
2	Y1.2	Yellow three-color
3	Y1.3	light-Red Tool
4	Y1.4	releases the tool magazine into (bamboo hat
5	Y1.5	style tool magazine) tool magazine back (bamboo
6	Y1.6	hat style tool magazine) tool magazine
7	Y1.7	forward rotation (all tool magazines) tool
GND 24V	ground	magazine reverse Turn (all tool magazines)
GND 24V	ground	External DC 24V power supply ground External DC 24V power supply ground

Y02:

Pin No.	Signal Name	Signal definition
0	Y2.0	Tool arm forward rotation (robot tool magazine)
1	Y2.1	Tool arm reverse rotation (robot tool magazine)
2	Y2.2	Tool pocket back (robot tool magazine)
3	Y2.3	Tool pocket reverse (robot tool magazine)



4	Y2.4	Undefined
5	Y2.5	Undefined
6	Y2.6	Undefined
7	Y2.7	Undefined
GND 24V	ground	External DC 24V power supply
GND 24V	ground	ground External DC 24V power supply ground

4.3.4 Introduction to Electrical Schematic Diagram

The main part of the electrical schematic diagram is given below in the form of a schematic diagram. For wire numbers, only the  
The wire numbers of the cables appear on different pages.

4.3.4.1 Power section

In this design, the AC24V power supply of the lighting lamp and the solenoid valve with a large working current use  
DC24V power supply, DC24V power supply for output switching value (such as relay, servo control signal, etc.)  
They are independent and separated by a low-pass filter in the middle.  
The anti-interference magnetic rings and high-voltage ceramic capacitors at the main power supply line, transformer input terminal, etc. are not shown in the figure  
show it. As shown in Figure 4.3.2.

In Figure 4.3.2, QF0~QF4 are three-phase air switches; QF5~QF11 are single-phase air switches;  
KM1~KM4 are three-phase AC contactors; RC0~RC3 are three-phase RC absorbers (arc extinguishers); RC4~  
RC12 is a single-phase resistance-capacitance absorber (arc extinguisher); KA0~KA11 are DC 24V relays; VX is  
Freewheeling diode; YVZ is the solenoid valve and Z-axis motor brake.

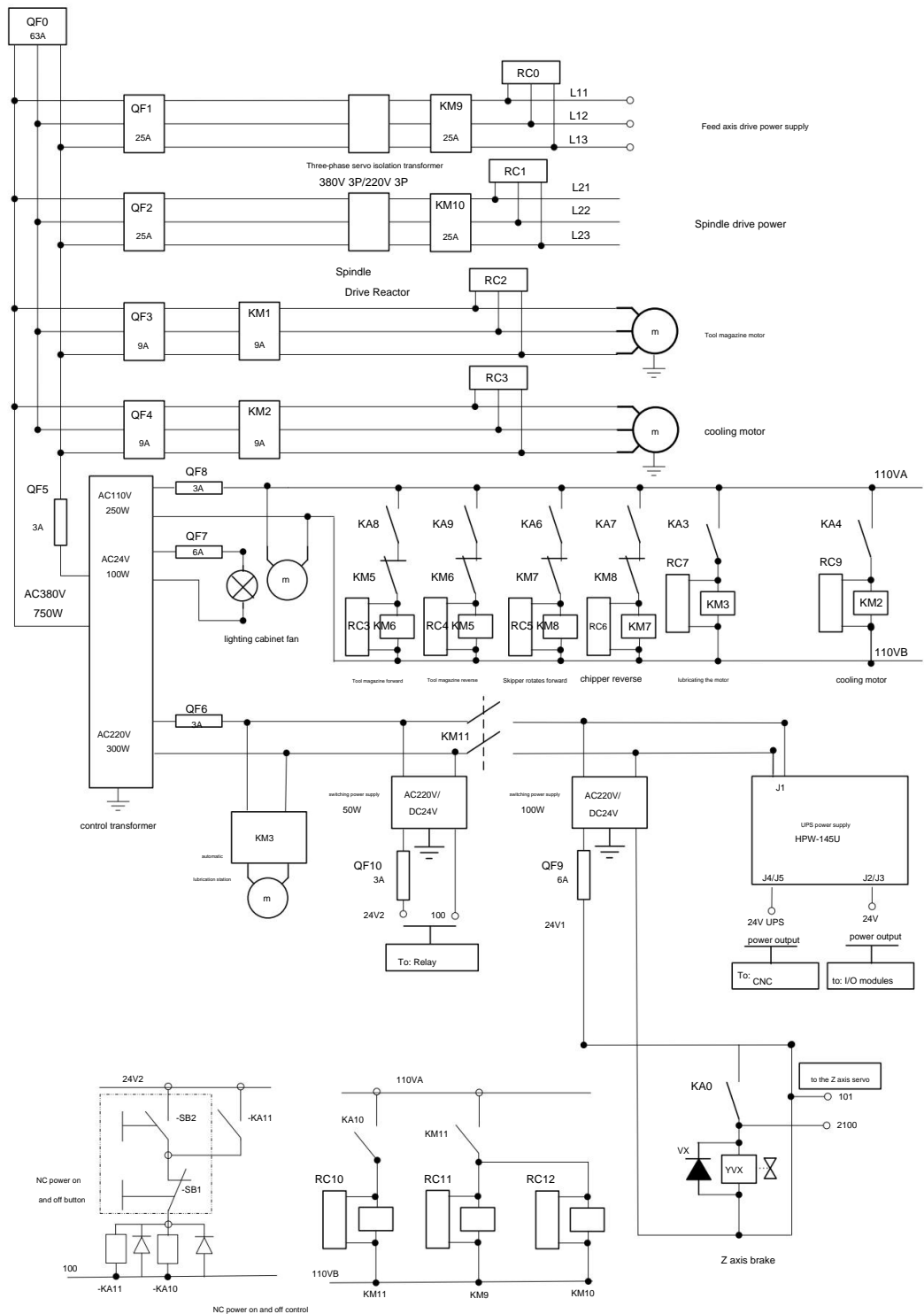


Figure 4.3.2 Electrical schematic diagram of typical CNC system - power supply diagram

4.3.4.2 Relay and input and output switching value

The relay is mainly controlled by the output switching value; the input switching value mainly refers to the feed drive device, spindle drive

The status information and alarm information of the moving device, machine tool electrical and other parts. Figure 4.3.3 is a typical lathe CNC system

Electrical schematic relay section. Input and output digital wiring are shown in Figure 4.3.4 and Figure 4.3.5 respectively.

The switching value of the two-axis lathe requires 3 input sub-modules HIO-1011N in the bus I/O unit.

There are 2 sub-modules HIO-1021N.

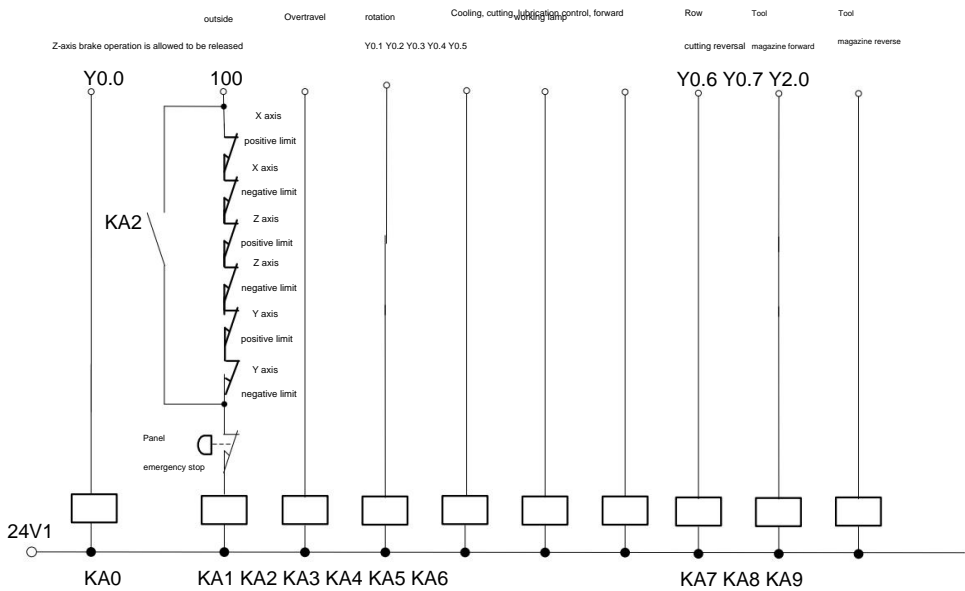
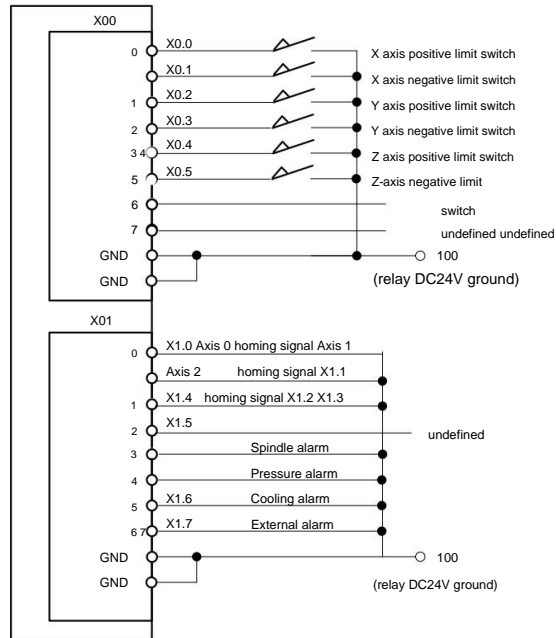


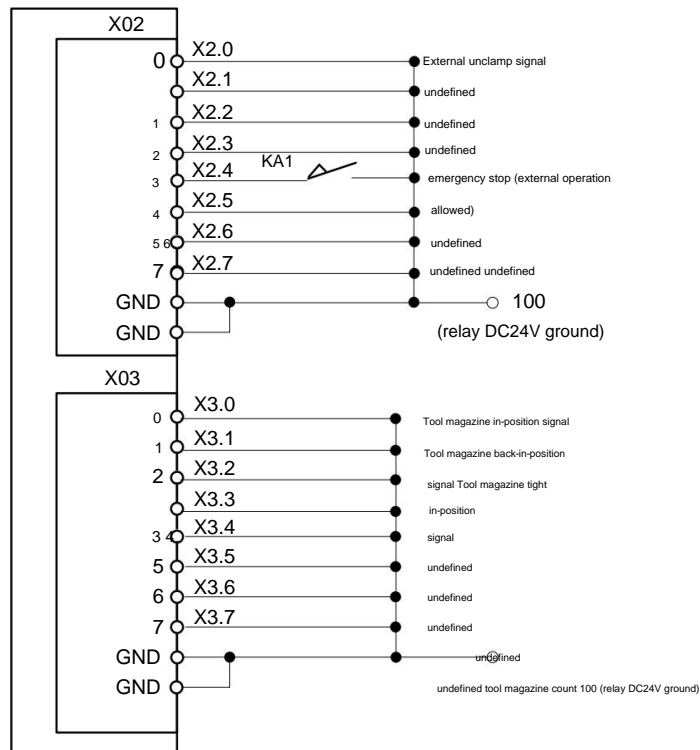
Figure 4.3.3 Electrical schematic diagram of typical CNC system - relay part

100 is the ground of the DC24V 50W switching power supply in Figure 4.3.2;

Input module HIO-1011N



Input module HIO-1011N





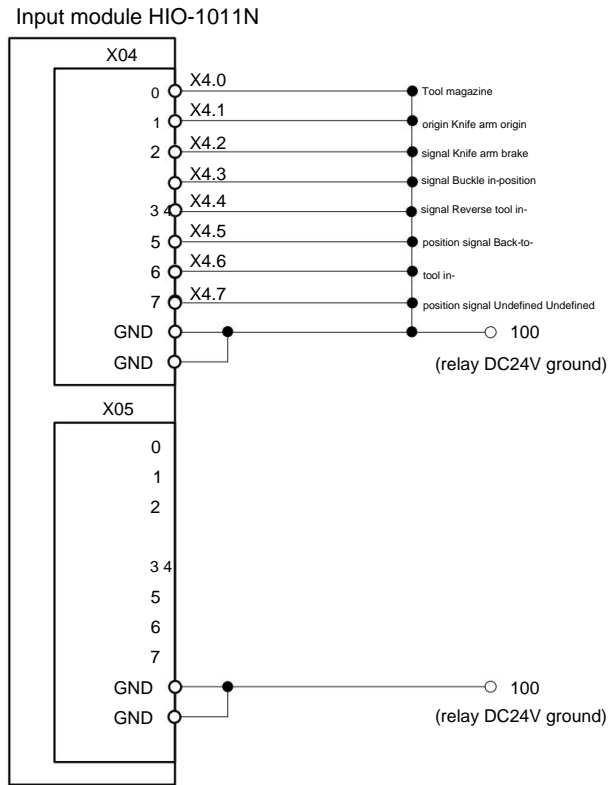


Figure 4.3.4 Electrical schematic diagram of a typical CNC milling machine system - input and output switching values

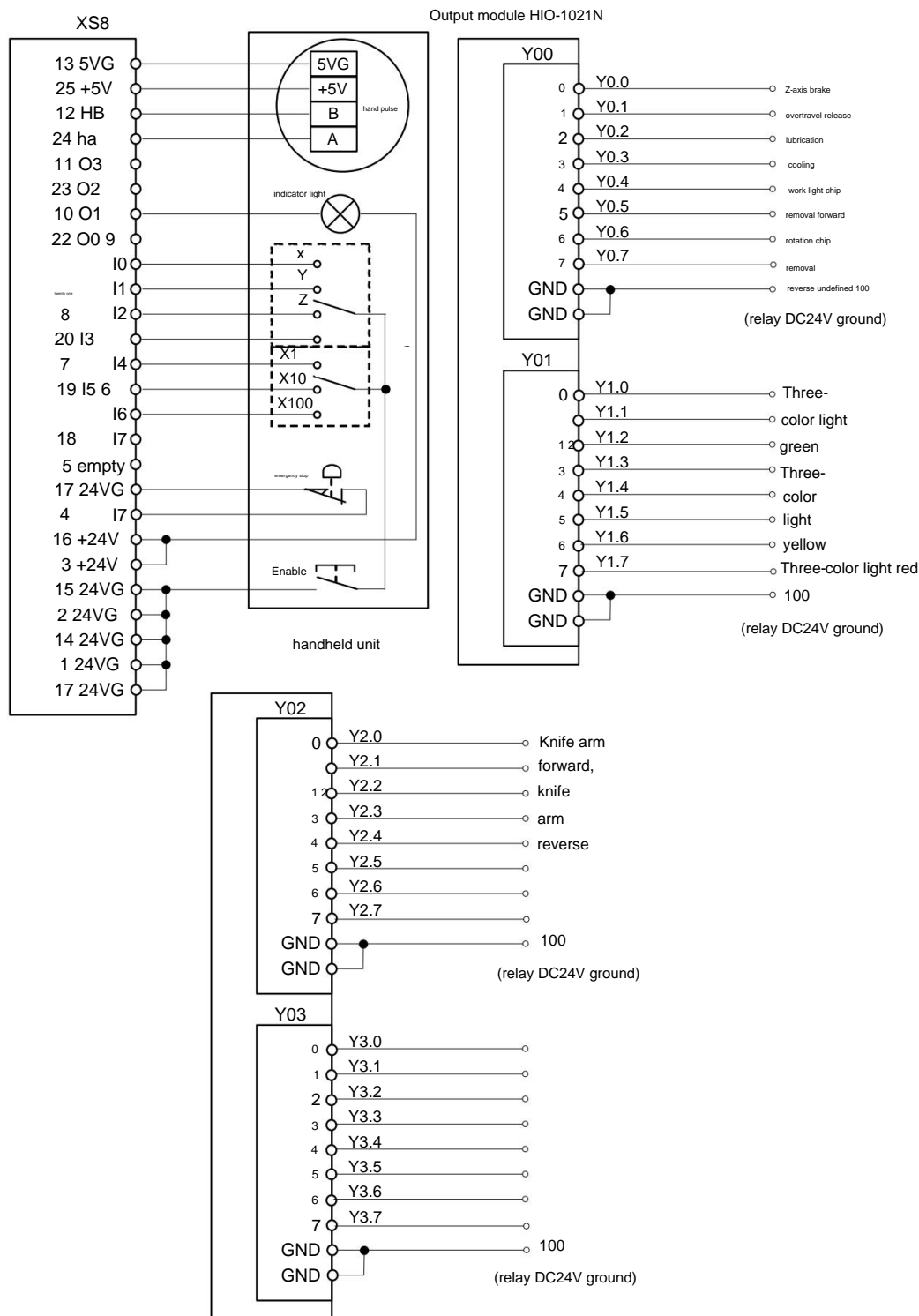


Figure 4.3.5 Electrical schematic diagram of a typical CNC milling machine system - input and output switching values

## 4.3.4.3 Driver wiring diagram

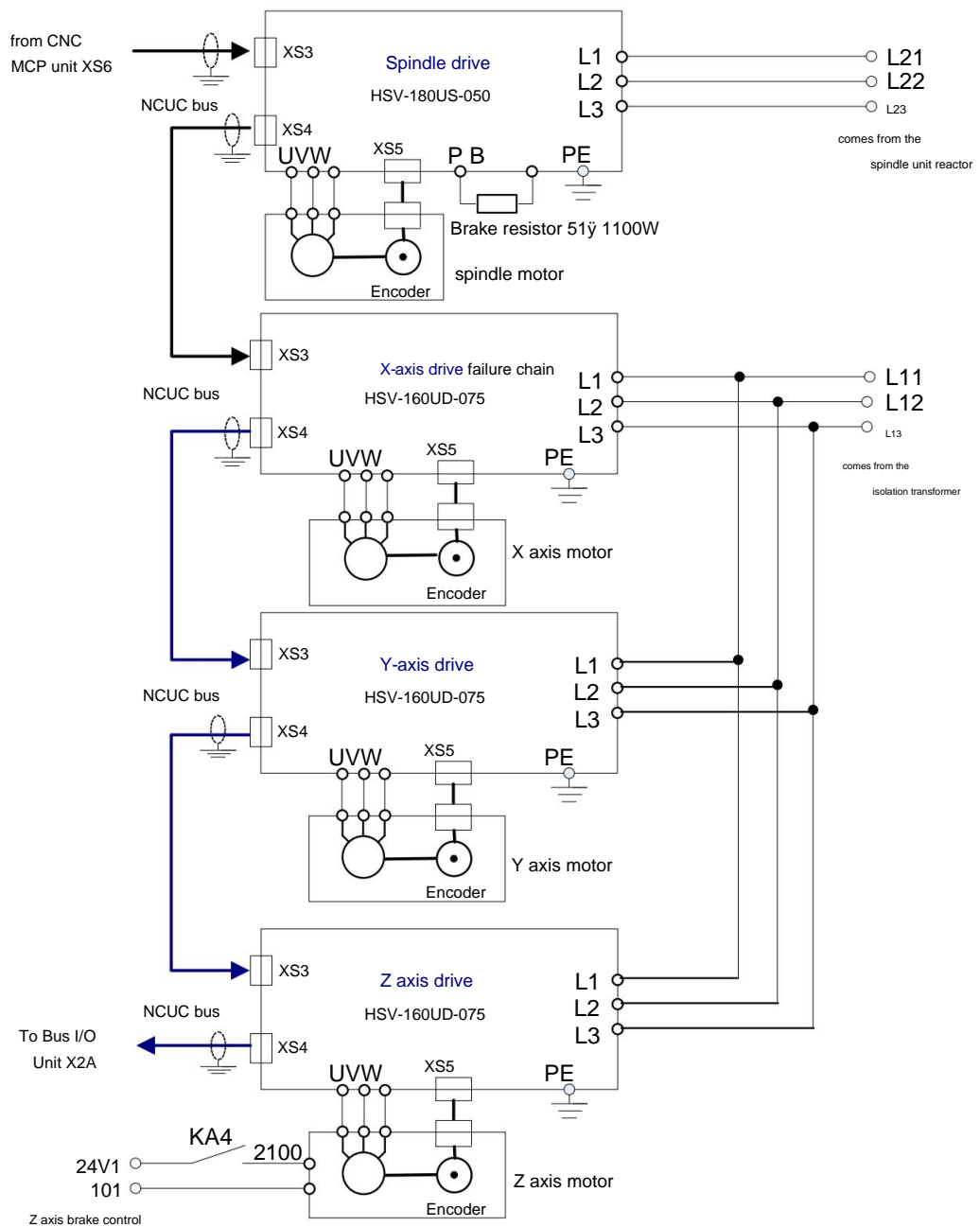


Figure 4.3.6 Electrical schematic diagram of typical CNC milling machine system - driver wiring diagram

The cable connection of NCUC bus is shown in Figure 4.3.7.

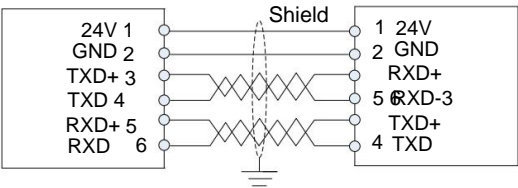
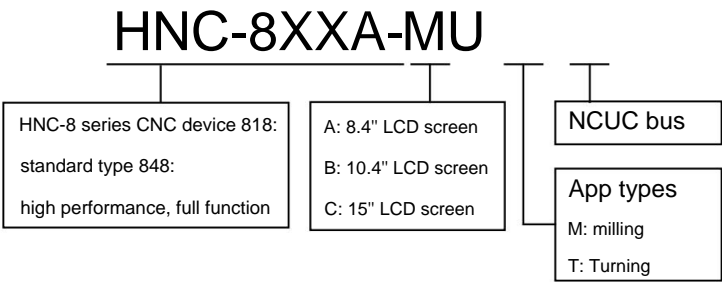


Figure 4.3.7 Electrical schematic diagram of typical CNC milling machine system - NCUC bus cable connection diagram

Chapter 5 Appendix

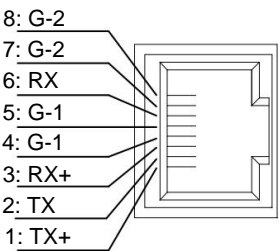
5.1 Device model

Number description:



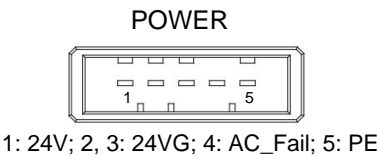
5.2 Interface definition

XS3 LAN: Ethernet port (RJ45)



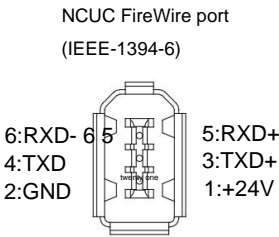
pin number	signal name	illustrate
1, 2	TX+, TX- data output	
3, 6	RX+, RX- Data input ground	
4,5	G-1	
7, 8	G-2	and

POWER: power interface (seat pin) (D-3100S-178 (AMP))



pin number	signal name	
1	24V	Description DC 24V power supply
2, 3 4	GND DC 24V power ground	
	AC-FAIL power failure detection connected	
5	PE	to ground

PORT0 ~ 3, XS6A, XS6B, XS6: NCUC bus interface (IEEE-1394-6 FireWire port)



signal name	illustrate
24V	DC 24V power supply
GND	
TXD+	data transmission
TXD	
RXD+	data reception
RXD	

XS8: handheld unit interface (DB25 socket)

XS8 (DB25 socket)

1:24VG

2:24VG

3:24V

4:I7

5: Empty

6:I6

7:I4

8:I2

9:I0

10:O1

11:O3

12:HB

13:5VG

14:24VG

15:24VG

16:24V

17:24VG

18:I7

19:I5

20:I3

21:I1

22:O0

23:O2

24:HA

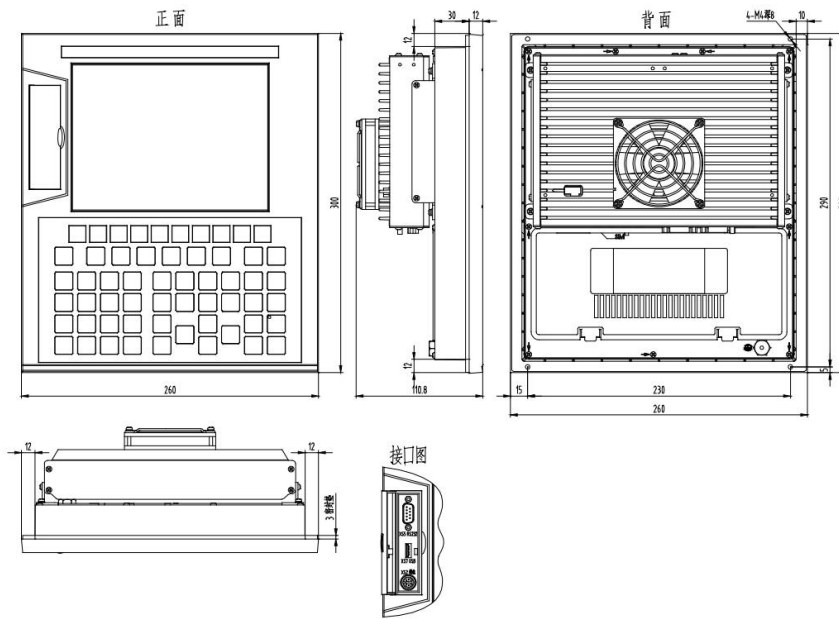
25:+5V

signal name	illustrate
24V, 24VG	DC24V power output
I7	handheld unit emergency stop button
I0~I6	Handheld unit input switch value
O0~O3	Hand-held unit output switching value
HA	Manual phase
HB	A Manual phase B
+5V, 5VG	Manual DC5V power output

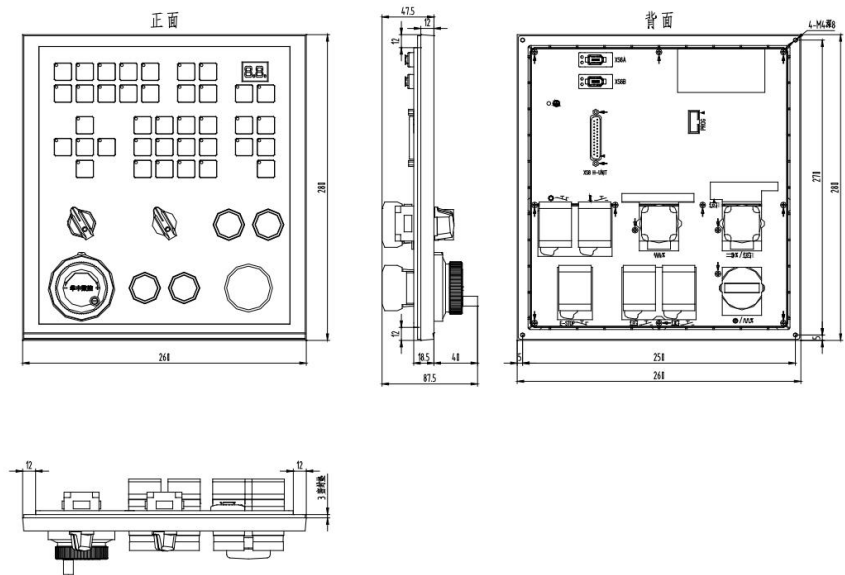
5.3 Dimensions

5.3.1 Appearance dimension drawing of CNC device

1) Appearance dimension drawing of A series CNC device



b) A series top panel



b) Figure 5.3.1 A series lower

panel figure 5.3.1 A series numerical control device appearance dimensions

(2) Appearance dimension drawing of B series CNC device

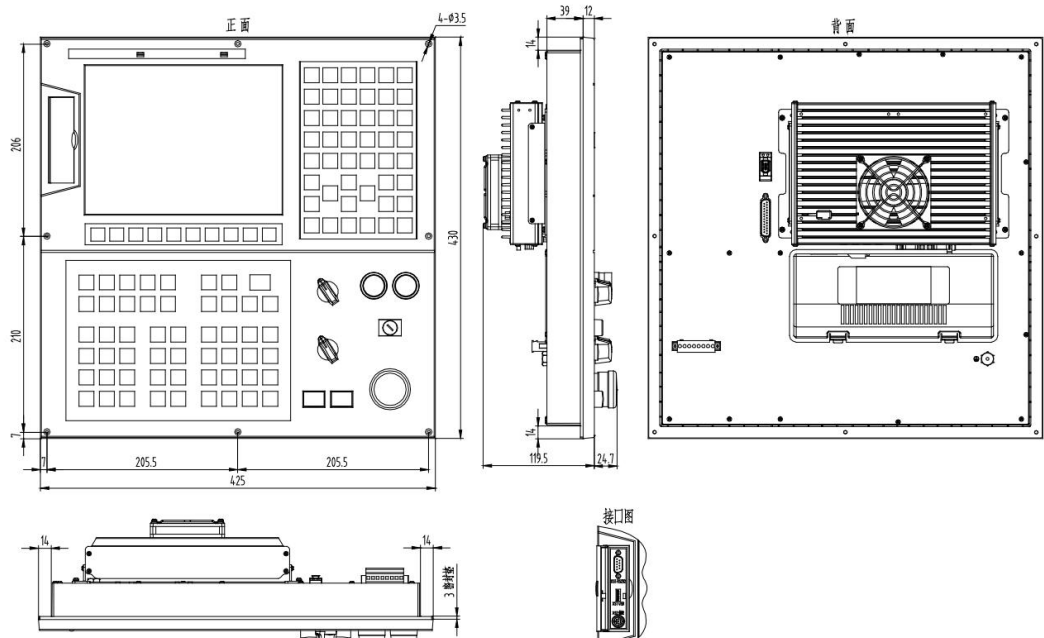
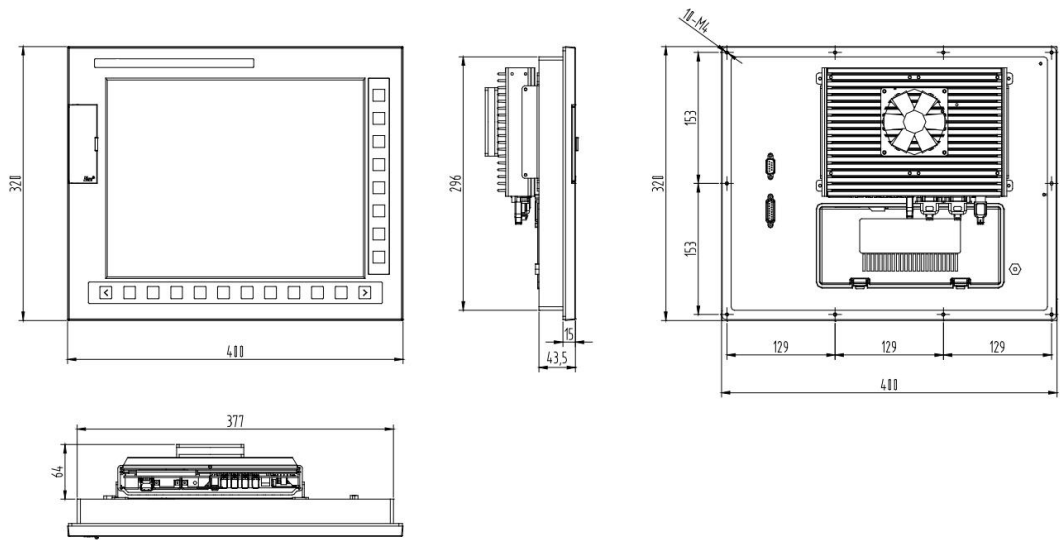
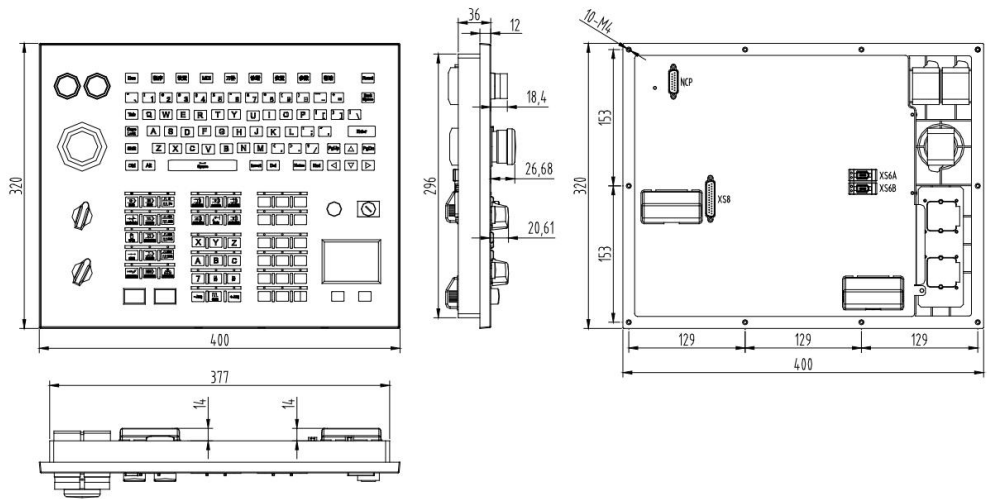


Figure 5.3.2 Appearance dimensions of B series CNC device

(3) Appearance dimension drawing of C series CNC device



a) Upper panel of C series CNC device



b) Figure 5.3.3 The lower panel of the C series CNC device . Dimensions of the C series CNC device



5.3.2 Dimensions of the IPC unit

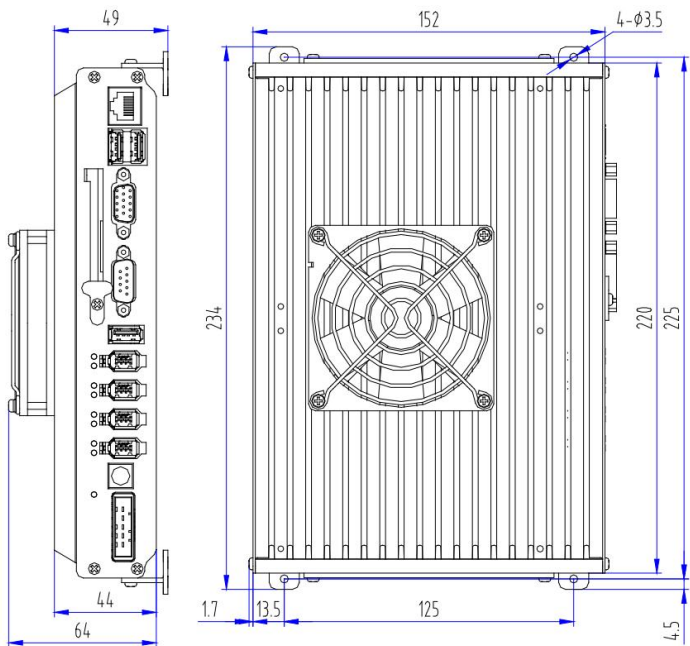


Figure 5.3.4 Dimensions of HPC-100 IPC Unit - Horizontal

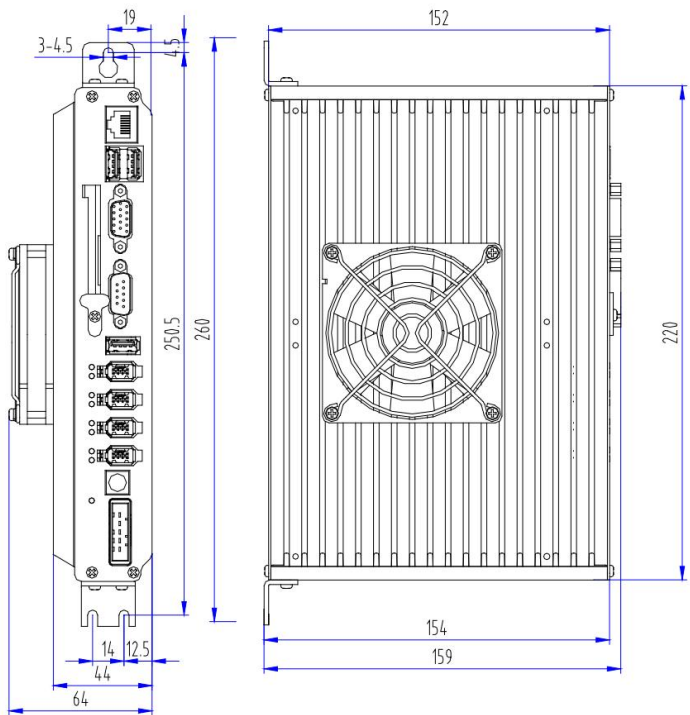


Figure 5.3.5 Dimensional drawing of HPC-100 IPC unit – vertical

### 5.3.3 Dimensions of bus I/O unit

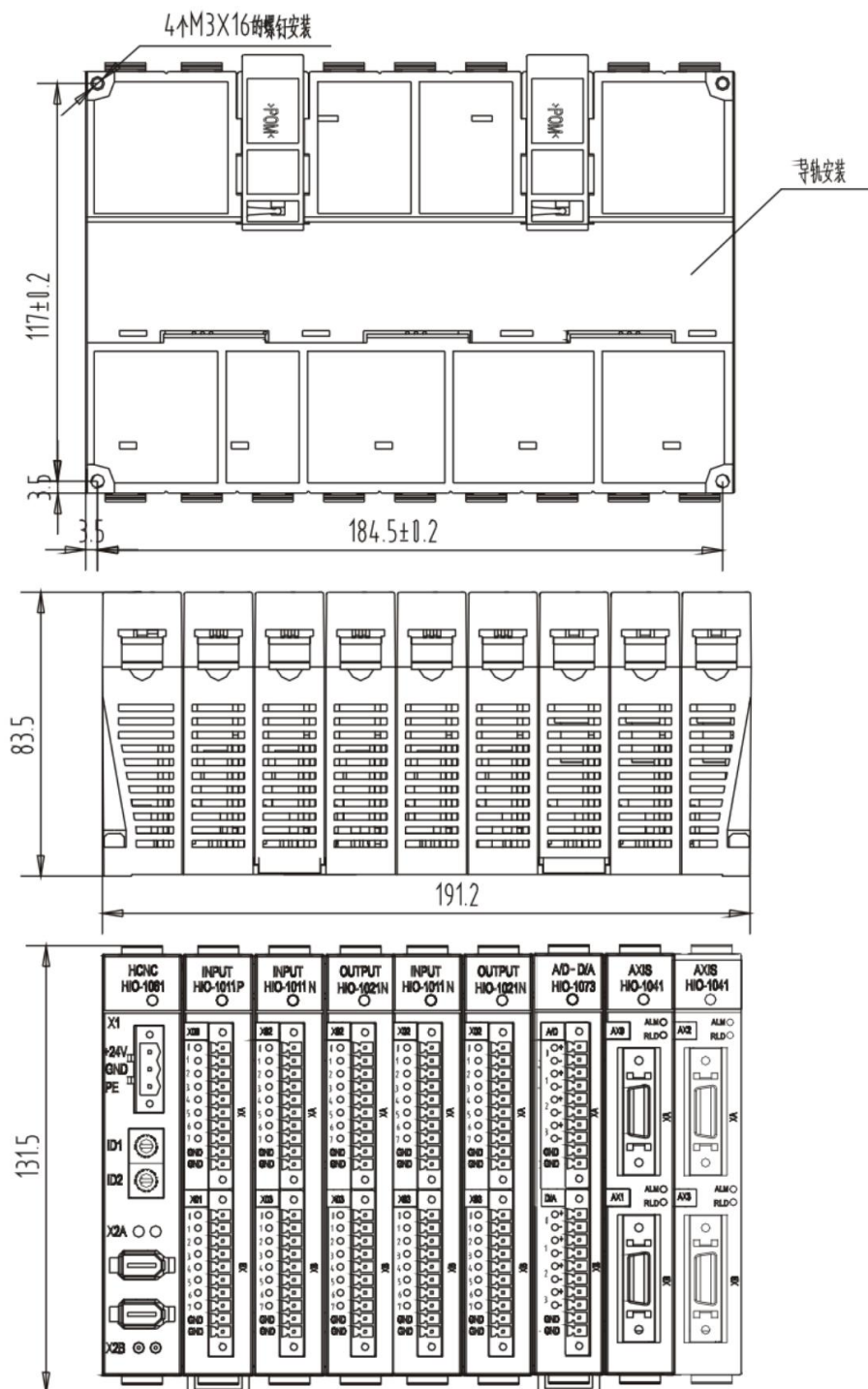


Figure 5.3.6 HIO-1000A Bus Type I/O Unit Dimensions

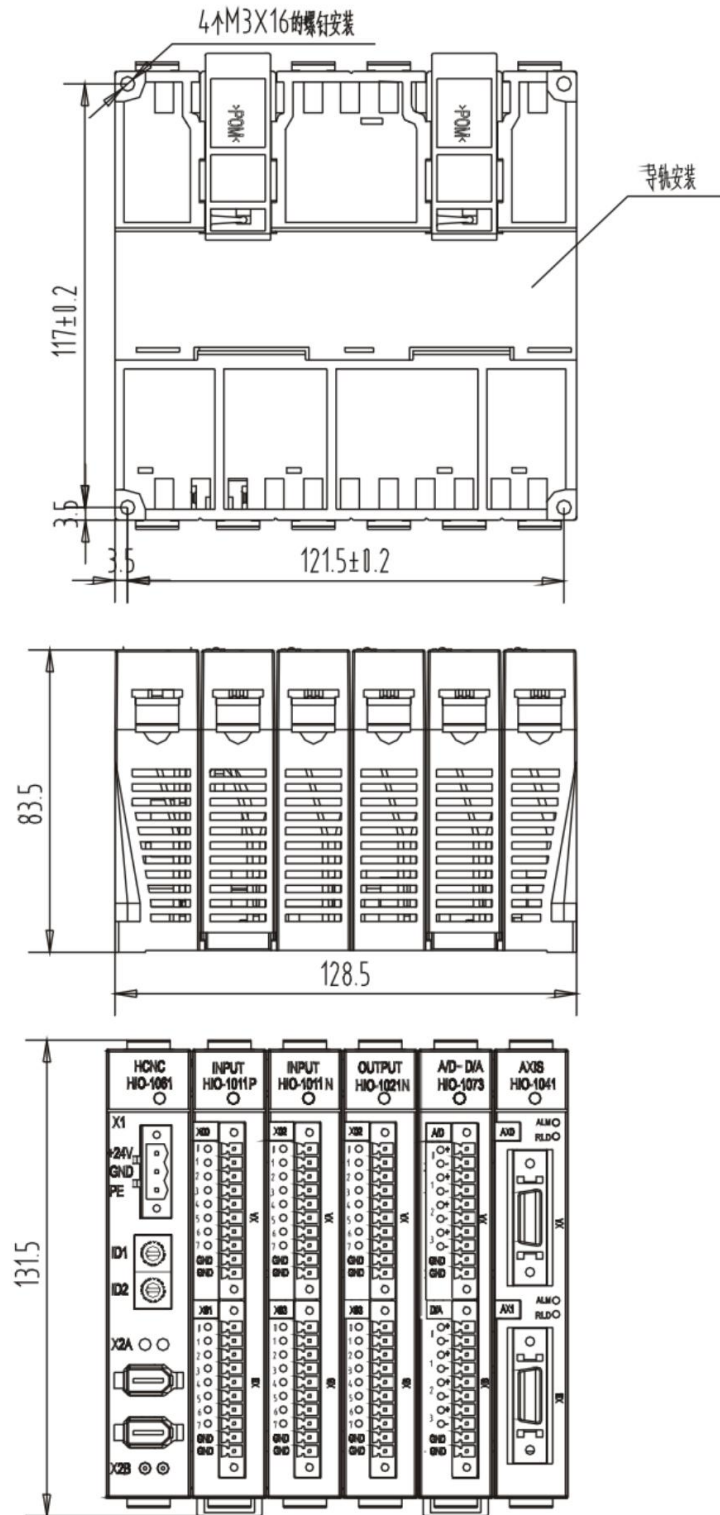


Figure 5.3.7 HIO-1000B Bus Type I/O Unit Dimensions